

# Chapter 3

## Risk Behaviours for Developing Breast Cancer: A Multi-disciplinary Approach

Rosalba León-Díaz, Yamilet Ehrenzweig, Tania Romo-González  
and Carlos Larralde

**Abstract** Breast cancer (BRCA) is the most common neoplasia among women around the world. The Official Mexican Standard states that health services must provide opportune information for the prevention of BRCA. However, this information focuses on the reduction of biological, iatrogenic or environmental risk factors and those related to reproductive history, neglecting those risk factors relating to lifestyle and other psychosocial risk factors (e.g. personality type, stress management). In this chapter we point out some recent findings that link not only obesity but also dietary habits, glycaemic index, alcohol intake and sedentary lifestyle as risk factors for developing BRCA. We also highlight the importance of addressing the psychological and social aspects, such as taboos of patients, to provide a multidisciplinary approach that allows an accurate prevention and treatment of this disease.

**Keywords** Breast cancer · Psychosocial risk factors · Personality type  
Stress management · Obesity · Eating habits

### 3.1 Introduction

Around the world, breast cancer (BRCA) is the most common neoplasia among women. In Mexico, guidelines for its diagnosis and treatment are stipulated in Official Mexican Standard NOM-041-SSA2-2011, which outlines that prevention

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Dr. Rosalba León-Díaz, Posdoctoral Researcher, Department of Integrated Health and Biology, Institute of Biological Research, Universidad Veracruzana. Email: rossalba\_leon@yahoo.com.mx.

Dr. Yamilet Ehrenzweig, Researcher, Institute of Psychological Research, Universidad Veracruzana. Email: yamiletehrenzweig@hotmail.com.

Dr. Tania Romo-González, Researcher, Department of Integrated Health and Biology, Institute of Biological Research, Universidad Veracruzana. Email: romisnaider@hotmail.com.

Dr. Carlos Larralde (1938–2015), Researcher, Department of Immunology, Institute of Biomedical Research, National Autonomous University of Mexico.

measures must include: (1) educational communication for the general public regarding symptomology of BRCA and risk factors; (2) the promotion of healthy lifestyles that help to decrease morbidity resulting from BRCA; and, (3) the advancement of demand for detection services.

Regarding point number 3, for BRCA detection, this Standard stipulates three types of intervention aimed at women based on their age and level of vulnerability: self-examination, clinical examination and mammogram. Self-examination is recommended from the age of 20 onwards. For self-examination, patients must have information regarding the symptoms and signs of the disease and information about when to seek medical advice. A clinical examination is necessary every year from the age of 25, and a mammogram after the age of 40 and until the age of 69, on a bi-annual basis. The purpose of the latter is to identify BRCA ideally during the preclinical stage of the disease. This is why women must receive the clinical results in writing no more than 21 working days after their examination. In the event of any abnormalities, the patient must also receive the date and location for a diagnostic evaluation at a public institution.

Despite these guidelines, mammograms, the primary method for detecting and diagnosing BRCA in Mexico, reduce mortality by only 7–23% (Chávarri-Guerra et al. 2012). This is due mainly to a lack of adequate infrastructure for the procedure, in addition to a shortage of trained and certified radiologists needed to interpret the tests. According to the Mexican Department of Health (SS), in 2010 there were 415 mammography technicians at public health institutions and hospitals and 366 within the private sector (Chávarri-Guerra et al. 2012; Mexican Department of Health [SS] 2011). This number of mammography technicians does not provide the coverage needed to undertake the number of tests recommended by international organizations, such as the National Cancer Institute (19.9 mammograms per million inhabitants). Moreover, the majority of mammograms carried out in Mexico are for diagnostic purposes and not for screening, which means that only 6% of women are diagnosed during the early stages of the disease, leading to higher treatment costs and reduced survival rates (SS 2011). Furthermore, studies of private and public hospitals in the metropolitan area of Mexico City show that the technical performance of operational mammography technicians is inadequate, not to mention that 53–82% of them do not comply with quality control measures and evaluations (Brandan/Villaseñor 2006).

These difficulties in opportunistically diagnosing BRCA can be clearly seen in the statistical data available. For example, in 2012, 1.67 million new cases of BRCA were diagnosed around the world, representing 25% of all cancers. Furthermore, BRCA led to 522,000 deaths, making it the fifth leading cause of death by cancer in the world. It is the leading cause of death by cancer in developing countries, with 324,000 deaths, and the second cause in developed countries, with 198,000 (GLOBOCAN 2012). In Mexico, the mortality rate for BRCA is 9.7/100,000 inhabitants (GLOBOCAN 2012), a figure that has doubled over the past 20 years (Knaul et al. 2008).

This data highlights that, despite the inclusion of a clause within the Standard specifically for the opportune detection of BRCA, the morbi-mortality for this

**Table 3.1** Risk factors associated with developing breast cancer

| Factor                      | Description   |
|-----------------------------|---|
| Biological                  | Female; ageing (the older the person, the greater the risk); personal or family history of breast cancer among mother, daughters or sisters; history of atypical ductal hyperplasia, radial or star-shaped marks, lobular carcinoma <i>in situ</i> by biopsy; menstrual life of more than 40 years (menarche prior to the age of 12 and menopause after the age of 52), mammary density and known carrier of BRCA1 or BRCA2 genes |
| Iatrogenic or environmental | Exposure to ionizing radiation, mainly during development or growth ( <i>in utero</i> or during adolescence) and thoracic radiotherapy treatment  |
| Reproductive history        | Nullipara or having had first pregnancy after the age of 30; hormone therapy during peri- or post-menopause for more than 5 years   |
| Lifestyles                  | Diet rich in carbohydrates and low in fibre; diet rich in animal fats and trans fatty acids; obesity, mainly during post-menopause; sedentary lifestyle; alcohol consumption of more than 15 g/day; and smoking   |

Source Official Mexican Standard NOM-041-SSA2-2011. For the prevention, diagnosis, treatment, control and monitoring of breast cancer

disease has not decreased. Furthermore, points 1 and 2 of the Standard, which focus on providing education about risk factors and the promotion of healthy lifestyles, have not been effective in preventing and opportunely diagnosing the disease. This could be as a result of the fact that the measures stemming from the application of the Standard focus mainly on decreasing the prevalence of biological, iatrogenic or environmental risks factors and those related to reproductive history (Table 3.1), neglecting those risk factors relating to lifestyle (even when it contemplates these factors) and other psychosocial risk factors. With regard to the latter, a number of authors have associated personality type (Morris/Greer 1980; Temoshok 1987; Kune et al. 1991; Zetu et al. 2013), stress management (Wayner et al. 1979; Kiecolt-Glaser/Glaser 1991; Kruk/Aboul-Enein 2004; Andersen et al. 2008) and cultural aspects (Carvalho et al. 2005), among others, with the onset of BRCA. This wide range of factors associated with the development of this neoplasia makes it necessary to create and promote materials, such as this chapter, which provide accurate information regarding those risk behaviours and factors that the Standard does not overtly mention or focus on, in order to ensure their inclusion in healthcare strategies to prevent BRCA.

## 3.2 Eating Habits

In Mexico, the lifestyles and eating habits of the population have changed dramatically over the past 20 years, and this shift can be seen in the increased prevalence of overweight and obesity: 33.4% in 1988 and 71.9% in 2006. There is a

greater prevalence of obesity among adult women (36.9%) compared to 23.5% among men (Olaiz-Fernández et al. 2006; Romieu et al. 2011).

Furthermore, the analysis of dietary patterns of the Mexican population shows that 35.1% of women are at risk of excessive carbohydrate consumption and 12.6% demonstrate excessive fat intake. The excessive consumption of these two elements (fats and carbohydrates) has been associated with overweight and obesity and a number of neoplasias, including BRCA, mainly among post-menopausal women (De Pergola/Silvestris 2013; Olaiz-Fernández et al. 2006; Romieu et al. 2011).

The exact manner in which obesity favours the development of cancer has not yet been pinpointed, but the following proposals have been made: (a) the insulin—insulin-like growth factor 1 [IGF-1] axis; (b) endogenous reproductive hormones; and, (c) chronic inflammation (De Pergola/Silvestris 2013; Patterson et al. 2013; Vucenik/Stains 2012). The first proposal is one of the most widely described and is explained below: obesity commonly leads to a state of insulin resistance and, consequently, a state of hyperinsulinemia. This hyperinsulinemic state increases the bio-availability of the IGF-1 protein, a protein that alters the cellular micro-environment, favouring the development of tumours. In cases of BRCA among post-menopausal women, it has been observed that IGF-1 favours the rapid progression and aggressiveness of cancerous cells. Furthermore, an epidemiological association between the presence of IGF-1 and BRCA in pre-menopausal women has been researched (De Pergola/Silvestris 2013; Patterson et al. 2013; Sundaram et al. 2013; VanSaun 2013; Vucenik/Stains 2012).

Another event favoured by obesity and linked to the appearance of cancer is the dysregulation of adipokines, proteins that are tasked with maintaining metabolic homeostasis, modulating inflammation, angiogenesis, proliferation and apoptosis. One of the major adipokines is leptin, a protein that controls the sensation of fullness and modulates the homeostasis between glucose and insulin, in addition to increasing the proliferation, migration and invasion of cancerous cells. A number of studies have shown an 83% increase in the leptin receptor among people with BRCA, while the receptor of 34% of patients with high leptin levels and high expression presented with metastasis (Alegre et al. 2013; Lima et al. 2009; Minatoya et al. 2013; VanSaun 2013).

With regard to the analysis of dietary patterns and their association with obesity and BRCA, it is important to take Glycaemic Index values (GI) into consideration. A prospective study in France highlights the association between elevated total GI and BRCA in overweight women, suggesting that the intake of fast-absorbing carbohydrates could be relevant in the development of this pathology in the presence of an underlying resistance to insulin. Furthermore, it found a direct association between carbohydrate intake, glycaemic load and oestrogen-receptor negative BRCA [ER-] (Lajous et al. 2008). A similar study among people in Mexico showed that there is a direct link between the development of BRCA (among both pre- and post-menopausal women) and carbohydrate intake, and, specifically, the elevated glycaemic load of the diet (Romieu/Lajous 2009).

In addition to the intake of food with a high glycaemic value, in Uruguay, for example, a strong link between the presence of BRCA and a Western diet was

found (fried and grilled meat and processed meats). Moreover, the increased risk of developing BRCA is associated with the consumption of red meat, and the risk is significantly higher among post-menopausal women (Torres-Sánchez et al. 2009; Coronado et al. 2011; Romieu et al. 2011).

On the other hand, in countries such as Argentina and Brazil, the consumption of green, leafy vegetables, non-citrus fruits, apples and water melon has been associated with a decrease in the risk of BRCA. Furthermore, in Mexico, the consumption of onion and spinach, polyunsaturated fats and vitamin E, vitamin B12 and folic acid, as well as flavonoids and phytoestrogens considerably reduces the risk of BRCA (Torres-Sánchez et al. 2009).

### 3.3 Sedentary Lifestyle

Another risk behaviour that has more recently been associated with the development of BRCA is a lack of physical activity, which represents the fourth major risk factor in terms of global mortality. It is also estimated to be the leading cause of approximately 21–25% of colon and breast cancers (World Health Organization [WHO] 2010).

For the specific case of BRCA, there is evidence that post-menopausal women who do light exercise reduce the risk by 20%. This effect is attributed to the regulation that physical exercise brings to body energy balance (calories consumed vs. energy expended) and the consequent decrease in resistance to insulin and hyperinsulinemia, predisposing factors to the development of BRCA (Alegre et al. 2013; Neilson et al. 2014; Romieu/Lajous 2009; Sundaram et al. 2013). However, only 16% of Mexican women regularly exercise, and the average amount of time dedicated to recreational physical activity is 5 min per day, despite the fact that there is evidence to show that risk decreases by 9% per hour of moderate exercise per week, and the Official Mexican Standard proposes at least 30 min of physical activity per day (Romieu/Lajous 2009).

### 3.4 Alcohol Intake

The harmful use of alcohol causes 2.5 million deaths every year, being ranked as the third major risk factor of the global burden of disease (WHO 2011). Carcinogenesis is one of the most significant health consequences attributed to alcohol consumption, not to mention the fact that approximately 3.6% of all cancers (5.2% among men and 1.7% among women) around the world, in addition to 3.5% of deaths linked to cancer, are related to chronic alcohol consumption (Seitz/Becker 2007; Varela-Rey et al. 2013).

A number of epidemiological studies have associated dose-dependent alcohol intake with BRCA, and, despite the fact that a specific mechanism has not been

identified, it is known that alcohol consumption: (1) increases endogenous oestrogen levels; (2) produces carcinogenic metabolites, such as acetaldehyde and reactive oxygen species; and, (3) decreases the capacity to absorb essential nutrients (Coronado et al. 2011; Seitz/Becker 2007; Lu et al. 2014; Varela-Rey et al. 2013). Moreover, a link between alcohol consumption and the presence of oestrogen receptor-positive mammary tumours (ER+) has been found, mainly among post-menopausal women. Specific studies have shown that an alcohol intake greater than 27 g/day increases the risk of presenting BRCA ER+/PR+ among post-menopausal patients (Enger et al. 1999).

### 3.5 Emotional Suppression and Chronic Exposure to Psychological Stress

Studies carried out by Pennebaker (1999) have shown that expressing emotions and recognizing traumatic events have a positive effect on an individual's physical and mental health. This is because emotional suppression is associated with more anguish or emotional stress (Iwamitsu et al. 2005a, b), while emotional expression is associated with improved psychological adjustment and, as such, a decrease in distress and an increase in quality of life.

Furthermore, different studies have tried to establish the recognition of certain character traits that are predisposed to specific kinds of illnesses. Specifically, people with behavioural patterns of negation, emotional suppression (mainly anger), conflict avoidance, who are socially agreeable, harmonizing and highly rational, with a C personality type, have a greater possibility of developing infectious diseases and cancer (Herranz et al. 1997; Temoshok 1987; Zozulya et al. 2008), in addition to BRCA (Herranz et al. 1997).

Emotional suppression, specifically, is considered to be the psychological variable that most affects the psychosocial adjustment of people with cancer, and it can be related to pathological clinical outcomes [death or improvement] (Cordova et al. 2003). More specifically, repression (low anxiety and high defensiveness) and suppression (deliberate retention of the expression of negative emotions) are associated with the faster progression of BRCA and a smaller likelihood of survival (Giese-Davis et al. 2002, 2006; Weinberger 1990).

Moreover, psychological alterations, such as a state of chronic stress, mean that the organism activates physiological systems to conserve homeostasis, leading to a negative impact on the nervous system through the activation of biochemical changes and a hormonal imbalance, such as the inefficient handling of catecholamine and corticosteroid hormones, which, in turn, has an impact on the endocrine and immune systems as well as on health in general (Dhabhar/McEwen 1997; Andersen et al. 2008).

The possible contribution of psychological stress to the development of BRCA has been widely studied (Antonova et al. 2011; Michael et al. 2009; Priestman et al.

1985), and it has been associated with immunosuppression generated by high levels of corticosteroids and conducts to tackle stress, such as, among others: an increase in the intake of foods rich in carbohydrates and high in fats (McGregor/Antoni 2009), alcohol consumption, smoking and poor sleep quality (Torres/Nowson 2007). These conducts favour increases in Body Mass Index (BMI), waist circumference, weight, abdominal adiposity (McGregor/Antoni 2009) and, in general, obesity, which we have already described as a risk factor for developing BRCA.

### **3.6 Socio-cultural Barriers to the Opportune Detection of BRCA**

Other risk factors that favour morbidity and mortality stemming from BRCA focus more on socio-cultural barriers relating to beliefs, attitudes, behaviours or social situations that do not permit self-monitoring and reduce access to early detection and treatment programmes for this disease. Examples of these barriers include embarrassment, fear of losing their role as an object of desire, fear of losing their partner, reluctance to abandon the household or children during the treatment process, social context, the age of the women or their family situations, their ideas regarding the incurability of cancer and the generation of negative feelings about the disease, among others. All of these barriers can, at any given time, become more decisive than physical access or financial barriers (Stein et al. 1998; Grana 1998; Hewitt et al. 2004; Angus et al. 2006; Daly/Collins 2007).

There is also a serious lack of knowledge surrounding self-care measures, as demonstrated by Nigenda et al. (2008), who interviewed women with BRCA and found that the majority knew how useful self-examination was for detecting ‘abnormalities’ in their breasts; however, almost none of them knew the technique, nor did they use it on a monthly basis after menstruating. Furthermore, they mentioned that before being diagnosed, they had ‘vague’ information about the changes the disease causes, such as ‘redness’, ‘splitting of the nipple’ or the appearance of ‘lumps’. Giraldo/Arango (2009) comment that, despite women knowing that self-examination is important in detecting BRCA in its early stages, they do not know how or when to do it. They also found that women with higher levels of education carried out self-examination on a periodic basis and were more aware of the risk and the symptoms of BRCA. These self-care measures are also undertaken by women who are caring for a relative with cancer, and their main motivation is the fear of developing the disease themselves, which is why they search for information about how to prevent it.

In terms of the barriers perceived by women within the healthcare system, Hewitt et al. (2004) found obstacles such as the lack of communication between healthcare professionals and patients, failures in clinical practice, failures in diagnosis, errors in the treatment prescriptions, the inexperience of healthcare professionals in evaluating the urgency of the situation and the anxiety stemming from the

latter, inadequate coordination and fragmentation of the care patients require, lack of knowledge of healthcare professionals regarding the resources available in the community, and, finally, an underdeveloped system that guarantees quality and responsibility for healthcare services. Furthermore, Nigenda et al. (2008) found the lack of diagnostic equipment and insufficient specialized training for doctors to be issues that women viewed as being decisive during the diagnostic process for BRCA. Moreover, representatives from civil society organizations recognized, through testimonials shared by women in self-help groups, the lack of clinical training and low levels of sensitivity of some healthcare professionals, both at public and social security institutions. These factors led women to lack confidence in healthcare services and feel embarrassed or scared by the doctor, especially when accepting some diagnostic procedures [breast exploration and mammogram] (Cumpián-Loredo 2000; Wiesner 2007; Sánchez/Dos Santos 2007).

### 3.7 Conclusions

There is more and more academic literature to support the fact that the origin and progress of BRCA is 50% attributable to factors associated with lifestyle (Khan et al. 2010; Antonova et al. 2011; Macon/Fenton 2013). As such, recognizing and studying these factors is crucially important in developing new methods of preventing, diagnosing and treating BRCA, especially in Mexico, where diet and lifestyles have changed radically.

There are few BRCA prevention campaigns supported by the official healthcare system that constantly and perceptibly reinforce the importance of monitoring eating habits, our lifestyles and risk behaviours (such as alcoholism or a sedentary lifestyle). Almost all of the campaigns focus on risk factors relating to biology or reproductive history. This clearly reflects the clinical procedures currently in place in Mexico, given that women within the age range for a mammogram are not given an insulin-resistance test, their BMI data is not taken and they are not asked about their alcohol intake, dietary habits or physical activity. It is not difficult to see why the only mention of these risk factors in the Standard means that a greater focus on these elements is required. As such, more is needed than just mass campaigns that focus on self-examination or mammograms; the constant promotion of healthy lifestyles is important, not so as to avoid death (a natural process for any human being at any time of their lives), but rather to help people have a positive impact on their personal well-being. This task not only involves the healthcare and education sectors, but also people in general.

Some risk factors discreetly mentioned in this chapter, such as a personality that is susceptible to cancer, are not as widely recognized by the healthcare sector and are unknown within the elementary education sector, which is why these concepts must be established within our cultural backgrounds. Other factors, such as psychosocial stress, are not officially considered to be risks despite the notorious (and,



in many cases, costly) consequences for our health. The most notorious of these factors is obesity, which leads to a number of diseases, including BRCA.

Moreover, it has been recognized that socio-cultural factors greatly affect prevention. This is due to the fact that they are not truly identified as risk factors, but rather as part of our cultural background. The behaviours stemming from these factors are seen as normal, preventing them from being identified as a health risk for women. As such, it is fundamentally important to, firstly, understand them and break inherent cultural and health paradigms, and drive a true culture of breast cancer prevention.

The epidemiological panorama and the multi-causality of BRCA make incorporating earlier detection testing into primary prevention indispensable. This requires multi-disciplinary studies that offer effective alternatives to save more lives than self-examination, detection by mammogram, surgery, radiotherapy and chemotherapy. Furthermore, these options must promote changes in risk behaviours and the adoption of healthy lifestyle through health education, a fundamental tool in acquiring healthy habits that prevent cancer (Bayes 1990).

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