

Weight Gain and Body Composition Changes During and After Breast Cancer Treatment: A Systematic Review

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Abstract

Background: Weight gain and adverse changes in body composition are common among women undergoing treatment for breast cancer. These changes may negatively affect metabolic health, quality of life, treatment outcomes, and long-term survivorship. **Objective:** To systematically synthesize current evidence on weight gain, adiposity, body composition, and related metabolic alterations during and after breast cancer treatment in adult women. **Methods:** A systematic review was conducted to identify studies evaluating changes in body weight, body mass index, adiposity, body composition, or metabolic markers during or after breast cancer treatment. Primary observational and interventional studies were included in the qualitative synthesis, while review articles and commentaries were used to provide contextual background. Owing to heterogeneity in study design, patient populations, treatment modalities, and outcome measures, findings were synthesized narratively. **Results:** Seven primary studies met the eligibility criteria for qualitative synthesis. Overall, the evidence indicates that clinically meaningful weight gain and unfavorable body composition changes occur in a substantial proportion of women receiving treatment for breast cancer, particularly during chemotherapy and the early survivorship period. Common findings included short-term weight gain during the first year after diagnosis or treatment, persistence of excess weight over longer follow-up, increased fat mass and adiposity, and deterioration in cardiometabolic risk factors. Baseline body mass index, chemotherapy, endocrine therapy, dietary patterns, physical activity, and neighborhood food environment were identified as important factors influencing these outcomes. **Conclusions:** Current evidence supports routine monitoring of body weight and body composition throughout breast cancer treatment and survivorship. Early preventive interventions emphasizing healthy dietary patterns, regular physical activity, and identification of patients at increased metabolic risk may help mitigate treatment-related weight gain and improve long-term health outcomes. Further high-quality prospective studies are needed to clarify underlying mechanisms and evaluate effective intervention strategies.

Keywords: Breast cancer, Weight gain, Body composition, Adiposity, Chemotherapy, Endocrine therapy, Survivorship

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Introduction

Advances in the early detection and treatment of breast cancer have substantially improved survival, shifting the focus of survivorship care toward the prevention and management of long-term treatment-related complications. Among these, weight gain and unfavorable changes in body composition have emerged as common and clinically significant concerns. These alterations often extend beyond increases in body weight to include increased fat mass, loss of lean muscle mass, insulin resistance,

dyslipidemia, and other metabolic abnormalities that may adversely affect quality of life, increase cardiovascular risk, and potentially influence long-term cancer outcomes.

The mechanisms underlying treatment-related weight gain are multifactorial. Chemotherapy-induced fatigue, reduced physical activity, corticosteroid use, treatment-induced ovarian suppression or premature menopause, endocrine therapy, changes in appetite and dietary habits, and alterations in energy metabolism all

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contribute to weight and body composition changes. Importantly, body weight alone may not accurately reflect these changes, as patients may experience increases in adiposity despite relatively stable body weight. Consequently, comprehensive assessment should include body mass index (BMI), fat mass, body fat percentage, visceral adiposity, insulin resistance, and other metabolic indicators.

Rationale

Although numerous studies have investigated weight gain during and after breast cancer treatment, the available evidence remains heterogeneous with respect to study design, patient populations, treatment modalities, follow-up duration, and outcome measures. Furthermore, many investigations have evaluated broader metabolic outcomes, including adiposity and body composition, rather than weight gain alone. A systematic synthesis of the current evidence is therefore warranted to clarify the extent, timing, and determinants of these treatment-related changes and to identify factors that may inform preventive and supportive care strategies. Given the methodological heterogeneity across studies, a qualitative synthesis was considered the most appropriate approach.

Objective

The objective of this systematic review was to synthesize current evidence regarding weight gain, body composition changes, adiposity, and metabolic alterations occurring during and after breast cancer treatment, with particular emphasis on treatment-related and modifiable lifestyle factors associated with these outcomes.

Review Question

Among adult women with breast cancer, what is the frequency, magnitude, timing, and clinical determinants of weight gain and adverse body composition or metabolic changes during and after cancer treatment?

PICO Framework

The review question was structured using the PICO framework (Table 1) to define the target population, exposure, comparator, and outcomes of interest.

Materials and Methods

Study Design

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The review addressed a predefined research question and included explicit eligibility criteria, a structured study selection process, predefined data extraction domains, and a planned assessment of methodological quality. Owing to substantial heterogeneity in study populations, outcome definitions, measurement methods, and follow-up duration, a narrative synthesis was performed rather than a meta-analysis.

Reporting Standard and Protocol

The review was structured according to PRISMA reporting recommendations. At the time of manuscript preparation, the review protocol had not been registered. If registered subsequently (e.g., in PROSPERO), the registration number should be reported in the final manuscript. To enhance transparency and reproducibility, the complete search strategy, study selection flow diagram, data extraction forms, and risk-of-bias assessments should be provided as supplementary material.

Eligibility Criteria

Studies were eligible for inclusion if they met the following criteria:

1. Included adult women diagnosed with breast cancer.
2. Evaluated changes in body weight, body mass index (BMI), body composition, adiposity, or metabolic outcomes during or after breast cancer treatment.
3. Reported original data from observational or interventional human studies.
4. Investigated outcomes associated with chemotherapy, endocrine therapy, neoadjuvant treatment, survivorship, or relevant lifestyle factors such as diet or physical activity.

Review articles, scoping reviews, commentaries, and narrative summaries without original breast cancer-specific patient data were not included in the primary qualitative synthesis but were used to provide contextual background where appropriate.

Table 1. PICO Framework for the Systematic Review.

Element	Definition
Population (P)	Adult women diagnosed with breast cancer, including those undergoing active treatment (e.g., neoadjuvant, adjuvant, or endocrine therapy) and breast cancer survivors following completion of treatment.
Exposure (I/E)	Breast cancer treatment, particularly chemotherapy, neoadjuvant chemotherapy, endocrine therapy, and survivorship; lifestyle-related factors, including dietary patterns and physical activity, were also considered when evaluated.
Comparator (C)	Baseline or pre-treatment body weight or body composition; post-treatment or follow-up assessments; alternative treatment groups; categories of lifestyle adherence; or no formal comparator, depending on the study design.
Outcomes (O)	Changes in body weight, body mass index (BMI), body fat percentage, fat mass, visceral adiposity, body composition, metabolic syndrome, insulin resistance, lipid profile, glucose metabolism, and other cardiometabolic biomarkers.

Study Selection

Studies identified through the literature search were screened according to the predefined eligibility criteria. Titles and abstracts were initially reviewed, followed by full-text assessment of potentially eligible articles. Studies meeting all inclusion criteria were included in the qualitative synthesis, whereas review articles and other non-primary publications were retained solely to support the background and discussion sections. The study selection process should be summarized in a PRISMA flow diagram.

Data Extraction and Synthesis

Data extracted from the included studies comprised study characteristics, patient population, treatment modality, duration of follow-up, weight- and body composition-related outcomes, metabolic parameters, and key findings. Because of considerable heterogeneity in treatment settings, outcome definitions, measurement techniques, and follow-up periods, statistical pooling was not considered appropriate. Therefore, findings were synthesized narratively and organized into four predefined domains: [1] short-term weight change during or immediately after treatment, [2] long-term persistence of weight gain, [3] changes in body composition and metabolic health, and [4] treatment-related and modifiable lifestyle factors associated with these outcomes.

Results

Study Selection

The literature search identified nine potentially relevant records for assessment. Following application of the predefined eligibility criteria, seven primary studies were included in the qualitative synthesis. Two additional publications, comprising a scoping review and a contextual review article, were excluded from the primary synthesis but were retained to provide background and contextual interpretation in the Introduction and Discussion.

Figure 1 presents the PRISMA flow diagram summarizing the study selection process. The diagram should be updated with the final screening and eligibility numbers following completion of the full literature search, duplicate removal, and full-text assessment.

Characteristics of the Included Studies

Table 2 summarizes the characteristics of the studies included in the qualitative synthesis, together with contextual publications used to support the background and discussion. The evidence base comprised prospective and longitudinal cohort studies, observational studies, a real-world lifestyle intervention study, and long-term follow-up investigations involving women with early-stage breast cancer receiving chemotherapy, endocrine therapy, or survivorship care. Most studies evaluated changes in body weight, body composition, adiposity, or metabolic health during treatment or throughout survivorship. Two review-based publications were included solely as contextual references and were not incorporated into the primary qualitative synthesis.

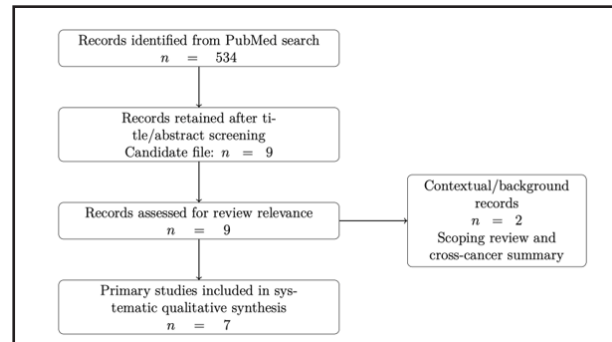


Figure 1. PRISMA Flow Diagram Illustrating the Study Selection Process for the Systematic Review.

Results

Study selection

A total of nine candidate records were identified from the available evidence set. Following eligibility assessment, seven primary studies met the inclusion criteria and were included in the qualitative synthesis. Two additional records a scoping review and a cross-cancer review were retained as contextual evidence but were excluded from the primary synthesis because they did not provide original breast cancer-specific data.

Figure 1 presents the draft PRISMA flow diagram summarizing the study selection process. The diagram should be updated after completion of the final database search, duplicate removal, and full-text screening.

Characteristics of included studies (Table 3)

Short-term weight change during and after treatment

Evidence from the included studies consistently indicates that clinically relevant weight gain may occur during the first year following breast cancer diagnosis or treatment initiation. Makari-Judson et al. observed a modest but statistically significant increase in body weight at 12 months after diagnosis among women with early-stage breast cancer. Patients receiving chemotherapy also experienced transient worsening of insulin resistance, although this effect diminished during subsequent follow-up [1].

Similarly, Pedersini et al. demonstrated that weight trajectories varied substantially according to lifestyle behaviors. While most patients maintained stable body weight and some achieved clinically meaningful weight loss, only a minority experienced weight gain exceeding 5% of baseline body weight. Greater adherence to a Mediterranean dietary pattern and regular physical activity were associated with more favorable outcomes, suggesting that early lifestyle interventions may mitigate treatment-related weight gain [3].

Long-term persistence of weight gain

Longitudinal evidence suggests that weight gain occurring during active treatment frequently persists into survivorship. His et al. reported that more than one-third of patients experienced weight increases exceeding 5% following initiation of adjuvant chemotherapy, with

Table 2. Characteristics of the Included and Contextual Studies.

Study	Year	Journal	Study design	Treatment or population	Main contribution to this review
Makari-Judson et al. [1]	2022	Breast Cancer Research and Treatment	Prospective observational study	Women receiving adjuvant chemotherapy and/or endocrine therapy for early-stage breast cancer	Evaluated longitudinal changes in body weight, body composition, and insulin resistance over 24 months following diagnosis.
Qin et al. [2]	2022	Journal of Clinical Oncology	Population-based prospective cohort	Black breast cancer survivors	Examined weight and fat mass changes and identified chemotherapy exposure and neighborhood food environment as determinants of adiposity gain.
Pedersini et al. [3]	2023	Breast Cancer Research and Treatment	Real-world observational study	Women with early breast cancer receiving chemotherapy	Assessed the effectiveness of Mediterranean diet counseling and physical activity recommendations in preventing clinically significant weight gain.
His et al. [4]	2025	Breast Cancer Research	Longitudinal cohort study	Early-stage breast cancer treated with adjuvant chemotherapy	Investigated long-term weight trajectories and persistence of weight gain over a 13-year follow-up period.
Ryu et al. [5]	2021	Scientific Reports	Comparative observational study	Estrogen receptor-positive/HER2-negative breast cancer treated with neoadjuvant chemotherapy or endocrine therapy	Compared changes in BMI and cardiometabolic profiles between treatment modalities.
Dieli-Conwright et al. [6]	2022	Diabetology & Metabolic Syndrome	Follow-up cohort analysis	Early-stage breast cancer survivors 4–5 years after chemotherapy	Evaluated metabolic syndrome components, body composition, and cardiometabolic biomarkers during survivorship.
Silva et al. [7]	2021	Clinical Nutrition ESPEN	Observational study	Women with early-stage breast cancer following chemotherapy	Examined metabolic syndrome, nutritional status, body composition, and visceral adiposity indices after treatment.
Poltronieri et al. [8]	2022	Nutrition and Cancer	Scoping review (contextual)	Breast cancer treatment	Used as background evidence on treatment-related adiposity changes; not included in the primary synthesis.
Khan et al. [9]	2025	Journal of Cachexia, Sarcopenia and Muscle	Narrative review (contextual)	Chemotherapy across multiple cancer types	Provided contextual evidence on chemotherapy-associated weight gain across cancer populations; not included in the primary synthesis.

Abbreviations: ER, estrogen receptor; HER2, human epidermal growth factor receptor 2.

elevated body weight remaining evident throughout 13 years of follow-up [4]. These findings indicate that the first year after diagnosis represents a critical period during which preventive interventions may have the greatest long-term impact.

Body composition and metabolic deterioration

The reviewed studies indicate that treatment-related metabolic alterations extend beyond simple changes in body weight. Ryu et al. found that patients receiving neoadjuvant chemotherapy experienced temporary increases in BMI and overweight prevalence compared with those receiving neoadjuvant endocrine therapy, in whom similar changes were not observed [5].

Long-term metabolic consequences were further demonstrated by Dieli-Conwright et al., who reported persistent deterioration in metabolic syndrome components, lipid metabolism, glucose regulation, inflammatory biomarkers, and body composition several years after chemotherapy completion [6]. Likewise, Silva et al. documented increases in visceral adiposity indices together with adverse nutritional and metabolic profiles among breast cancer survivors [7]. Collectively, these findings emphasize that BMI alone does not adequately

capture treatment-related metabolic risk and should be complemented by assessment of body fat distribution, visceral adiposity, and metabolic biomarkers.

Determinants and modifiable risk factors

The available evidence suggests that treatment-related weight gain is influenced by a complex interaction of clinical, behavioral, and environmental factors. Qin et al. demonstrated that both chemotherapy exposure and neighborhood food environments independently contributed to increases in body weight and adiposity among Black breast cancer survivors, highlighting the importance of social and environmental determinants of health [2].

Behavioral factors also appear highly modifiable. Pedersini et al. reported that declining adherence to a Mediterranean dietary pattern and reduced physical activity were associated with clinically significant weight gain, whereas repeated lifestyle counseling promoted weight maintenance or modest weight loss among overweight patients [3]. These findings support integrating dietary counseling and structured physical activity into routine breast cancer care beginning during active treatment rather than waiting until survivorship.

Table 3. Characteristics of the Included and Contextual Studies.

Study	Year	Study design	Population	Main focus	Principal findings
Makari-Judson et al. [1]	2022	Prospective observational	Early-stage breast cancer	Chemotherapy and/or endocrine therapy	Evaluated longitudinal changes in body weight, body composition, and insulin resistance up to 24 months after diagnosis.
Qin et al. [2]	2022	Population-based prospective	Black breast cancer survivors	Individual and neighborhood determinants	Chemotherapy exposure and neighborhood food environment were associated with increased weight and adiposity.
Pedersini et al. [3]	2023	Real-world observational	Early breast cancer receiving chemotherapy	Lifestyle intervention	Mediterranean diet adherence and physical activity reduced clinically significant weight gain.
His et al. [4]	2025	Longitudinal cohort	Early breast cancer after adjuvant chemotherapy	Long-term weight trajectories	Weight gain frequently persisted for more than a decade following treatment.
Ryu et al. [5]	2021	Comparative observational	ER-positive/HER2-negative breast cancer	Neoadjuvant chemotherapy versus endocrine therapy	Chemotherapy was associated with temporary increases in BMI and overweight prevalence.
Dieli-Conwright et al. [6]	2022	Follow-up cohort	Early-stage breast cancer survivors	Metabolic syndrome	Chemotherapy was associated with persistent deterioration in metabolic and inflammatory markers.
Silva et al. [7]	2021	Observational	Early breast cancer after chemotherapy	Body composition and metabolic health	Demonstrated increased visceral adiposity and metabolic syndrome after treatment.
Poltronieri et al. [8]	2022	Scoping review	Contextual evidence	Adiposity during treatment	Included for background only; not part of the qualitative synthesis.
Khan et al. [9]	2025	Narrative review	Contextual evidence	Chemotherapy-associated weight gain	Included as contextual evidence only.

Abbreviations: BMI, body mass index; ER, estrogen receptor; HER2, human epidermal growth factor receptor 2.

Contextual evidence

The two contextual records provided broader perspectives on treatment-related weight and adiposity changes but were not included in the primary qualitative synthesis. Poltronieri et al. reported considerable heterogeneity in body adiposity changes during breast cancer treatment, with studies demonstrating increases, decreases, or no significant changes depending on treatment modality, assessment method, and duration of follow-up [8]. Likewise, Khan et al. reviewed chemotherapy-associated weight gain across multiple malignancies and concluded that clinically meaningful weight gain occurs in a substantial proportion of patients, with breast cancer survivors among the populations at highest risk [9]. Although these reviews provide valuable context, they do not contribute original patient-level data and were therefore considered supportive rather than primary evidence.

Discussion

Principal findings

This systematic review indicates that weight gain and adverse changes in body composition are common and clinically relevant consequences of breast cancer treatment. Across the included studies, weight gain was most frequently observed during the first year following diagnosis or initiation of chemotherapy, whereas long-term follow-up demonstrated that these early changes often persisted throughout survivorship. Beyond increases in body weight, several studies consistently reported unfavorable metabolic alterations, including increased fat mass, insulin resistance, dyslipidemia, and metabolic syndrome components, suggesting that treatment-related metabolic health extends beyond simple weight change.

Clinical interpretation

The clinical significance of treatment-related weight gain depends not only on the magnitude of weight change but also on accompanying alterations in body composition and metabolic health. Stable body weight does not necessarily indicate metabolic stability, as increases in visceral adiposity, fat mass, or insulin resistance may occur without substantial changes in BMI. Conversely, modest average weight gain may conceal clinically important subgroups experiencing substantial increases in adiposity. These findings emphasize that survivorship care should incorporate comprehensive metabolic assessment whenever feasible rather than relying exclusively on body weight or BMI.

Clinical implications

The available evidence has several practical implications for breast cancer survivorship care. First, assessment of body weight, body composition, and metabolic health should begin before treatment initiation and continue throughout follow-up. Second, patients receiving chemotherapy appear particularly vulnerable to early weight gain, highlighting the first year after diagnosis as a critical period for preventive intervention. Third, structured lifestyle counseling promoting regular physical activity and adherence to healthy dietary patterns, particularly Mediterranean-style diets where culturally appropriate, should be integrated into routine oncology care. Fourth, normal baseline BMI should not be considered protective, as several studies suggest that clinically meaningful weight gain may also occur among women who are not overweight at diagnosis. Finally, assessment of waist circumference, body fat percentage, visceral adiposity, lipid profile, glucose metabolism, and insulin resistance may provide clinically valuable

information beyond BMI alone. Broader environmental determinants, including neighborhood food availability and access to healthy dietary options, should also be considered when developing survivorship interventions.

Strengths

This review synthesizes recent evidence across multiple dimensions of treatment-related metabolic health, including body weight, BMI, body composition, adiposity, insulin resistance, metabolic syndrome, and lifestyle-related determinants. An additional strength is the clear distinction between primary empirical studies and contextual review articles, thereby minimizing the risk of double-counting evidence and improving the interpretability of the findings.

Future research

Future studies should adopt standardized definitions of clinically meaningful weight gain and distinguish intentional from unintentional changes in body weight. Greater emphasis should be placed on objective assessment of body composition and metabolic biomarkers rather than body weight alone. Large prospective studies are needed to evaluate whether early lifestyle interventions initiated during chemotherapy or endocrine therapy can improve long-term metabolic health, treatment tolerance, quality of life, recurrence risk, and overall survival. Where appropriate, future systematic reviews should also perform quantitative meta-analyses using standardized outcome measures.

In conclusion, Weight gain and adverse metabolic changes during and after breast cancer treatment represent important survivorship challenges. The available evidence indicates that chemotherapy, endocrine therapy, baseline BMI, lifestyle behaviors, insulin resistance, and environmental factors all contribute to long-term weight and adiposity trajectories. Early identification of patients at increased metabolic risk, together with structured dietary and physical activity interventions initiated during active treatment, may help reduce clinically significant weight gain and improve long-term health outcomes. Future systematic reviews should incorporate comprehensive risk-of-bias assessment, complete PRISMA reporting, and quantitative synthesis where sufficient methodological homogeneity exists.

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Conflict of Interest

The authors declare that they have no competing interests.

Author Contributions

All authors contributed to the conception and design of the review. Literature screening, data interpretation, manuscript drafting, and critical revision were performed collaboratively. All authors read and approved the final manuscript.

Data Availability

All data analyzed in this study were obtained from published articles cited in the reference list. Additional data extraction materials are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

Ethics approval was not required because this study is a systematic review based exclusively on previously published literature and did not involve human participants or identifiable personal data.

Consent for Publication

Not applicable.

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