

Nutritional support for women who are receiving chemotherapy for breast cancer.

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Abstract

Nurses are in a unique position to provide nutritional support and information to women with breast cancer who are undergoing chemotherapy, supporting them with making decisions regarding nutrition and diet. This narrative review evaluated the research evidence relating to: the nutritional challenges experienced during chemotherapy; and the most effective approaches for supporting women with dietary choice. Weight gain was identified as a specific problem for women undergoing chemotherapy. The evidence indicated that information about nutrition and food preparation support may go some way to assisting women in overcoming some of the nutrition related challenges experienced during chemotherapy treatment for breast cancer. However, further research is required to better inform person-centred nursing practice in this area.

Keywords: breast cancer; chemotherapy; patient education; nutritional approaches; weight gain.

Introduction

Breast cancer is the most common cancer among females, with over 55,000 women being newly diagnosed every year in the UK (Cancer Research UK, 2017).

Treatment commonly includes surgery, radiotherapy, chemotherapy and hormonal therapies (SIGN, 2013). Being diagnosed with cancer may prompt an individual to make dietary changes (Beeken et al, 2016). Commencing chemotherapy has also been identified as a timely opportunity for receiving information about diet and weight

management (James-Martin et al, 2014; Heinze and Williams, 2015; Kelly et al, 2015). Improving nutrition in women during chemotherapy may provide benefits such as enhancing general health and wellbeing (Lawn et al, 2015); enabling women to better cope with chemotherapy side effects (Breast Cancer Care 2014; Boltong and Keast, 2015); and reducing the subsequent risk of cancer recurrence (Tramm et al, 2011).

However, evidence suggests women undergoing chemotherapy treatment for breast cancer lack nutrition-related information (Miyashita et al, 2015; Droog et al, 2014); and health professionals feel unprepared to provide this support (Murphy & Girot, 2013; James-Martin et al, 2014). No evidence-based guidelines on nutritional information for women undergoing chemotherapy for breast cancer currently exist. While there is some evidence from a systematic review that dietary counselling may improve energy and protein intake during chemotherapy for people with lung cancer (Kiss et al, 2014), benefits of nutritional interventions in chemotherapy are not clear (Isenring et al, 2013).

Nurses are in a unique position to support women undergoing chemotherapy for breast cancer to make decisions regarding nutrition-related health behaviours (Bailey et al, 2012; RCN 2012), but need to understand the challenges facing women, and identify the most effective approach to provide support.

This narrative review aimed to evaluate evidence regarding:

1. The nutritional-related challenges experienced by women undergoing chemotherapy for breast cancer.

2. The most effective approach to providing nutritional support for women who are receiving chemotherapy for breast cancer.

Theoretical framework

The review was underpinned by principles of person-centredness (McCance & McCormack, 2017), acknowledging the role of a health practitioner in supporting an individual to make informed choices and decisions regarding health-related behaviours about nutrition during cancer treatment. Rogers (1961) described the therapeutic relationship in which the practitioner creates a climate for change by a client. Nurses can therefore support an individual through making changes in health-related behaviour, based on current available evidence (NHS 2016).

Review methodology

A systematic approach was followed for the review (Aveyard, 2014).

Search strategy

A comprehensive literature search was conducted using the electronic databases: PubMed; JBI; Cochrane; CINAHL; MEDline; PsychINFO; and Scopus. Search terms and combinations included: breast cancer; chemotherapy; diet; nutrition; side effects; lifestyle; interventions; quality of life. These terms were selected in accordance with the research aims and theoretical framework. Inclusion and exclusion criteria are presented in Table 1. A period of 5 years was chosen to understand current practice and the evidence relating to it. A flow chart showing the number of papers identified and finally appraised is provided in Figure 1. Of the included studies, two were

qualitative studies. A total of 2,770 women participated in the studies, most of which occurred outside of the UK.

Appraisal of the literature

Each literature source included in the review was independently evaluated using CASP critical appraisal tools (CASP, 2013) by the two authors. Themes were then identified for the review.

Review findings

The evidence from the reviewed papers is presented in several themes.

Influence of chemotherapy on taste, appetite and nutritional status

Coa et al. (2015) undertook a self-report survey with 173 women undergoing chemotherapy for breast cancer, reporting a decrease in appetite during chemotherapy in 36% of the women, and a statistically significant preference for a diet which was high in vegetables ($p < 0.01$). In contrast, studies have identified women as eating foods with low nutritional content, including a diet low in fruit and vegetables, during chemotherapy (Ceccatto et al, 2014; Custodio et al, 2016; Ferreira et al, 2016). Cecatto et al. (2014) used the Brazilian healthy eating index to assess the diet of 78 women having breast cancer treatment showing a reduction in fruit intake ($p = 0.002$), and concluding that diet quality is likely to change over the course of treatment.

Sarenmalm et al. (2014) studied 'burdensome symptoms' in 206 women with breast cancer, identifying poor appetite, nausea, weight loss, taste changes, and swallowing difficulties as common symptoms in women undergoing chemotherapy.

Spearman correlations showed associations between weight and lack of appetite (0.546), and changes in taste and nausea (0.503).

A prospective study of 52 Australian women explored the effect of anthracycline and/or taxane chemotherapy on taste, food likes/dislikes, appetite, nutritional status and food intake (Boltong et al, 2014). Findings showed significant reductions in taste and appetite by cycle three ($p=0.043$), although this was reversed by two months post- chemotherapy. Researchers also reported a significant association between taste function and kilojoule intake ($p=0.008$) and a significant association between reduced appetite and a reduced kilojoule and protein intake ($p=0.002$, and $p=0.001$ respectively). Reduced appetite was also associated with a reduced body mass index and worsening nutritional status (Boltong et al, 2014).

Weight gain

Weight gain featured as a significant challenge for women in several studies.

Evidence indicates that, even prior to chemotherapy, women with breast cancer presented with unhealthy metabolic features in relation to blood lipids, body composition and diet when compared with women without breast cancer (Bell et al, 2014). Greenlea et al. (2016) identified 65.5% of 1237 women with breast cancer as overweight at baseline. A retrospective chart review of 46 women with breast cancer (Hatch and Davies, 2014) identified a mean body mass index of 32.6kg/m^2 and 27.9kg/m^2 in premenopausal and postmenopausal women respectively.

Coa et al. (2015) reported that women with breast cancer were more likely than those with other types of cancer to report weight gain during chemotherapy ($p<0.01$). Liu et al. (2014) described a trajectory of weight gain over the two years after chemotherapy, with women receiving cyclophosphamide, methotrexate and flurouracil exhibiting a

steeper weight change than in those receiving anthracycline-based chemotherapy. The association between different types of chemotherapy and weight gain was also explored in a retrospective review of the medical records of 483 women from four Dutch hospitals over a 10 year period to 2010 (Winkels et al, 2014). The study revealed an average weight gain of 6kg in women during chemotherapy; women who received anthracyclines and taxanes treatment were more likely to gain weight than those who received anthracycline therapy alone. The authors surmised that, as women having anthracyclines and taxanes undergo a longer treatment duration, they are exposed to treatment and side effects for longer. A further study of 1237 women undergoing taxane therapy, also reported chemotherapy-induced peripheral neuropathy as more likely to occur in women who were overweight compared with women who were of a healthy weight, at 24 months post-chemotherapy (Greenlea et al. 2016).

Kwok et al. (2015) used semi-structured interviews to explore the experiences, dietary information and support needs of 17 women who gained weight during chemotherapy. Women talked of not being informed that they might experience weight gain during their chemotherapy treatment, and some anticipated weight loss. Lack of physical activity due to fatigue, and changes to their usual diet as result of food cravings and comfort eating, were identified as leading to weight gain. In a phenomenological study of 12 women treated for breast cancer, women described themselves as being in transition between their former well-known body and a current strange and demanding body, caught in a dilemma where medication that contributed to long term survival, also led to weight gain and resultant self-blame (Pedersen et al, 2016).

Approaches to providing nutritional support

Studies of dietary interventions during chemotherapy for breast cancer included those supporting women to manage their body weight, make changes to their diet during and beyond their treatment, the use of dietary supplements, and outcomes of nutritional education programmes.

Villarini et al. (2012) undertook an intervention study that aimed to prevent weight gain during chemotherapy treatment for breast cancer. The researchers compared findings from 47 women in the intervention group who participated in cooking classes and ate two low energy meals over the duration of their chemotherapy treatment, with 47 women in a control group who received dietary information and attended basic cooking classes. The intervention group lost an average of 2.8kg, significantly more weight than those in the control group ($p=0.0004$).

Arends et al. (2014) investigated the impact of a support programme consisting of six theory classes and two 3.5 hour cookery classes on dietary change in women undergoing chemotherapy for breast cancer. By month six, the average fruit and vegetable intake of those who participated in the support programme was almost 200g greater than those in the control group who received standard nutritional advice.

Dietary supplement use during chemotherapy was examined in two studies. In one placebo controlled trial, Valadares et al. (2013) evaluated the effect of daily *Agaricus sylvaticus* (a type of mushroom) supplement on chemotherapy side effects in a study of 46 women. The intervention group were 80% less likely to have nausea and vomiting, 92.8% less likely to have problems with bowel function, and 20% less likely

to have poor appetite than the control group. In a study of fish oil supplementation, Suzumura et al. (2016) reported significantly enhanced respiratory function ($p < 0.05$), and significantly lower blood lactate concentration ($p < 0.05$) in women in the intervention group compared to the control group who did not take the supplement.

A further randomized control trial (de Groot et al, 2015) evaluated the effects of short term fasting during chemotherapy, comparing side effects and toxicity indicators in an intervention group who fasted ($n=7$) and control group ($n=6$) who did not fast. At seven days post-chemotherapy, erythrocyte and thrombocyte counts were significantly higher in the intervention group who fasted 24 hours prior to and following chemotherapy ($p = 0.007$; $p = 0.00007$ respectively). Although the authors suggested that fasting reduced the destruction of healthy circulating cells, and may reduce haematological toxicity by protecting CD3- and CD45+ cells from chemotherapy-related damage, the study sample is small.

Discussion

The review has identified evidence that women may face various nutritional challenges during chemotherapy for breast cancer, particularly in relation to taste, appetite, nutritional status, and weight gain. Qualitative evidence regarding the experience and impact of weight gain on women as a result of chemotherapy indicates a role for nurses in providing lifestyle and emotional support to women during treatments. This evidence could suggest that a person-centred approach to practice could support women in meeting their needs during chemotherapy for breast cancer. Unfortunately, none of the studies in this review included evidence from a nursing perspective. A small number of controlled trials provided evidence that

information and education regarding food preparation and diet may influence the eating habits of women having chemotherapy for breast cancer, enabling women to better manage their weight during treatment. However the studies are small, and often use poorly validated tools. Nevertheless, a person-centred approach to practice could enable nurses to support women having chemotherapy to identify their nutrition needs. The evidence is limited by relatively small sample groups in studies of supplement use and fasting during chemotherapy. No conclusions can, therefore, be drawn from this particular evidence, and further work with larger populations is required. Furthermore, it is notable that the studies do not focus on the gastrointestinal effects of chemotherapy nor the impact of other medications given alongside chemotherapy, such as corticosteroids which are likely to contribute to weight gain.

Conclusions and implications for practice

Making positive choices about nutrition may enhance health and wellbeing in women undergoing chemotherapy for breast cancer. This is a key time when a woman may be open to making changes to improve her health, but may also be living with the physical and emotional effects of cancer and its' treatment. Nurses have the opportunity to deliver individualised person-centred care as they build strong relationships with women having chemotherapy over a period of time. Exploring nutrition and dietary challenges and solutions may be a key step to supporting women with breast cancer to make longer term changes towards healthy eating habits.

More research evidence is required to explore the work of nurses in relation to nutrition and lifestyle support for patients during cancer treatment, and those living with and beyond cancer (James-Martin et al, 2014; Scottish Government, 2016).

Limitations

This narrative review is limited by its focus on nutrition. The studies included do not report on the effect of chemotherapy on physical activity and the effect of that this can have on the weight of participants.

Key Points

- Many women who are having chemotherapy for breast cancer feel motivated to make lifestyle changes.
- Weight gain is a common challenge that women experience when having chemotherapy treatment.
- Nurses have a key role in supporting women throughout their breast cancer treatment.
- Nutrition related support may assist women in living well during and beyond chemotherapy treatment for breast cancer.

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Table 1

Table 1: Inclusion and exclusion criteria for the search	
Inclusion	Exclusion
Peer reviewed	Palliative care
Available in full text	Focus on breast cancer survival
In English language	Exercise and physical activity only
Published 2012-2017	Not specific to breast cancer
	Involved complex biological and physiological aspects of nutrition.

Figure 1

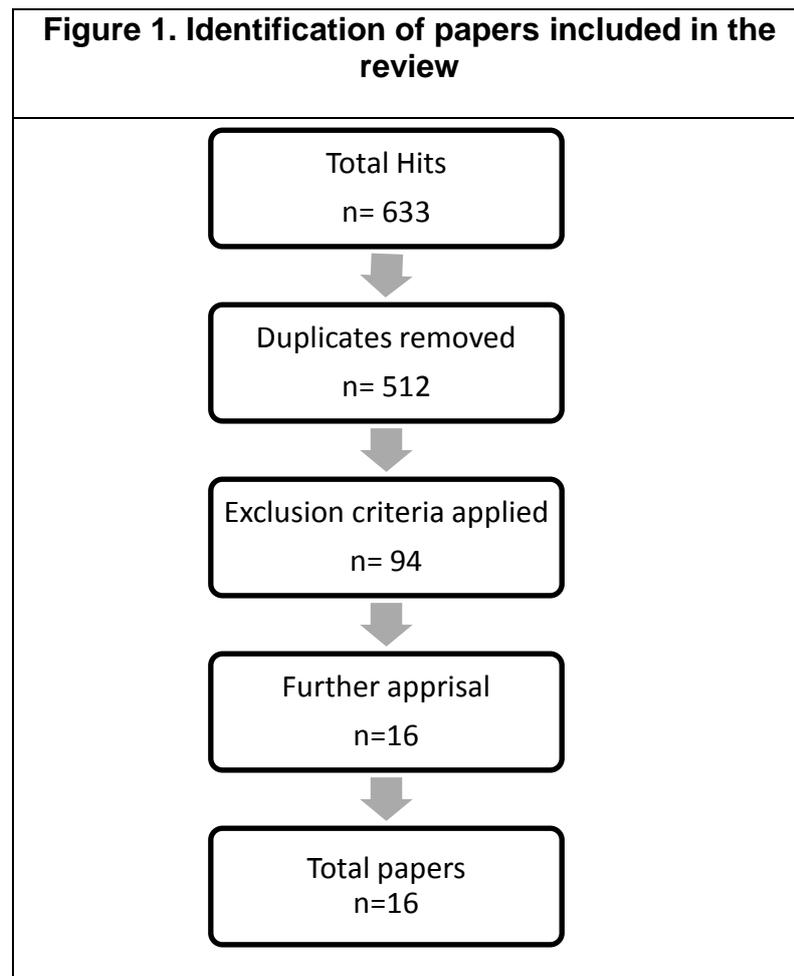


Table 2

Author	Aim	Methods	Findings	Key points	Limitations
Arendes et al. (2014)	The aim of the study was to increase fruit and vegetable (FV) intake for at least 6 months in women with early breast	118 participants RCT investigate the impact of a support programme consisting of six theory classes and two 3.5 hour cookery classes	By month six, the average fruit and vegetable intake of those who participated in the support programme was almost 200g greater than those in the control group who received standard nutritional advice.	A nutritional training intervention can increase fruit and vegetable intake	
Boltong et al. (2014)	Investigate the effects of chemotherapy on taste, food preferences and nutritional outcomes of women receiving chemotherapy for breast cancer	52 participants with stage I-II breast cancer Survey- Prospective cohort study. Standardized testing of taste perception, appetite and food liking.	Energy intake decreased as a result of reduced taste function and appetite reduction	Chemotherapy has an effect on taste and subsequently nutritional outcomes	Study does not report on the use of anti-emetic medication and if this had an impact on appetite.
Bell et al. (2013)	Aimed to characterize glucose metabolism in breast cancer patients near the initiation of chemotherapy.	8 participants with stage I-II breast cancer Measures: Fasting blood, an oral glucose tolerance test, body composition, waist circumference, diet, cardiovascular fitness and muscle strength	Breast cancer patients were abdominally obese, overweight and dyslipidemic. Compared to non-malignant matched females, fasting glucose and insulin concentrations were similar but fasting c-peptide was greater in patients.	Even prior to chemotherapy, women with breast cancer presented with unhealthy metabolic features in relation to blood lipids, body composition and diet when compared with women without breast cancer	Small study
Coa et al. (2015)	This cross-sectional study sought to describe the dietary changes experienced by cancer patients and to identify associations between these changes and common treatment symptoms	A convenience sample of 1199 cancer patients aged 18 yr and older undergoing active treatment Descriptive analyses were conducted to estimate prevalence of dietary changes and chi-squared tests were used to examine associations between dietary changes and health outcomes.	Approximately 40% of patients reported a decreased appetite since beginning treatment, and 67.2% of patients reported at least 1 chemosensory alteration. Increased taste sensitivities were more common than decreased taste sensitivities, with increased sensitivity to metallic being the most common taste sensitivity (18.6%). Patients who had less energy or lost weight since beginning treatment	women with breast cancer were more likely than those with other types of cancer to report weight gain during chemotherapy (p<0.01)	Not all participants had breast cancer

			were more likely than others to report treatment-related dietary changes.		
<p>Ceccatto et al. (2014)</p>	<p>To evaluate diet quality in women having adjuvant treatment for breast cancer.</p>	<p>78 women treated in a hospital in Brazil</p> <p>Non randomized clinical study using the Brazilian healthy eating index</p>	<p>The score of the Brazilian Healthy Eating Index Revised (BHEI-R) in the lowest tertile was 48.4 to 75.2 points, the second tertile was 75.7 to 81.8 points, and the upper tertile was 82.0 to 95.7 points. During treatment, of the women classified in the first tertile, 62% improved their diet score quality passing to the upper tertiles. Women classified in the second tertile, did not significantly alter the diet quality during the treatment, although 46% went to the third tertile. Patients classified in the third tertile significantly reduced the average score of the Index by 7.3 points during the treatment. Where the reduction in the diet quality was due to reducing the score of components Total fruits, Total vegetables, Dark Green and orange vegetables and Legumes, Total grains and Solid fats, Alcohol and Added sugar.</p>	<p>Diet quality is likely to change over the course of treatment.</p>	<p>Did not consider the impact of the type of chemotherapy treatment on diet quality.</p>
<p>de Groot et al. (2015)</p>	<p>The feasibility of STF and its effects on tolerance of chemotherapy in a homogeneous patient group with early breast cancer</p>	<p>RCT 13 randomized to fast 24h before and after commencing chemotherapy, or to eat according to the guidelines for healthy nutrition.</p>	<p>STF was well tolerated. At seven days post-chemotherapy, erythrocyte and thrombocyte counts were significantly higher in the intervention group who fasted 24 hours prior to and following chemotherapy (p= 0.007; p= 0.00007 respectively).</p>	<p>STF during chemotherapy was well tolerated and fasting reduced the destruction of healthy circulating cells, and may reduce haematological toxicity.</p>	<p>Small sample. Limited insight into the possible benefits of STF during chemotherapy.</p>
<p>Greenlee et al. (2016)</p>	<p>A component of the Pathways Study- a prospective study of women having treatment for invasive breast cancer. This paper focusses on associations between BMI and lifestyle</p>	<p>1237 women receiving taxane treatment. Data measure: neurotoxicity symptoms, BMI and fruit and vegetable intake</p>	<p>At baseline, 65.6% of the women were overweight or obese, 29.9% had low MVPA, 57.5% had low fruit/vegetable intake, and 9.5% reported antioxidant supplement use during treatment. Increased CIPN was more likely to occur in overweight and obese women</p>	<p>CIPN more likely to occur in women who were overweight compared with women who were of a healthy weight, at 24 months post-chemotherapy</p>	<p>Self-reporting bias</p>

	factors in chemotherapy-induced peripheral neuropathy (CIPN).				
Hatch & Davies (2014)	Aim to evaluate weight change in women with breast cancer and to compare these findings to the pertinent literature.	Date for 46 women- age, stage of cancer, weight, menopausal status, BMI and treatment.	The median BMI of premenopausal women at diagnosis was 32.6 kg/m ² . Postmenopausal women had a median BMI of 27.9 kg/m ² .	The average weight loss between diagnosis and treatment completion was not significant in either group	Pilot study
Kwok A et al. (2014)	The purpose of this study was to explore the experiences, dietary information and support needs of women who gain weight during chemotherapy treatment.	Qualitative approach to explore the experiences of 17 women from three Melbourne breast cancer clinics who gained weight between the commencement of chemotherapy and 2 months after its completion. Semi-structured interviews exploring diet, weight changes, dietary information, support needs and sources. Thematic analysis of the interview data.	Three themes: undesirable impacts of cancer treatment on diet and physical activity, surprise and concern associated with changes to weight and diet and insufficient dietary information and support.	Models of dietetic practice and the provision of tailored dietary information should be explored.	
Liu N et al. (2014)	To investigate the trajectory of weight change in Taiwanese women with breast cancer after starting chemotherapy and the impact of chemotherapy regimens on weight change while controlling for age, menopausal status, body mass index, lymph node involvement and	Longitudinal, clinical observational study. Weights were repeatedly measured in 147 women with breast cancer stages I–III. Hierarchical linear modelling was used to analyse these longitudinal data.	Mean weight of participants 56.9 kg before chemotherapy and increased to 59.4kg at 8.5 months after the first chemotherapy followed by a decrease to 58.5kg at 21.5 months. During the last 25 months, weight increased slightly and never returned to the initial level. The highest weight gain were observed in women receiving cyclophosphamide, methotrexate and fluorouracil and was 2.9 kg (5%) vs. 0.9 kg (1%) in the anthracycline-based group.	Women receiving cyclophosphamide, methotrexate and flurouracil exhibiting a steeper weight change than in those receiving anthracycline-based chemotherapy.	Limited sample size and no control to compare weight changes in women without breast cancer.

	changes in habits of dietary fat intake and exercise.				
Pederson et al. (2016)	To describe the essential meaning of the phenomenon of weight and body shape changes in women treated for breast cancer and how these changes influence the women's perception of body and self.	Guided by existential phenomenology and descriptive life-world research. 12 individual Interviews with women with changes in weight and body-shape Conducted at a Department of Oncology at a Danish University hospital.	Three themes: (1)The body - a Demanding stranger; (2) Fighting to be the master in one's own life and (3) Accepting the bodily changes.	Women described themselves as being in transition between their former well-known body and a current strange and demanding body, caught in a dilemma where medication that contributed to long term survival, also led to weight gain and resultant self-blame	
Sarenmalm et al. (2014)	To explore clusters of burdensome symptoms over time, the impact on health status and quality of life, and coping capacity in patients with breast cancer.	Longitudinal study of 206 women	Three clusters of burdensome symptoms were identified: emotional symptom burden, gastrointestinal symptom burden, and unwellness symptom burden. The gastrointestinal symptom burden, with "change in the way food tastes" as a core symptom, was more often associated with chemotherapy. Less stable over time, the unwellness symptom burden could be interpreted as short- and long-term side effects of hormonal therapy.	Poor appetite, nausea, weight loss, taste changes, and swallowing difficulties as common symptoms in women undergoing chemotherapy	Limited generalizability
Suzumura et al. (2016)	Investigate the effect of fish oil (FO) supplementation, at	RCT 32 patients with breast	The S group showed a significant increase in the maximal inspiratory and expiratory pressure ($P \leq 0.05$ vs.	Significantly enhanced respiratory function ($p < 0.05$), and	Limited generalizability

	4 g/day, on the respiratory performance and blood lipid profile	randomized into control (C) and FO supplemented (S). Both groups underwent three respiratory evaluations and blood harvest (before chemotherapy—Day 0, and 30 and 60 days after supplementation.	Day 0) and in the maximum voluntary ventilation ($P \leq 0.05$). Blood lactate concentration was significantly lower in the S group after 60 days, at rest, when compared to C ($P \leq 0.05$). Plasma high-density lipoprotein (HDL) cholesterol concentration remained the same after 60 days of supplementation, while in the C group, it decreased significantly ($P \leq 0.05$ Day 0 vs. Day 60). Triacylglycerol (TAG) plasma concentration in the S group was lower when compared to the C group ($P \leq 0.05$ Day 60S vs. Day 60).	significantly lower blood lactate concentration ($p < 0.05$) in women in the intervention group compared to the control group (n=15)	
Valadares et al. (2013)	To evaluate the effects of dietary supplementation of <i>Agaricus sylvaticus</i> on clinical and nutritional parameters in BC patients undergoing chemotherapy.	A randomized, placebo-controlled, double-blind, Brazil, September 2007 to July 2009. 46 patients with BC, Stage II and III, randomly assigned to receive either nutritional supplement with <i>A. sylvaticus</i> (2.1 g/day) or placebo.	Patient's supplemented with <i>A. sylvaticus</i> poor appetite decreased by 20% with no changes in bowel functions (92.8%), nausea and vomiting (80%)	Dietary supplementation with <i>A. sylvaticus</i> improved nutritional status and reduced abnormal bowel functions, nausea, vomiting, and anorexia in patients with BC receiving chemotherapy.	Limited generalizability
Villarini et al. (2012)	A randomized controlled study of adjuvant diet in BC patients undergoing chemotherapy. The diet was designed to prevent weight gain during chemotherapy treatment.	96 women of any age, receiving adjuvant chemotherapy without metastases. RCT The intervention implied changing their usual diet for the whole duration of chemotherapy, following cooking classes and having lunch or dinner at the study centre at least twice per week.	The women in the intervention group showed a significant reduction in their body weight (2.9 kg on average), compared with the controls. They also significantly reduced body fat mass, waist and hip circumferences, biceps, underscapular and suprailiac skinfolds compared with the women in the control group.	Dietary intervention during adjuvant chemotherapy for breast cancer is feasible and may prevent weight gain.	Did not consider changes to diet and physical activity.
Winkels et al. (2014)	To assess	Retrospective study of 739 breast cancer patients.	Median weight gain was	Average weight gain of 6kg in women during chemotherapy and	Changes in food intake and physical

	whether weight gain depends on the type of chemotherapy.	.	6 kg and median weight loss was of 3 kg. Women treated with anthracyclines taxanes gained 0.9 kg (95%CI 0.1, 1.7) more than women treated with anthracyclines only.	women who received anthracyclines and taxanes treatment were more likely to gain weight than those who received anthracycline therapy alone.	activity were not studied.
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