Association of Milk and Meat Consumption with the Development of Breast Cancer in a Western Mexican Population

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Introduction

Breast cancer is the most common gynecologic neoplasia \cite{1,2,3} and the second most frequent cause of death by cancer after lung cancer \cite{2,4,5}. Different genetic and environmental factors influence its development \cite{6}. Among the latter, the consumption of milk and meat has been controversially associated with breast cancer.

Meat consumption has been identified as a risk factor for the development of numerous types of cancer, associated with the frequency of consumption, the type of meat consumed \cite{7,8}, and how it is processed \cite{6}. Compared with Mexico, countries like Argentina and Uruguay, where meat consumption is high, also have relatively high incidence rates of breast cancer \cite{9}. Even though such facts are striking, many studies have found no association between the development of breast cancer and certain dietary patterns \cite{8,9,10,11,12}.

The consumption of milk and other dairy products is another environmental factor with a still controversial role in the pathogenesis of breast cancer. Some studies indicate that milk consumption is associated with breast cancer development \cite{13}, relating it to the increased intake of estrogen metabolites \cite{14}; others point out that dairy products, with the exception of milk, are a clear protective factor \cite{15}, and still others demonstrate no association with the pathology \cite{11,16,17}.

The importance of the present study is that it produces evidence regarding the association of milk and meat consumption with the development of breast cancer in a western Mexican population.
Methods

In this study, 97 women presenting with breast cancer and 104 healthy women with normal mammograms (American College of Radiology (ACR) Breast Imaging Reporting and Data System (BI-RADS) 1 or 2) at the Instituto Estatal de Cáncerología (IEC) in Colima were included. Once statements of informed consent were signed, medical histories for each participant were elaborated. The IEC case records of the patients forming the case group were reviewed, taking into account the tumor/node/metastasis (TNM) classification, histologic tumor type, etc.

Selection criteria for the control group individuals were: (1) that their routine mammograms were carried out at the same hospital in which the breast cancer patients were treated, (2) that they had a normal mammogram (BI-RADS 1–2), (3) that they belonged to the same age group (less than a 5-year difference) as the patients of the breast cancer group (individuals were paired by age group), and (4) that they had no personal history of cancer. Additionally, all study participants were non-blood-related Mexican mestizo subjects from the State of Colima, Mexico. None of the participants considered themselves to be vegetarians.

Of the study population, 80% belonged to a low social stratum with the following characteristics: a family of 4–6 members, farmers or laborers, minimum wage income, no economic stability (a secure line of work), and a dwelling, generally rented, with 1–2 improvised bedrooms. 15% of the study population belonged to a middle social stratum, corresponding to a family with 4–6 members, laborers or employees, income above the minimum wage, homeowners with 2–3-bedroom houses. Only 5% of the population belonged to an upper social stratum. This information was taken from socioeconomic data cards filled out by the personnel from the social work service of the hospital where the study was conducted. The present study was approved by the ethics committees of the School of Medicine of the Universidad de Colima and the IEC.

Definitions
A medical history was elaborated for each of the participants (including histopathologic and immunohistochemical reports on the tumors). Breast cancer patients were categorized into stages according to the TNM classification. The presence of metastasis was evaluated with a liver function test, chest X-ray, abdominal ultrasound scan, and bone scintigraphy. As part of the anamnesis, the frequency of milk and meat consumption was asked. 85 g of cooked meat and 240 ml of milk, per ingestion, were the portions that were evaluated [18]. Certain varieties of meat that can reduce (fish and seafood) or increase (luncheon meat) the risk for certain types of cancers were not among the study aims of this analysis, and so their consumption was not taken into consideration. This aspect was made clear to the patients during the interview [19, 20]. Consumption was understood as the habitual intake during the majority of the individual’s lifetime. In the group of breast cancer patients, it was emphasized that consumption did not refer to dietary changes that were made after the cancer diagnosis. The food-frequency questionnaire uses an open-ended format, providing subjects with the option of answering in terms of frequency per day, week, or month [21]. Consumption was categorized as: high (daily or at least once a week), moderate (at least once every 15 days, low (at least once every 2 months), null (less than 5 times a year or never). The rationale for the use of the consumption frequency was based on previous reports [22]. In addition, the food-frequency estimates were converted to times consumed per month [21]. Smoking was defined as the smoking of 100 or more cigarettes during the patient’s lifetime [23]. Alcoholism was regarded as the regular consumption of 20–40 g of alcohol daily; a standard drink contains approximately 12–14 g of alcohol. Lactation was considered positive when the mother breastfed 1 or more children for 6 months. Gestation was a pregnancy of 28 weeks or more. The use of hormonal contraceptives was regarded as positive when they were used for a period equal to or above 5 years [10].

Statistical Analysis
Student’s t-test was used to compare the mean values of the measurement variables (nominally distributed). The qualitative data were compared through the chi-square test. The association between food consumption and the risk for breast cancer was estimated by odds ratios (ORs) and 95% confidence intervals (CIs) (crosstabs procedure). They were calculated, controlling other risk factors, using the Mantel-Haenszel (MH) method for stratified analysis. The MH method is a technique that generates an estimate of an association between an exposure and an outcome after adjusting for confounding, or taking it into account. The method is used with a dichotomous outcome variable and a dichotomous risk factor [24, 25]. In our study, stratification was carried out to control 2 confounding factors: gestation (yes/no) and lactation (yes/no). All statistical analyses were performed with the software SPSS version 2.0 (IBM, Armonk, NY, USA).

Results

The mean age was 50.77 (standard deviation (SD) 7.51) and 51.38 (SD 13.64) years in the controls and cases, respectively. There was no significant difference in this variable (P = 0.69). Other characteristics of the population studied are summarized in table 1, where it can be seen that there were significant differences only in the variables of gestation and lactation, which were lower in the case group. With respect to tumor histology in the case group, ductal cancer predominated in 87.6%, followed by the lobular, papillary, and mucinous types at 6.5%, 3.1%, and 3.1%, respectively. The clinical stage of cancer was 0 in 14.4% of the cancer patients, IA in 11.3%, IB in 3.1%, IIA in 33.0%, IIB in 25.7%, IIA in 8.2%, IIIB in 4.1%, and IV in 0%. Overexpression of the human epidermal growth factor receptor 2 (HER2), the progesterone receptor, and the estrogen receptor was positive in 16.5%, 72.2%, and 77.3%, respectively.

As can be seen in table 2, high consumption of meat showed no significant difference when compared with null or low consumption. However, the risk for breast cancer was 7 times greater with high milk consumption, compared with null or low consumption. It should be mentioned that the gestation and lactation variables were adjusted for these analyses, thus avoiding bias from these confusion variables. In agreement with the previous result, the consumption frequency per month was, on average, 21.0 and 18.0 for milk (p = 0.02) and 8.7 and 9.1 (p = 0.06) for meat, in cases and controls, respectively. It is important to point out that 95% of the women stated that, throughout their lives, they had drunk whole cow’s milk, and 5% had drunk low-fat cow’s milk.

Table 1. Distribution of the main clinical characteristics of the study subjects

<table>
<thead>
<tr>
<th>Variables</th>
<th>Case (n = 97)</th>
<th>Control (n = 104)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>7.2%</td>
<td>8.6%</td>
<td>0.495</td>
</tr>
<tr>
<td>Diabetes</td>
<td>12.4%</td>
<td>14.4%</td>
<td>0.427</td>
</tr>
<tr>
<td>Hypertension</td>
<td>23.7%</td>
<td>22.1%</td>
<td>0.833</td>
</tr>
<tr>
<td>BMI</td>
<td>27.1 ± 4.0</td>
<td>27.8 ± 4.5</td>
<td>0.222</td>
</tr>
<tr>
<td>Pregnanacies, n</td>
<td>3.4 ± 2.8</td>
<td>4.3 ± 2.5</td>
<td>0.044</td>
</tr>
<tr>
<td>Pregnanacies (yes/no)</td>
<td>63.9/36.1%</td>
<td>78.8/21.2%</td>
<td>0.022</td>
</tr>
<tr>
<td>Lactation (yes/no)</td>
<td>55.7/44.3%</td>
<td>72.1/27.9%</td>
<td>0.013</td>
</tr>
<tr>
<td>Hormonal contraceptive</td>
<td>17.5%</td>
<td>11.5%</td>
<td>0.228</td>
</tr>
</tbody>
</table>

BMI = Body mass index.
Discussion

High consumption of cow’s milk was found to be a factor increasing the risk for presenting with breast cancer in the population studied. These results concur with those reported by Hjartåker et al. [11] and Farlow [26] who postulated that milk consumption is a risk factor for breast cancer. In spite of that, there are also reports in which no such association was indicated. Zhang and Keseloot [16] analyzed the general milk consumption and the incidence of this neoplasia in different countries and reported that milk consumption did not substantially change the risk for breast cancer. This last result does not concur with that of our study, which could be due to the large methodological differences between the 2 analyses. It has been suggested that high milk consumption results in the ingestion of cow estrogen metabolites as well as a high caloric intake, both of which are risk factors for developing breast cancer. It should be noted that, in contrast, dairy products have been clearly described as protective factors [14]. Nevertheless, this aspect was not determined in the present study.

On the other hand, it has previously been suggested that meat can also be a risk factor for developing breast cancer, but the results were inconclusive [7, 8] as well as controversial, given that there are also studies stating that non-vegetarian eating habits (consumption of animal products) per se does not elevate the breast cancer risk and that traditional manufacturing and cooking methods can have a more relevant influence than the type of food [27]. The methodological designs of the reports on this subject vary greatly, with a large number of variables involved, making it difficult to arrive at a widely acceptable conclusion [28]. We did not observe an association between red meat consumption and breast cancer in our study. On the contrary, meat consumption was lower in the patients with breast cancer. It is worth noting that 80% of the population studied had a low economic level, with limited access to expensive food such as meat. This particularity could be the reason why the consumption of meat at least once a week (high consumption) in this population had the tendency to be a protective factor. Future studies with a larger sample number are needed in order to determine the effect of meat consumption in non-vegetarian populations in which a significant percentage of subjects do not frequently consume meat for socioeconomic reasons.

An important aspect of the present study was the confirmation of the protective role of gestation and lactation in the development of breast cancer. Just as in a large number of epidemiologic studies, it was found that patients with this cancer had a lower number of pregnancies and breastfed less, when compared with healthy women [29]. At the commencement of pregnancy, the breast undergoes a cyclical transformation during which it matures from a resting, nonfunctional gland to a milk-producing organ, which then gradually reverts back to quiescence after cessation of lactation. Data suggest that the pregnancy-lactation cycle permanently alters the molecular histology of the breast and influences the breast cancer risk [30].

In conclusion, high milk consumption was a risk factor for developing breast cancer in this study population. Meat consumption was not significantly associated with the development of this neoplasia. Further studies are needed to evaluate the effects of the dietary pattern on breast cancer development in populations with ethnic, cultural, and economic differences.

Disclosure Statement

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Referencias