The Influence of Body Mass Index on Survival in Breast Cancer Patients

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Abstract

Weight gain and obesity are a important problems in breast cancer patients. A cross-sectional study was conducted with 147 BCSs. This study demonstrated the influence of obesity on health-related fitness, anthropometric measures, and cardiovascular state.

Introduction: More than half of breast cancer survivors (BCSs) are obese at diagnosis and experience approximately 50% to 96% of weight gain during treatment that could physically affect their survival. The aim of the study was to evaluate the influence of body mass index (BMI) on physical, anthropometric, and physiological parameters in BCSs. **Patients and Methods:** A cross-sectional study was conducted with 147 BCSs. Health-related fitness, anthropometric measures, cardiovascular state, and cancer-related fatigue (CRF) were assessed for our analysis and 3 groups were formed. **Results:** Tests of force handgrip (affected side: $F = 3.44$; $P < .05$; nonaffected side: $F = 3.067$; $P < .05$), functional capacity ($F = 3.239$; $P = .043$), and endurance of trunk flexors ($\times 2 = 8.264$; $P = .016$) were significantly lower in obese BCSs compared with the normal-weight group, whereas systolic ($F = 5.839$; $P = .004$) and diastolic blood pressure ($F = 8.794$; $P < .001$), waist circumference ($F = 85.81$; $P < .001$), and arm circumference at 10 cm (affected side: $F = 23.530$; $P < .001$; nonaffected side: $F = 17.095$; $P < .001$) and 5 cm (affected side: $F = 21.751$; $P < .001$; nonaffected side: $F = 22.490$; $P < .001$) were significantly greater in BCSs with higher BMI compared with other groups. No significant differences were observed between groups regarding lower limb endurance, resting heart rate or CRF. **Conclusion:** This study demonstrated the influence of obesity on health-related fitness, anthropometric measures, and cardiovascular state.

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Introduction

In developed countries, the 5-year prevalence of cancer cases in the population older than 15 years is approximately 13,605.7 people,[1] and these numbers continue to increase for most cancer types. The exact reason for this increase remains unknown, but the growing rate of obesity and improvements in early detection practices are likely responsible in some types of cancer; these factors could be intensified by population expansion and aging.[2] Furthermore, the survival rate for cancer patients is very high; more than 70% of women with breast cancer (BC) survive for more than 10 years after their original diagnosis.[3] However, cancer survivors suffer frequent symptoms during the aging process that are aggravated by associated health problems, such as obesity.

More than half of all BC patients are obese at diagnosis,[4] and 50% to 96% of women experience weight gain during treatment,[5] which could be related to development of comorbid conditions that affect survival.[6,7] Weight gain should be taken into account, especially in postmenopausal BC survivors (BCSs), because of the number of comorbidities and its increase with age.[8] Cancer patients with a body mass index (BMI) > 35 had worse disease-free survival than those of normal weight, independent of age, race, treatment, and sex.[9] Nevertheless, the mechanism of the relationship between BMI and survival remains unclear.

Obesity is related to sedentary lifestyle, which leads to decreased physical fitness.[10] A recent study demonstrated that a lack of physical activity and obesity are the most important determinants

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of physical performance in BCSs after patients finished adjuvant treatment.[9] Nevertheless, other components of health-related physical fitness, such as muscle strength, were not included in this study. A decrease in grip strength has a negative influence on the health of BCSs.[11] Therefore, studies are needed to improve our understanding of the influence of BMI on different components of health related to fitness in BCSs.

A sedentary lifestyle and unhealthy BMI also increase the risk of cardiovascular diseases in BCSs,[7] which are among the most frequent concomitant comorbidities in women with BC.[8] This is especially interesting for critical health markers, such as arterial pressure. Hypertension and high-severity heart disease are commonly found in BCSs aged 55 years and older,[8] and these conditions are aggravated by weight gain.[7] In this context, obese BCSs could have cardiovascular alterations that influence their health status. Thus, understanding the cardiovascular status of obese BCSs is necessary to improve the supportive care in cancer.

Inactivity also alters body composition. Elme et al[7] found that BC patients with less physical activity had a larger waist circumference than more active patients, and a large waist circumference is associated with an increased risk of several diseases, including cardiovascular diseases[12] and cancer,[13] among others. Thus, waist circumference is an important parameter that must be studied in relation with accepted health markers.

Another study demonstrated that cancer survivors with severe fatigue were less physically fit than nonfatigued patients.[14] However, physical activity and physical fitness are not unique factors linked to cancer-related fatigue (CRF).[15] The origin of CRF is not clear, suggesting an etiology linked to different factors; it is related to cancer treatment, type of tumor, pain, anemia, or lack of exercise,[16] reflecting multifactorial symptoms with negative physical, mental, and social effects.[17] However, the influence of BMI in CRF is not clear.

A large proportion of BCSs suffer severe side effects that affect their quality of life, and BMI could exacerbate this situation. A high BMI is linked to a sedentary lifestyle, which leads to decreased physical fitness, and a lack of exercise is related to cardiovascular diseases, alterations in body composition, and CRF. These conditions contribute to increased BMI, creating a vicious cycle that warrants further investigation.

In view of the growth of BCSs and the possible repercussions of increased BMI in this population, in this study we evaluated the influence of BMI on health-related fitness, anthropometric measurements, cardiovascular state, and CRF in BCSs.

Patients and Methods

Sample

We conducted a cross-sectional study with 147 BCSs recruited from the Department of Oncology of 2 major hospitals in Granada. Two oncologists contacted women if they met the following inclusion criteria: at least 18 years of age, BC grades I to IIIA, and having completed primary treatment, except hormone therapy. Subjects were not eligible if they met the following exclusion criteria: recurrent or active cancer, other medical conditions (fibromyalgia), or a psychological limitation hindering test completion. This study was approved by the ethics committee of the Virgen de las Nieves Hospital (Granada, Spain).

Breast cancer survivors who were interested in joining the study were provided a complete explanation of the protocol, and they signed a written consent form to participate. During a second appointment, the variables of interest were assessed.

Measures

A self-report questionnaire was used to obtain information regarding demographic, personal, and medical characteristics.

Physical Measures

Handgrip strength was determined bilaterally using a digital dynamometer (TKK 5101 Grip-D; Takey, Tokyo, Japan). This assessment was carried out in the standing position with the arm extended and was repeated 3 times. A 1-minute rest period was allowed between measures, and the mean value was used for further analysis[18]; this value represents a reliable correlate between quality of life and health status in BCSs.[11]

The 6-minute walk test was used to assess functional capacity by determining the distance a patient can walk over 6 minutes. This test was applied following the guidelines of the American Thoracic Society.[19]

The isometric endurance of trunk flexors test was used to determine the endurance strength of the abdominal muscles. In this test, the patient remains supine, keeping hips and knees bent at 90°, feet flat approximately 30 inches from the buttocks, and arms extended with hands on knees without actually touching. The patients were instructed to separate their trunk from the stretcher to the inferior angle of the scapula. The time that the patient is able to maintain that position until a maximum isometric of 90 s was recorded.[20]

General lower extremity endurance was assessed using the multiple sit-to-stand test.[21] Participants were required to sit and rise 10 times as fast as possible. This test was confirmed to be reliable.[22]

Cardiovascular Measures

After 10 minutes of rest in the sitting position, the measurements were performed using an Omron HEM-737 validated automatic oscillometric device (Kyoto, Japan).

Anthropometric Measures

Waist circumference was measured to the midpoint of the distance between the last rib and the iliac crest at the end of normal breathing.[23]

Arm circumference was assessed in the sitting position with both arms at the side and was measured at 5 and 10 cm below the olecranon process using a flexible plastic tape.[24]

Body composition was measured using multifrequency bioimpedance and segmental Biospace Inbody 720 (Biospace Inc) with 8 tactile electrodes placed on the feet and hands. After at least 3 hours of fasting, patients were placed on the platform barefoot and picked up the electrodes with both hands.[25] BMI was categorized as follows: 18.5 to 24.9 (normal weight), 25.0 to 29.9 (overweight), and 30.0 or more (obese).[26]

Fatigue

Fatigue was measured using the Spanish version of Piper Fatigue Scale, a self-administered scale that subjectively measures 4