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Epidemiological study on breast cancer risk and physical activity level among Transylvanian females

Studiu epidemiologic asupra riscului cancerigen mamar şi nivelul activităţii fizice la femeile din Transilvania

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Abstract

Background. Research data shows that physical activity, part of a healthy lifestyle, represents a protective factor against mammary carcinogenesis.

Aims. The study estimates the level of physical activity in females with breast cancer from Transylvania and establishes the relationship between the physical activity level and mammary cancerogenesis.

Methods. We used a case-control epidemiological study applied to 211 cases, breast cancer females hospitalized at the "Ion Chiricuţă" Cancer Institute Cluj-Napoca, aged 53.02 ± 9.40 years. Physical activity was estimated using a questionnaire that analyzed the time, frequency and intensity of the occupational and recreational physical activity. The results were expressed as arithmetic means and compared using the ANOVA statistical test. We calculated the odds ratio to estimate the relationship between breast cancer risk and physical activity. Only the results that had $p<0.05$ were statistically significant.

Results. The level of professional physical activity of breast cancer patients was greater than in controls (p=0.004). The professional physical activity was a protective factor against mammary carcinogenesis (OR=0.48; p=0.002). The extra-professional physical activity of breast cancer cases was higher than in controls (p=0.001). The total physical activity had lower levels for both cases and controls.

Conclusions. The results of this study are important for providing recommendations to breast cancer patients, to improve physical activity behavior for preventing mammary carcinogenesis.

Key words: breast cancer, physical activity, prevention.

Rezumat

Premize. Datele din literatură au arătat că activitatea fizică reprezintă un factor de protecţie faţă de cancerul mamar, alături de alte elemente ale stilului de viaţă.

Obiective. Studiul de faţă îşi propune să estimeze nivelul activităţii fizice la pacientele cu cancer de sân din regiunea Transilvania şi să stabilească relaţia acesteia cu cancerul mamar.

Metode. S-a utilizat un studiu epidemiologic caz-martor, aplicat la 211 paciente, repartizate în 2 loturi, cu cancer mamar, spitalizate în Institutul Oncologic „Ion Chiricuţă" din Cluj-Napoca, cu vârsta medie de 53,02 ± 9,40 ani. Estimarea activităţii fizice s-a făcut pe baza unui chestionar, care a analizat efortul fizic ca durată, frecvenţă şi intensitate. Rezultatele obţinute au fost exprimate sub forma mediei aritmetice şi au fost comparate cu ajutorul testului statistic ANOVA. Probabilitatea apariţiei cancerului mamar în funcţie de nivelul activităţii fizice s-a estimat prin calcularea lui odd ratio. S-au considerat semnificative statistic rezultatele a căror valoare $p<0,05$.

Rezultate. Pacientele cu cancer mamar au avut un nivel al activităţii fizice profesionale şi extraprofesionale semnificativ mai mare decât lotul martor (p=0,004, respectiv p=0,001). Efortul fizic profesional a reprezentat un factor de protecţie pentru femeile cu neoplasm (OR=0,48; p=0,002). Rezultatele obţinute au arătat un nivel scăzut al activităţii fizice totale pentru ambele loturi, deşi mai crescută ca durată pentru femeile cu cancer mamar (p=0,03).

Concluzii. Rezultatele studiului sunt importante, deoarece activitatea fizică reprezintă un factor de protecţie al cancerului mamar, ce poate fi augmentat prin adoptarea unui stil de viaţă mai activ.

Cuvinte cheie: cancer mamar, activitate fizică, risc, protecţie.

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Introduction

Epidemiological studies have shown that physical activity protects against colon, breast and endometrial cancers (Kruk, 2007; Sizer & Whitney, 2003). Breast cancer is the most frequent cancer in women worldwide. The incidence of breast cancer increases with industrialization and urbanization and with the possibilities of detection. Some risk factors for breast cancer act early in life, most of which are related to reproductive events. Risk is increased by an early onset of menarche, nulliparity, late natural menopause and late age at first birth. On the other hand, it is estimated that 30-40% of breast cancer cases can be prevented by a healthy lifestyle (Lahmann PH, Friedenreich C, Schuit et al., 2007; ***, 2007). A healthy lifestyle is characterized by a healthy diet, moderation in alcohol consumption and a proper physical activity level. A healthy lifestyle prevents obesity, another risk factor for breast cancer. About 15% of breast cancer cases are thought to be hereditary, resulting directly from gene defects. However, the majority of breast cancer risk factors are not known.

This study is part of a wider research on the relationship between breast cancer and associated dietary factors, carried out at the Department of Environmental Health in collaboration with the „Ion Chiricuţă" Cancer Institute Cluj-Napoca (Năsui, 2007).

The aim of this study was to estimate the level of physical activity in patients with breast cancer and to evaluate the risk of breast cancer depending on the physical exercise performed.

Hypothesis

Many epidemiological studies have shown the possible protective effect of physical activity against breast cancer. The present study aims to highlight the relationship between exercise and breast cancer risk in women in Transylvania.

Materials and methods

To achieve this aim, we performed an epidemiological case-control study.

Research protocol

a) *Period of research*. The study was conducted in the period 2003-2007 and included patients with a histopathological diagnosis of breast cancer, hospitalized at the "Ion Chiricuță" Cancer Institute Cluj-Napoca.

b) *Subjects and groups.* The investigated group consisted of 211 patients with breast cancer. The mean age of women with breast cancer was 53.02 ± 9.40 years. The control group consisted of 207 women selected from the same geographic area as the women with cancer, without the studied pathology, with a mean age of 55.3 ± 10.01 years ($p>0.05$).

c) *Test applied*

The assessment of the physical activity performed by the investigated subjects was based on the questionnaire interview method. The questionnaire was developed by the Temple University Institute for Survey Research, USA in collaboration with the U.S. National Cancer Institute for research in biomedical, epidemiological and behavioral risk factors of breast cancer. The questionnaire was adapted to Romania. The questionnaire was applied according to the medical research ethics regulations (Article 19 of the Law on patient rights no. 46/2003).

On the basis of the questionnaire, both occupational and recreational physical activity was analyzed. Quantification was done in terms of exercise duration, frequency and intensity (hours per week and months per year, which were then converted to minutes per day). Questions were formulated for the investigation of the physical activity level.

Depending on intensity, physical activity was classified into three categories:

- light (intellectual work, sedentary, automated);
- moderate (light industry, walking, gardening);
- vigorous (construction and other industries, digging).

Depending on the type of physical activity performed, the following categories were obtained:

- occupational (at work);
- extra-professional or recreational (leisure).

d) *Statistical proccessing*

The results were expressed as arithmetic means, and the ANOVA test was used for the comparison of the recorded average values. The probability of breast cancer depending on the level of physical activity was estimated by calculating the odds ratio (OR). Statistical analysis was performed using Microsoft Excel 2000 and EpiInfo version 3.3.2. We considered results with a value of $p<0.05$ as statistically significant.

Results

The results showed that the percentage of cancer patients who reported to perform an activity requiring physical effort at work was higher (30.04%) than that of control subjects (16.99%). It appears that physical activity during work carried out by the group with cancer was significantly higher than that of control patients (mean value 7.46 hours/day to 5.54 hours/day) (Table I).

Table I

Mean duration of occupational physical activity.

Occupational physical activity			Mean hours/day ± SD	p
Cases	No.	67	7.46 ± 3.27	0.004
	%	30.04		
Controls	No.	35	5.54 ± 2.97	
	%	16.99		

Depending on professional physical activity, the probability of breast cancer was assessed by calculating the OR. It was found that patients who performed intense physical exercise at work were protected against breast cancer (OR = 0.48, p = 0.002), while the lack of exercise was a risk factor (OR = 2.1) (Table II).

Table II

Odds ratio and occupational physical activity.

Physical activity	OR	95% CI	p
No	2.1	1.29-3.42	0.002
Yes	0.48	0.29-0.78	0.002

The study also examined extra-professional activity. This analysis revealed that patients with breast cancer performed more exercise during leisure time than women in the control group (102 patients vs. 79 controls). It was

also noted that in both studied groups, there were women who performed several types of physical activities of different intensity (Table III).

Table III
Patient distribution depending on physical activity intensity.

Physical activity	Cases	Controls
Light intensity	1	6
Moderate intensity	49	43
Vigorous intensity	52	30
Total	102	79

By quantifying the duration of exercise performed, the study showed that cancer patients had a significantly longer duration of recreational physical activity compared to subjects in the control group (mean value 12.55 min/day vs. 6.43 min/day). However, the achieved level of physical activity was much lower than the recommendations for a healthy lifestyle (minimum 30 minutes of moderate exercise per day) (Table IV).

Table IV
Duration of recreational physical activity.

Extra-professional physical activity	Cases	Controls	p
Mean ± SD min/day	12.55 ± 16.51	6.43 ± 5.18	0.001

Similarly, the relationship between extra-professional physical activity and the probability of breast cancer risk was estimated by calculating the odds ratio. The results showed that leisure exercise provided a possible protection against the risk of breast cancer and also, the lack of protection for sedentary patients, p-value being at the limit of statistical significance (Table V).

Table V
Odds ratio and recreational physical activity.

Extra-professional physical activity	OR	95% CI	p
No	2.1	1.29-3.42	0.05
Yes	0.12	0.01-1.04	0.057

The duration of total physical activity was estimated for the subjects of both groups, by adding up exercise performed at work and leisure physical activity. In this way, the results of the study revealed a more active life-style in the case of patients with breast cancer compared to women in the control group (p=0.03). However, observations showed that the exercise duration was reduced, being shorter than the current recommendations (Table VI).

Table VI
Total physical activity duration.

Physical activity (min/day)	Cases	Controls	p
Total	19.67 ± 21.87	14.21 ± 14.83	0.03

Discussion

With industrialization, urbanization and automation, the population has become increasingly sedentary. Like obesity and overweight, sedentary lifestyle has become common in high income industrialized countries. This lifestyle is now common in most countries. Most people living in industrialized countries and other urban settlements present habitual physical activity levels below those to which the human species is adapted. Sedentary behaviors such as watching television, using the computer, etc. are among others a cause for weight gain, overweight and obesity, which are in turn risk factors for breast cancer (McCullogh et al., 2012; Fair & Montgomery, 2009). Another study performed on the same population group showed that obesity was a risk factor for breast cancer patients (Năsui et al., 2007).

Like other studies (Friedenriech & Cust, 2008; Friedenreich, 2011), the present research shows that women in Transylvania had a reduced duration of both professional and recreational physical activity. Patients with breast cancer reported a significantly longer duration of daily physical activity compared to control women. This activity consisted of moderate or high intensity exercise (49 and 52 cases). Some of the patients surveyed were non-responders or denied any physical activity performed. The causal relationship between breast cancer and the physical activity performed was analyzed by calculating the ORs. The risk rate showed the protective effect of both professional and recreational physical activity. In contrast, the lack of exercise was a risk factor for patients with cancer (OR = 2.1, p=0.002). It is possible that this risk factor could aggregate to other factors not accounted for in this study (genetic, hormonal, etc.)

This study reveals the need for an active lifestyle. It is recommended to perform moderate physical activity (e.g. brisk walking) for at least 30 minutes every day. As fitness improves, the aim should be to perform 30 minutes of vigorous physical activity or 60 minutes of moderate physical activity (Ionuţ et al., 2004; ***, 2007). Another major goal of cancer prevention would be to halve every ten years the numbers of sedentary population. A sedentary lifestyle is characterized by a PAL (physical activity level) of 1.4 or less. PAL expresses an average intensity of the daily exercises performed. It is calculated as a percentage of daily energy intake, a multiple of basal metabolism. On average, moderate physical activity would have a PAL of 1.6. At the beginning of the 21st century, in developed societies the average daily activity reached 20-30% of total energy intake, but it can be even lower than 15% for sedentary people (***, 2007). The results evidence a short duration of exercise performed by women from Transylvania in relation to the recommendations in effect.

On the other hand, the study highlights the need to improve the methods for estimating exercise using standardized methods worldwide. A useful thing today would be including in the physical activity questionnaire items to estimate the number of hours spent watching TV, using the computer, and the means of transport used, knowing that most people prefer traveling by car rather than using a bike or walking. The existence of bias of history is also possible, patients with breast cancer knowing the information related to the disease (Bernstein et al., 2005; Johnson-Kozlow et al., 2007).

Plausible biological mechanisms have been identified

by which physical activity exerts a protective effect against mammary carcinogenesis. Physical activity appears to decrease the production of estrogen, resulting in lower levels of circulating estrogen (Irwin et al., 2005; Irwin et al., 2009; Irwin, et al., 2011).

Conclusions

1. The average level of occupational physical activity in patients with breast cancer is significantly higher than in the control group (p=0.004).

2. The probability of the development of breast cancer in relation to the occupational physical activity performed shows the protective effect of the latter (OR = 0.48, p=0.002) and also, the possibility of increased cancer risk in its absence.

3. The quantification of total physical activity shows low levels in both groups, although women with cancer reported significantly higher physical exercise levels compared to controls (p=0.03).

4. The study reveals the importance of adopting an active lifestyle for the prevention of breast cancer in women in Transylvania.

Conflicts of interest

There are no conflicts of interests.

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