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Dairy products and red meat intake and the risk of breast cancer – a case-control study in females from Transylvania

Studiu caz-martor privind aportul alimentar de produse lactate, carne roşie şi riscul la cancer mamar la femeile din Transilvania

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Abstract

Background. Dairy products and red meat are diverse groups of foods (milk, cheese, yoghurt, ham, etc.) that have a relatively high saturated fat content, which may increase breast cancer risk.

Aims. The aim of the study was to estimate milk and dairy products and red meat consumption and to establish the relation to breast cancer risk.

Methods. To achieve the aim of the study we used an epidemiological case-control study on 223 breast cancer patients and 211 non-cancer controls. The average age was 53.02±9.40 years for breast cancer women and 55.3±10.01 years for controls. Dairy products and red meat consumption was estimated with a valid semiquantitative food frequency questionnaire. The data were expressed as average values and we used the statistical Anova test to compare the results. We calculated odds ratio by the stratification of the groups on different levels of dairy products and meat intake (quartiles). The results were considered statistically significant at $p<0.05$.

Results. High levels of dairy intake represented a risk for breast cancer (OR=1.79, p=0.013). High levels of meat consumption (over 142 g/day) were associated with breast cancer risk (OR=1.67, p=0.03).

Conclusions. The study highlights the importance of decreasing the consumption of dietary high-fat animal products in order to prevent breast cancer risk in Transylvanian females.

Key words: breast cancer, risk, dairy products, red meat, diet.

Rezumat

Premize. Laptele, carnea roşie şi preparatele reprezintă alimente de o mare diversitate (lapte, brânzeturi, produse lactate acidofile, şuncă etc.), care conţin o cantitate mare de grăsimi saturate, un presupus factor de risc al cancerului mamar.

Obiective. Scopul studiului a fost de a estima consumul de lapte, produse lactate și carne roşie la pacientele cu cancer de sân și de a stabili relaţia acestora cu riscul cancerigen mamar.

Metode. S-a aplicat un studiu epidemiologic caz-martor unui lot de 223 paciente cu cancer mamar şi unui lot martor de 211 femei. Vârsta medie a femeilor cu cancer mamar a fost de 53,02±9,40 ani şi a femeilor martor de 55,3±10,01 ani. Aportul alimentar de produse lactate şi carne a fost estimat cu ajutorul unui chestionar de frecvenţă alimentară validat. S-a folosit testul statistic Anova pentru compararea valorilor medii calculate. Stratificarea lotului pe diferite nivele ale consumului alimentar (quartile) a permis calcularea riscului relativ estimat (odds ratio) în funcţie de nivelul expunerii. S-au considerat semnificative statistic rezultatele a căror valoare $p<0,05$.

Rezultate. Studiul a arătat că nivelele mari de ingestie a produselor lactate au reprezentat un factor de risc pentru pacientele cu cancer de sân (OR=1,79, p=0,013). Consumul crescut de carne roşie a fost asociat cu creşterea riscului cancerigen (OR=1,67, p=0,03).

Concluzii. Studiul de faţă evidenţiază necesitatea reducerii aportului alimentelor de origine animală cu conţinut crescut de grăsimi, în vederea scăderii riscului cancerigen la femeile din Transilvania.

Cuvinte cheie: cancer mamar, risc, produse lactate, carne roşie, alimentaţie.

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Introduction

Breast cancer is the most common cancer in women worldwide. It is also the main cause of death from cancer among women globally. It was estimated at 1.38 million new cases diagnosed worldwide in 2008. The incidence of breast cancer is higher in Western Europe and lower in Central and Eastern Africa, with variations in the incidence of approximately five times between different parts of the world. The frequency of breast cancer has been steadily increasing in the developed world and in Central and Eastern Europe and Asia, regions that were considered with a low incidence. This increase was associated with changes in the population's lifestyle, such as reproductive behavior, weight gain, alcohol consumption and use of oral contraceptives (1).

There are well-established determinants of breast cancer in women: age, relative body weight, weight changes over time, lactation, late age at first pregnancy, early menarche, late menopause, endogenous and exogenous estrogen hormone concentration, history of benign breast disease, alcohol consumption, family history of cancer, exposure to ionizing radiation (Dunnwald et al., 2007; Cleary & Grossman, 2009). The differences in breast cancer incidence between different countries and geographic regions and the different dietary habits between populations have led to the hypothesis of the importance of environmental factors, including diet in modifying breast cancer risk. Milk, meat, dairy and meat products are food groups that can potentially modify the risk of breast neoplasms primarily by a high saturated fat content (Genkinger, 2013; Moorman & Terry, 2004). Dietary factors associated with breast cancer risk may act early in the course of life, causing rapid growth and development, and early age of puberty, known risk factors of breast cancer as shown above.

The aim of the study was to estimate the intake of milk, meat, dairy and red meat products in breast cancer patients and to establish their relationship to the risk of cancer.

This study is part of a larger research on the relationship between breast cancer and associated dietary factors (Năsui, 2007).

Hypothesis

Literature studies suggest that increased intake of animal foods rich in saturated fat, such as milk and red meat, may contribute to increased breast cancer risk. This study aims to estimate the consumption of milk, dairy products, red meat and red meat products among Transylvanian women and to establish the relationship with breast cancer.

Material and methods

Research protocol

A case-control study was conducted.

a) *Period and place of research*

The study was conducted during 2003-2007 and included patients with a histopathological diagnosis of breast cancer, hospitalized in the "Ion Chiricuţă" Oncological Institute, Cluj-Napoca.

b) *Subjects and groups*

The investigated population group consisted of 223 patients with breast cancer. The average age of women with breast cancer was 53.02±9.40 years. The control group consisted of 211 women selected from the same geographical area as women with cancer, without the studied pathology, with a mean age of 55.3±10.01 years ($p>0.05$).

c) *Test applied*

Estimation of milk, meat and dairy and meat product consumption was performed using a validated food frequency questionnaire, developed by the U.S. National Cancer Institute in collaboration with Temple University (2). The questionnaire was designed to estimate the epidemiological and behavioral factors of breast cancer. The questionnaire was adapted to Romanian dietary habits and pre-tested to verify its validity. The questionnaire was applied by interview. It evaluated both the frequency and amount of intake of milk (including condensed milk) and dairy products, such as acidophilus products like yoghurt, buttermilk and cheese. The amount of milk and products such as yoghurt was estimated using standardized measures (cup, glass). Cheese was assessed by reporting the portion size of individuals. In the same way we evaluated the intake of meat and red meat products (bacon, ham, sausages, salami, traditional pork products). The interviewed subjects estimated portion sizes of consumed red meat (pork, beef, lamb) or meat products.

d) *Statistical proccessing*

The results were expressed as arithmetic means. The comparison of the means was performed using the ANOVA test. The stratification of the studied groups on different levels of consumption represented by quartiles allowed the calculation of odds ratio, the probability of developing breast cancer by level of exposure. Statistical analysis was done using Microsoft Excel 2000 and EpiInfo version 3.3.2. We considered results with a p value <0.05 as statistically significant.

Results

The study results showed that the average intake of milk and dairy products, although elevated in both groups, presented no statistically significant differences. It is noted that acidophilus milk intake was significantly higher in patients with cancer, but intake of cheese was similar for both groups (Fig. 1).

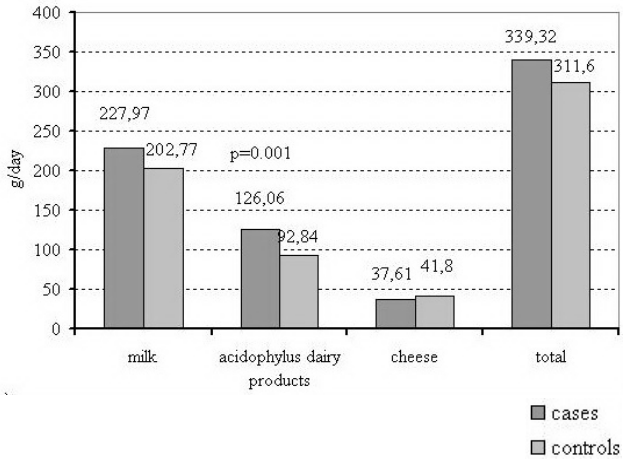

Fig. 1 – Average intake of milk and dairy products.

To estimate the likelihood of development of breast cancer according to consumption levels, a stratification of the studied groups on quartiles of food intake was performed. Estimated relative risk analysis of food consumption quartiles showed that milk intake levels higher than 250 g/day were a risk factor for the studied cancer patients (Table I).

Table I
Odds ratio of quartiles of milk intake.

Milk g/day	OR	95% CI	p
0.14 – 71.42	1.96	1.09 – 3.56	0.05
71.42 – 142.857	1.27	0.79 – 2.05	0.350
142.857 – 250	0.13	0.07 – 0.26	< 0.001
250 – 4000	**1.91**	1.21 – 3.02	**0.005**

In the case of acidophilus dairy products the probability of development of breast cancer occurred at consumption levels higher than 142 g/day. Instead, reduced intake was a protective factor for women in the study group (Table II).

Table II
Odds ratio (OR) of quartiles of consumption of acidophilus milk (yoghurt).

Yoghurt ml/day	OR	95% CI	p
2.19 – 57.143	0.88	0.54 –1.44	0.68
57.143 – 64.285	**0.39**	0.23 – 0.66	**< 0.001**
64.285 – 142.857	1.13	0.7 – 1.82	0.690
142.857 – 900	**2.37**	1.44 – 3.9	**< 0.001**

The calculation of the estimated relative risk for different dietary levels of cheese consumption in the studied patients did not show a relationship of association with breast cancer risk depending on the consumed amount (Table III).

Table III
Odds ratio and cheese intake.

Cheese g/day	OR	95% CI	p
0.33 – 14.285	1.66	0.99 – 2.7	0.053
14.285 – 28.571	0.74	0.45 – 1.21	0.250
28.0571 – 45.714	0.75	0.48 – 1.17	0.220
45.714 – 400	1.17	0.73 – 1.87	0.57

The probability of development of breast cancer was estimated in relation to different levels of food intake in group I (consumption of milk and dairy products). This analysis shows again that consumption levels higher than 357 g/day were a risk factor for breast cancer patients (OR = 1.79, p = 0.013), while a lower intake can be a protection factor from breast neoplasia in the investigated women (Table IV).

Table IV
Odds ratio (OR) and dairy product intake.

Milk and dairy products g/day	OR	95% CI	p
0.33 – 150	2.24	1.38 – 3.64	0.05
150 – 250	0.42	0.26 – 0.68	< 0.001
250 – 357.143	0.60	0.37 – 0.96	0.031
357.143 – 4300	1.79	1.12 – 2.85	0.013

This study also estimated the dietary intake of red meat and red meat products. In the category of red meat and processed meat were included pork, beef, lamb, veal. Meat and processed meat from wild animals or birds were excluded from this designation.

Thus, we calculated the average dietary intake of red meat and red meat products in the interviewed women and obtained similar values of ingestion without statistical significant differences in the studied groups (Fig. 2).

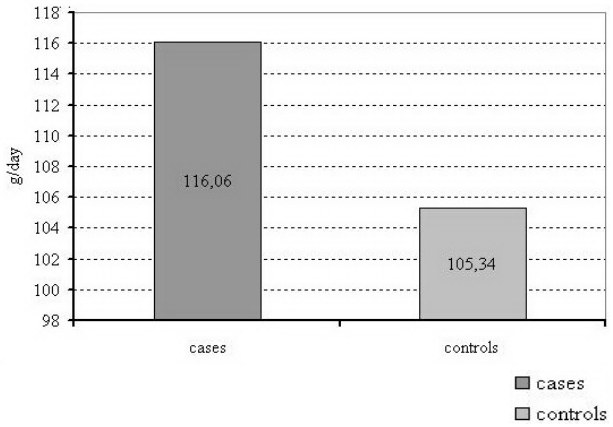

Fig. 2 – Average ingestion of red meat in the studied groups.

In contrast, the analysis of quartiles of red meat intake showed that levels higher than 142.86 g/day red meat were a possible risk factor for breast cancer in the studied patients (Table V).

Table V
Odds ratio (OR) and red meat intake.

Total red meat g/day	OR	95% CI	p
1 – 42.86	1.12	0.7 – 1.78	0.710
42.86 – 65.80	0.60	0.37 – 0.95	0.05
65.80 – 85.04	0.91	0.57 – 1.44	0.760
142.86 – 730.73	**1.67**	1.04 – 2.68	**0.032**

Discussion

Studies have shown that milk and dairy products may influence breast cancer risk by both an increasing and protective effect (Moorman & Terry, 2004). There are several hypotheses according to wich milk and dairy products may increase the risk of breast cancer: a first hypothesis is that dairy products are sources of saturated fat wich are related to breast cancer risk. On the other hand, milk may become contaminated with pesticides that are potentially carcinogenic and it may also contain growth factors, such as insulin-like growth factor (IGF-1), which promote the growth of cancer cells. Other studies argue for the protective effect of dairy products due to calcium, vitamin D and conjugated linoleic acid content. The active form of vitamin D (1.25 (OH) D) exerts antiproliferative effects in multiple cellular processes related to cell growth and development (Crew, 2002). Calcium and vitamin D act by interfering with cell proliferation and differentiation (Parodi, 2005). Studies carried out on animals receiving a high fat diet show that vitamin D and calcium supplementation reduces tumor growth (Shin et al., 2002).

Conjugated linoleic acid that is found in dairy products and meat from ruminant mammals inhibits tumor growth by oxidative effects in cancer cells (McCullough al., 2005). The present study revealed that low milk intake exerted a protective effect in patients with cancer.

People who have a high consumption of milk and dairy products are likely to consume large amounts of meat and other products with a high fat content, which can also contribute to an increased risk of breast cancer. The study group also had an increased consumption of milk and cheese in relation to the age of the investigated subjects. The recommendations of the Romanian Ministry of Health are aproximately 210 ml/day milk (and acidophilus dairy products) and 25 g/day cheese for the 40-60 year age group (Ionuţ et al., 2004). As the study results show, these recommendations were mainly exceeded on account of milk and acidophilus dairy products (yoghurt). Milk is the main product that is consumed by Romanian females. Hence the need to reduce milk consumption and to choose food with a low fat content.

Regarding the consumption of red meat, international WCRF recommendations limit its intake to 80 g/day (***, 2007). The investigated women had a daily red meat intake above this value. In addition to the increased saturated fat content of red meat, this may be the source of carcinogenic chemicals resulting from high-temperature preparation or it may contain hormones (Taylor et al., 2007; Mignone et al., 2009).

Patients who consume large amounts of milk, meat and dairy and meat products may have an increased intake of other high calorie foods and a low intake of vegetables and fruit, lacking protection provided by these (Nasui et al., 2007b). It is therefore very difficult to separate the effects of the ingestion of milk and dairy products from other dietary nutrients. Excess calorie intake can lead to obesity, another risk factor for breast cancer in the studied patients (Năsui et al., 2007a). In addition, breast cancer is a multifactorial disease and there may be other factors that contribute to increased cancer risk (genetic, hormonal, alcohol consumption, physical inactivity, etc.), which were not included in the study.

Conclusions

This study highlights the necessity to reduce the consumption of animal origin products, namely milk, red meat, dairy and red meat products, to protect women from Transylvania from the development of breast cancer.

On the other hand, this study represents an argument for adopting a healthy lifestyle, which means having a proper diet, weight control and constant physical activity.

Conflicts of interest

There are no conflicts of interests.

Acknowledgement

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