



Review

Obesity in breast cancer – What is the risk factor?



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Abstract Environmental factors influence breast cancer incidence and progression. High body mass index (BMI) is associated with increased risk of post-menopausal breast cancer and with poorer outcome in those with a history of breast cancer. High BMI is generally interpreted as excess adiposity (overweight or obesity) and the World Cancer Research Fund judged that the associations between BMI and incidence of breast cancer were due to body fatness. Although BMI is the most common measure used to characterise body composition, it cannot distinguish lean mass from fat mass, or characterise body fat distribution, and so individuals with the same BMI can have different body composition. In particular, the relation between BMI and lean or fat mass may differ between people with or without disease. The question therefore arises as to what aspect or aspects of body composition are causally linked to the poorer outcome of breast cancer patients with high BMI. This question is not addressed in the literature. Most studies have used BMI, without discussion of its shortcomings as a marker of body composition, leading to potentially important misinterpretation. In this article we review the different measurements used to characterise body composition in the literature, and how they relate to breast cancer risk and prognosis. Further research is required to better characterise the relation of body composition to breast cancer.

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1. Introduction

Breast cancer is the most common cancer in women worldwide. In the United Kingdom (UK) during 2011 49,936 new cases of breast cancer were reported [1] and the incidence is still rising. Although mortality rates

are falling, over 11,000 British women still die of this disease each year [2], and thousands of long-term survivors undergo intensive and prolonged adjuvant therapies following the initial surgical management of their primary tumour. Inherited mutations in high susceptibility genes account for only a small percentage of these cases, and environmental factors play a major causative role in most adult cancers, potentially interacting with polygenic factors. Theoretically, if these environmental factors can be sufficiently characterised, interventions can be developed, leading to a reduced incidence and improved treatments for breast cancer.

The World Health Organisation (WHO) and many national authorities define obesity (a state of excess body fatness) in terms of body mass index (BMI). The current rate of obesity, (BMI >30 kg/m²), is estimated as 26% in British women and predicted to increase up to 43% by 2030 [3]. A recent updated comprehensive review of the evidence by the World Cancer Research Fund (WCRF) and American Institute for Cancer Research (AICR) [4] concluded that body fatness is an established and important risk factor for many cancers as well as other diseases (Fig. 1). The WCRF conclusion was an interpretation of evidence using body mass index (BMI) as a surrogate marker of body composition. The term ‘body fatness’ was used to describe the factor(s) underlying this increased risk, based on epidemiological BMI data, and evidence of mechanisms underpinning excess adiposity to cancer risk. However, BMI was not designed to describe body fatness [5], and does not describe body composition as it cannot distinguish lean from fat. Therefore, although there is now significant evidence that a high BMI is associated with an increased

- all-cause mortality
- ischaemic heart disease
- stroke
- diabetes mellitus
- chronic obstructive pulmonary disease
- metabolic syndrome
- non-alcoholic fatty liver disease
- benign prostate hyperplasia
- pulmonary embolism
- deep vein thrombosis
- gout
- gallstones
- reproductive disorders
- polycystic ovary syndrome
- osteoarthritis
- lower back pain
- psychiatric disorders
- complications in pregnancy
- complications in surgery
- Cancers of the: postmenopausal breast, colorectum, pancreas, kidney, endometrium and gallbladder

Fig. 1. Diseases in which increased weight/obesity lead to increased risk – Dynamo-HIA project and [4].

risk of breast cancer in post-menopausal women, and with poorer clinical outcomes in all ages [4], the exact nature of the exposure remains uncertain (Fig. 2). This uncertainty is reflected in the range of different approaches taken to characterise or describe body composition in the literature: BMI, body weight, body composition, metabolic state and nutritional state. Most studies have used the relatively simple measure of BMI. Given the importance of this risk factor, not only in influencing breast cancer incidence, but also its association with poorer clinical outcomes after diagnosis, it is crucial to characterise more precisely the aspects of body composition, or associated metabolic or physiological factors, that underlie the observed association. It is then important to identify how it can be assessed clinically, whether it can be influenced and whether this can reduce risk and improve outcome.

The aim of this review was to examine evidence, in terms of body composition, relating to the nature of the risk factor described as ‘body fatness’ in relation to breast cancer risk and outcome. To review the

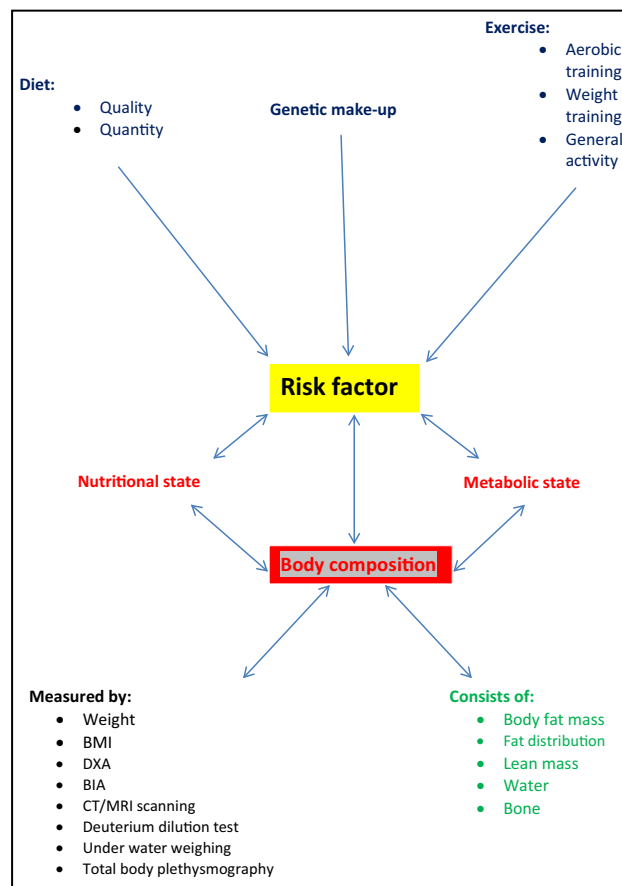


Fig. 2. Risk factor for breast cancer. There are several contributing factors (in blue) and interchangeable names (in red). In this review we specifically look at body composition. This is made up of various components (green) and can be measured by many methods (in black). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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