A Look into High-Intensity Interval Training for Breast Cancer

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Abstract

Breast cancer is a common cancer worldwide. Although breast cancer affects both sexes, the prevalence is higher in women. In Türkiye, breast cancer affects about one in four women. Survival rates from breast cancer treatment are improving every day, and people need help with complications from treatment. Exercise is an effective and safe treatment for people with breast cancer. In recent years, the results on the use of high-intensity interval training (HIIT) in the treatment of breast cancer are remarkable. The purpose of this review was to determine the effect of HIIT in the treatment of breast cancer. The studies included in the review were those conducted between 2014 and 2024. PubMed, Scholar Google and Scopus databases were searched using the search terms "breast cancer and high intensity interval training". According to the results of the studies included in this review, it was concluded that HIIT is an effective form of training on several health parameters in groups at risk of developing breast cancer, those undergoing breast cancer treatment, and breast cancer survivors. Further studies are needed to contribute to the clinical relevance of HIIT in individuals with breast cancer.

Keywords: Exercise, breast cancer, high intensity interval training.

Meme Kanserinde Yüksek Yoğunluklu Aralıklı Antrenmana Bakış

Öz

Meme kanseri dünyada yaygın olarak görülen bir kanser türüdür. Her iki cinsiyette de görülmesine rağmen prevelans kadınlarda daha yüksektir. Türkiye'de meme kanseri yaklaşık her dört kadından birini etkilemektedir. Meme kanseri tedavisinde sağkalım oranları her geçen gün artmaktadır ve tedavinin ortaya çıkardığı komplikasyonlardan dolayı kişiler yardıma ihtiyaç duymaktadır. Meme kanseri olan bireylerde egzersiz etkili ve güvenilir bir yöntemdir. Son yıllarda meme kanseri tedavisinde yüksek şiddetli aralıklı antrenman (HIIT) kullanımına dair sonuçlar dikkat çekicidir. Bu derlemenin amacı meme kanseri tedavisinde HIIT'in etkisini ortaya koymaktır. Derlemeye dahil edilen çalışmalar 2014-2024 yılları arasında yapılan çalışmalardır. Pubmed, Scholar Google ve Scopus veri tabanlarında "meme kanseri ve yüksek şiddetli aralıklı antrenman" arama terimleri kullanılarak literatür taranmıştır. Bu derlemede yer alan çalışmalardan elde edilen bulgulara göre HIIT'in meme kanserine yakalanma açısından riskli gruplarda, meme kanseri tedavisi görenlerde ve meme kanserinden kurtulanlarda çeşitli sağlık parametreleri üzerinde etkisi olan bir antrenman biçimi olduğu sonucuna ulaşılmıştır. HIIT' in meme kanseri olan bireylerdeki klinik önemine katkı sağlamak adına daha geniş çaplı çalışmalara ihtiyaç vardır.

Anahtar Sözcükler: Egzersiz, meme kanseri, yüksek yoğunluklu aralıklı antrenman.

Derleme Makale (Review Article)
Geliş / Received: 24.06.2024 & **Kabul / Accepted:** 24.02.2025
DOI: https://doi.org/10.38079/igusabder.1503998
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Introduction

Breast cancer is one of the most common cancers in the world. This type of cancer, which is the most common in the female gender, accounts for approximately 25% of all cancers. It is also one of the leading causes of cancer-related deaths in women[1].

According to the Global Cancer Statistics 2022 report, the incidence of breast cancer in Turkey is 10.5% for both sexes. This rate ranks first in women with 23.5%. In other words, about ¼ of women in Türkiye have breast cancer. In addition, the mortality rate from breast cancer ranks second at 5.7%[2]. In this context, the follow-up of women of reproductive age is important. The risk of breast cancer is increasing in this population. The awareness of individuals in this age group about breast cancer should be increased[3].

Even when individuals with breast cancer recover, treatment-related complications may occur[4]. Therefore, it is important to address post-treatment rehabilitation approaches to manage breast cancer and alleviate treatment-related impairments. These individuals face a wide range of medical and psychosocial challenges that need to be managed appropriately[5]. Breast cancer survival rates are improving every day. However, individuals still need help due to complications caused by treatment. Especially cardiovascular diseases that occur due to treatment are rehabilitated with appropriate exercise programs[6].

Breast Cancer Risk Factors

Gender, inactive lifestyle, family history, smoking habit, height/weight ratio, number of births, menopausal status, number of pregnancies, socioeconomic status, education level, occupation are among the risk factors for breast cancer[7]. In addition, breast cancer can be hereditary. From this point of view, risk factors can be classified into genetic and non-genetic factors[8].

Types of Breast Cancer

There are 5 basic molecular subtypes of breast cancer: Luminal A, Luminal B, HER2 overexpressed, Basal-like, and Claudin low[9].

It is important to correctly classify the Luminal A and Luminal B subtypes of breast cancer. Luminal A type is the most common type of breast cancer. Making this molecular type classification will be beneficial in patient management[10].

Breast Cancer Stages

Staging classifications were developed to better understand the clinical behavior of specific malignancies, determine prognosis, and allow physicians and their patients to compare outcomes of similar patient groups[11]. The staging system is also important for individuals with cancer. According to the staging, the roadmap to be followed throughout the disease is outlined. Staging is done by physical examination and imaging. Then surgery is decided[12].

The American Joint Committee on Cancer (AJCC) staging system is most commonly used in breast cancer staging, and the latest 8th edition of the AJCC was updated in 2017[13].

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According to the Turkish Society of Medical Oncology, stages 0, I, II, III and IV are used in cancer staging. Their characteristics are shown in Table 1[14].

Table 1. Cancer Staging[14]

Stage 0:	The cancer has not spread to surrounding tissue. It accounts for 15-20% of diagnosed cancers. This type of cancer can occur in the milk glands or milk ducts..
Stage I:	Tumor diameter is <2 cm. There is no spread to lymph nodes.
Stage IIA:	The tumor is <2 cm in diameter and has spread to the lymph nodes. Or the tumor is 2-5 cm in diameter but has not spread to the lymph nodes.
Stage IIB:	The tumor is 2-5 cm in diameter and has spread to the lymph nodes. Or the tumor is >5 cm in diameter but has not spread to the lymph nodes.
Stage IIIA:	The tumor is <5 cm in diameter but has spread to the lymph nodes. Or the tumor is >5 cm in diameter and has spread to the lymph nodes.
Stage IIIB:	The tumor, regardless of size, has spread 1-9 units to the chest wall and/or skin and lymph nodes.
Stage IIIC:	The tumor, regardless of size, has spread to the chest wall and/or skin and lymph nodes more than 10 units.
Stage IV:	The cancer has spread beyond the breast to other parts of the body (such as the bones, lungs, liver, or brain).

Breast cancer is a systemic disease. Metastases (the spread of cancer to other parts of the body) are usually detected when the tumor is larger than 1 cm in diameter and has spread to the axillary lymph nodes. Early diagnosis is very important because patients who are diagnosed and treated at an early stage can live longer and have a better quality of life. This has a positive effect on the patient's outlook on life and her enjoyment of life. Thanks to today's technology and medical approaches, breast cancer can be detected in a size of 1 cm or less[15]. According to a clinical study, mammography screening provides early detection of breast cancer and reduces mortality by 25% to 30%[16].

Breast Cancer Diagnosis Methods

In the diagnosis of breast disease, a specialist uses history, physical examination, imaging, and biopsy. While history, physical examination, and imaging are usually sufficient to diagnose benign diseases, biopsy is used in addition to these diagnostic methods to diagnose malignant diseases[17].

Breast Cancer Screening Methods

The most effective and appropriate screening methods for early detection of breast cancer include mammography (MG), breast examination (BE) by a physician or qualified

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health professional, and breast self-examination (BSE). These strategies are recognized as the most important methods for early detection[18].

Radiologic screening methods are not limited to MG. Ultrasonography (USG), magnetic resonance imaging (MRI), and positron emission tomography (PET) are among the screening methods. USG is not included among the screening methods in Türkiye but is used as an adjunctive imaging method[19].

The "National Standards for Breast Cancer Screening Program" implemented by the Ministry of Health in Türkiye are Breast Self-Examination (BSE) once a month and Clinical Breast Examination (CBE) every 2 years for the age group 20-40, and BSE once a month, CBE once a year and MG screening every 2 years for the age group 40-69[20].

In 1993, the American Society of Radiology developed the Breast Imaging Reporting and Data System (BIRADS) to define lesions in clinical terms and to ensure consistency of terminology (20th Anniversary of the American Society of Radiology). The BIRADS classification is scored from zero to six. While BIRADS 0 requires additional examination for a decision, BIRADS indicates a known malignancy[21,22].

Treatment of Breast Cancer

Breast cancer treatment is divided into local treatment and systemic treatment. Local treatment aims to destroy the tumor with surgical methods or radiation therapy. Systemic treatment aims to destroy metastasized tumor cells with chemotherapy, hormone therapy, or immunotherapy[23].

Surgical treatment is a method used mainly in early-stage cancers. There are different surgical methods, including mastectomy, in which the entire breast tissue is removed, and breast-conserving surgery, in which only the tumor and its surroundings are removed[24]. Radiation therapy is based on destroying cancer cells in the breast tissue using high-energy radiation. It has been reported that some women undergoing breast cancer treatment need radiotherapy as an additional treatment[25].

Chemotherapy, which is included in systemic treatment, is defined as the use of treatment to stop or destroy the growth of malignant cells. These drugs can be given intravenously or orally and can travel through the bloodstream to cancer cells in different parts of the body. In addition to all these situations, sometimes chemotherapy drugs can also be administered directly into the spinal fluid surrounding the brain and spinal cord[25].

Immunotherapy is a type of treatment that uses cells from a person's immune system to fight diseases such as cancer. The main goal of immunotherapy for cancer is to reactivate the immune system, which has been suppressed by cancer cells, and enable it to recognize cancer cells. In this way, cells of the immune system target cancer cells and try to destroy them[26]. In short, it is a method of boosting the immune system against tumor cells.

Finally, some types of breast cancer are hormone-sensitive tumors characterized by the expression of estrogen and progesterone receptors. These cancer cells have receptors that help them grow by binding to estrogen and progesterone. In the treatment of breast cancer, there are several hormonal therapies that prevent estrogen from binding to the

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receptors. Most of these treatments work by lowering estrogen levels or blocking the effect of estrogen on breast cancer cells. Hormone therapy is recommended for breast cancer patients who are hormone receptor positive[25].

Breast Cancer Rehabilitation

In patients with breast cancer, physical complications may develop after surgery and adjuvant treatments, and exercise is a safe and effective method in eliminating these complications and improving quality of life[27,28]. Various types of exercises, such as resistance, aerobic, calisthenics, progressive relaxation are used in patients undergoing breast cancer treatment[27-30]. Lymphedema is a common condition in women following breast cancer treatment[31]. Lymphedema physiotherapy includes manual lymph drainage, remedial exercises, aerobic exercises, normal joint movement exercises, stretching, and strengthening exercises[32,33]. A review of the current literature also includes studies on the use of high-intensity interval training (HIIT), which has become popular in recent years for breast cancer.

High Intensity Interval Training (HIIT)

High-intensity interval training (HIIT) is a time-efficient method that improves both aerobic and anaerobic strength and capacity[34]. Athletes typically perform HIIT training consisting of classic exercise methods such as running, cycling, and rowing to improve endurance and sport-specific performance[34,35]. In the HIIT method, there are exercise and rest periods; the exercise intensity is high and the exercise duration is low and the rest interval is short[36]. The HIIT method is traditionally a workout in which the VO2Max remains above 90% for 2-4 min of high intensity runs or 30 s of 30 s of rest[37]. The HIIT method typically consists of 6 to 11 repetitions of workout/rest intervals[38]. HIIT benefits both healthy people and those with chronic diseases in several health markers[36].

Material and Methods

This review examined studies on the use of HIIT for breast cancer. The scope of the review was limited to studies conducted between 2014 and 2024. The literature was searched in PubMed, Scholar Google, and Scopus databases using the search terms "breast cancer and high intensity interval training". The flowchart of the literature samples accessible within the scope of the topic is shown in Figure 1.

Figure 1. Literature Review Flowchart

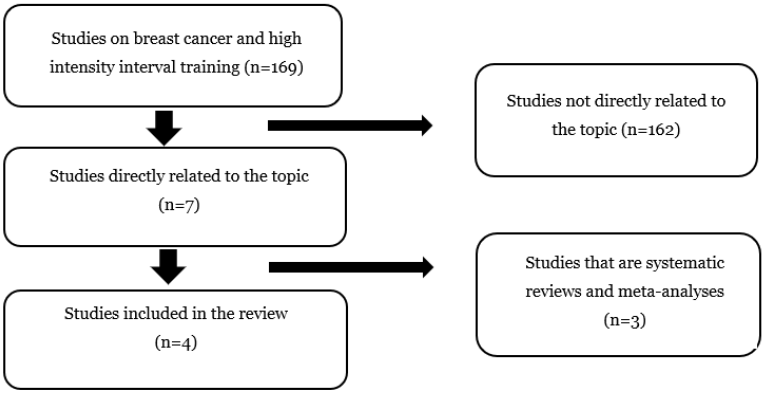

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Table 2. Summary of studies reviewed in the review on breast cancer and HIIT

Authors,year	Research Group	Method	Conclusion
Coletta AM, et al. (2019)[39]	44 obese women at risk for postmenopausal breast disease with a mean age of 63.9±8.8 years.	The 44 women in the study were randomized to high intensity interval training (HIIT), moderate intensity continuous training (MICT), and usual care (UC) groups for 12 weeks/3 times per week.	The results of the study in obese postmenopausal women at risk for breast cancer showed that there was no significant difference between the groups in terms of body weight and body mass index, but HIIT was associated with more improvement in terms of cardiorespiratory fitness.
Mijwel S, et al. (2018)[40]	240 women aged 18-79 years receiving chemotherapy	The effects of concurrent resistance and high-intensity interval training (RT-HIIT) or concurrent moderate-intensity aerobic and high-intensity interval training (AT-HIIT) on usual care (UC) were evaluated. 240 women were randomized to 16 weeks of RT-HIIT, AT-HIIT, or UC treatment.	The study results concluded that a 16-week supervised RT-HIIT intervention significantly increased muscle strength and prevented hyperalgesia in breast cancer patients receiving chemotherapy. It was also concluded that RT-HIIT was as effective as AT-HIIT in improving cardiorespiratory fitness.
Wilson R, et al. (2023)[41]	A total of 50 women diagnosed with breast cancer	50 breast cancer patients undergoing chemotherapy were randomized to HIIT or an attention control group. The HIIT group performed a 16-week intervention three times a week. The attention control group was given a stretching program with no exercise component and asked to maintain their exercise level for 16 weeks.	The study results add to the existing evidence on the role of HIIT in managing cognitive function and various patient-reported outcomes in breast cancer patients undergoing chemotherapy.
Ochi E, et al. (2022)[42]	50 women aged 20-59 with stage I-IIa breast cancer	Fifty women who had completed initial treatment other than hormone therapy were randomized to HIIT or control. HIIT was performed at home for 12 weeks with smartphone support.	We conclude that a home-based HIIT intervention can lead to improved cardiorespiratory fitness and muscle strength in early-stage breast cancer survivors.
Bettariga F, et al.(2024) [43]	28 breast cancer survivors (Stage I-III) (Age: 55.5±8.8 years, BMI: 27.9±5 kg/m²)	Participants were randomly assigned to 12 weeks of supervised resistance training (n=14) or HIIT (n=14), three times per week. Body composition, muscle strength (1RM), cardiovascular fitness (CRF), Ekblom Bak Cycle Test, and quality of life (QoL) (EORTC QLQ-C30 and EORTC QLQ-BR45) were assessed at baseline and after 12 weeks.	Both exercise groups improved body composition, physical fitness, and QoL. Resistance training led to greater increases in lean mass and muscle strength, while HIIT resulted in greater fat mass reduction and CRF improvement.
Klavina A, et al. (2024) [44]	Fifty-six patients (48.56±7.84 years) with newly diagnosed locally advanced (stage II-III) breast cancer requiring neoadjuvant chemotherapy (NACT)	6 months, randomized to HIIT group (2-3 weekly HIIT sessions at 85-95% peak HR) and control group following oncologist's standard care	HIIT was effective in reducing breast cancer symptoms, systemic treatment side effects, and cancer-related symptoms, improving quality of life in breast cancer patients during NAC.

Conclusion and Suggestions

There are studies in the literature on the role of HIIT in breast cancer[39-44]. HIIT has become an important component of exercise prescription in breast cancer treatment. HIIT is a form of exercise that has beneficial effects on various health parameters in breast cancer risk groups, breast cancer survivors and breast cancer patients.

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Methodological studies including and comparing larger populations, different age groups and breast cancer survivors at different stages are needed to increase the clinical importance of HIIT in breast cancer patients.

We believe that this review will make an important contribution to the literature by addressing the role of HIIT in breast cancer treatment and provide an overview of the topic. Our study highlights the effects and potential benefits of HIIT on breast cancer patients. In this context, we believe that our study aims to provide valuable information for clinical applications by addressing the effects of HIIT in breast cancer treatment from a broader perspective.

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