Introduction

The role of physical activity in malignant tumour aetiology has been the topic of many research studies. In fact, the research indicates that physical effort may contribute to the decrease in the development of breast, colon, prostate and endometrial cancer. What is more, the benefits stemming from an active lifestyle involve lowering the risk of chronic diseases, such as cardiovascular diseases, diabetes, osteoporosis and hypertension [1–4].

Additionally, minimizing the risk of malignant tumours is directly proportional to the intensity of physical activity, although intensive form of exercise is not indicated for patients with cardiovascular disorders [5].

Furthermore, regular and moderate physical activity influences proper weight and BMI within 18.5–25 kg/m². In fact, it is recommended to involve in physical exercise 3 times a week for 30 minutes [5].

The advantages of a healthy lifestyle involving a balanced diet, appropriate physical activity and maintaining proper body weight may contribute to a decrease in the incidence of cancer.

Aim

The aim of the paper was to assess the influence of physical activity associated with domestic duties, pro-
fessional work, as well as with the recreational activities on an increase or a decrease in breast cancer odds ratio in women.

Material and Methods

The research was conducted among the patients of the Gynaecology and Maternity Teaching Hospital at Poznan University of Medical Sciences between 2011 and 2013. It involved healthy subjects (n = 683), not diagnosed with breast cancer, as well as patients with breast cancer (n = 167) diagnosed on the basis of the histopathological examination. The research in total included 850 women aged 21–84.

The questionnaire was based on questions assessing physical activity in professional work and leisure time. The patients were asked to choose forms of physical activity which they had been involved in prior to the breast cancer diagnosis. A given unit of physical effort was assigned to a physical activity form, whereas in order to assess the intensity of the activity, a metabolic equivalent in MET units (Metabolic Equivalent of Task) was attributed to it.

Estimated physical activity was presented in MET units, as a value of the following parameters: MET value, number of days in a week when the activity was performed, and the activity duration in minutes per day. Additionally, MET coefficient facilitated the division of patients into 3 groups in terms of physical activity: low (under 600 MET), moderate (600–1500 MET) and high (more than 1500–3000 MET) [6].

The assessment of physical activity in professional work was attempted on the basis of a modified Freidenreich’s questionnaire [7].

The odds for developing breast cancer were calculated when the risk factor was present:

\[
Odds\ ratio_{positive} = \frac{a}{a + c} \frac{b}{b + d}
\]

In addition, it was also calculated when it was absent:

\[
Odds\ ratio_{negative} = \frac{b}{b + d} \frac{c}{c + d}
\]

By means of logistic regression model, odds ratio (OR) as a relative risk was calculated within its confidence intervals (CI) at 95%.

\[
OR = \frac{a \times d}{c \times b}
\]

Statistical analysis

The calculations were performed using StatSoft, Inc. STATISTICA Version 10.

Odds ratio (OR) with confidence intervals at 95% was established by means of logistic regression model. The odds ratio relevance was verified with a test where statistical hypotheses were the following: \( H_0: OR = 1 \), \( H_1: OR \neq 1 \). Moreover, Wald test statistics was established which is characterized by asymptotic distribution \( \chi^2 \) with first degree freedom. On the basis of \( p \) value compared with relevance level \( \alpha = 0.05 \) the following decision was made: if \( p \leq \alpha \), \( H_0 \) was rejected, whereas \( H_1 \) was accepted. On the other hand, if \( p > \alpha \) there was no ground to reject \( H_0 \).

The research was approved by the Poznan University of Medical Sciences Ethical Board.

Results

35.4% of the subjects diagnosed with breast cancer went for a walk daily, 11.4% took a stroll once a week,
and 17.7% did not undertake it at all. The majority of the patients (81%) did not go to the swimming pool, 11.4% went to the swimming pool less frequently than once a month, whereas 3.8% went for a swim once a week. More than a half of subjects (50.6%) did not ride a bicycle at all, 16.4% rode a bike 3 times a week, and 10.1% participated in this activity every day.

Nearly half of the subjects with no change in the reproductive organs (40.6%) did not ride a bicycle, 11.2% participated in this activity once a week, and 9.3% took part in it six and more times a week. However, 15.8% of the patients went for a walk every day, 13.4% did so once a week, whereas 10.4% went for a walk less frequently than once a month. 23.8% of patients did not take part in such an activity at all.

Increased physical effort during household duties and physical activity in patients with breast cancer presented as follows: 1102.61 MET for passive rest, 3803.47 MET for household duties, and 1971.54 MET for physical activity. However, in the patients with no change in breasts the results were: 1024.05 MET for passive rest at home, 4150.97 MET for household duties, and 1651.46 MET for sports activities.

Professional work analysis in the studied groups, revealed the following results: the average number of hours per week in the breast cancer patients was estimated at 19.9 hours. On the other hand, in subjects with no change in breast it was 31.9 hours.

The average MET value during household duties was the following: the highest value of 1297.5 MET was attributed to patients with no change in breast in the course of preparing meals, whereas in subjects diagnosed with breast cancer this value was 799.4 MET. Detailed data is presented in Figure 1.

What is more, the influence of physical activity on an increase or a decrease in developing breast cancer odds ratio was also analysed.

Subjects assessing their sports activities between 600–1500 MET daily have 1.29 times higher odds ratio for developing breast cancer, where OR = 1.29; 95% CI 0.68–2.44. On the other hand, participating in sports activities above 1500 MET daily indicated a 1.72 increase in the risk of developing cancer, where OR = 1.72; 95% CI 0.99–2.98, as compared to patients undertaking little physical activity. The results are presented in Table 2.

<table>
<thead>
<tr>
<th>Sports activities</th>
<th>Odds Ratio</th>
<th>Confidence Intervals</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>600–1500 MET</td>
<td>1.29</td>
<td>0.68–2.44</td>
<td>p = 0.4378</td>
</tr>
<tr>
<td>≥ 1500 MET</td>
<td>1.72</td>
<td>0.99–2.98</td>
<td>p = 0.0537</td>
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Table 2. Odds ratio for breast cancer development on the basis of physical activity

Moderate physical effort during household duties decreases the risk of breast cancer development. The odds ratio equals to OR = 0.52; 95% CI 0.06–4.53 in comparison with low physical effort.

On the other hand, in subjects participating in passive rest of 600–1500MET daily the risk is increased. Odds ratio for developing breast cancer is OR = 1.51; 95% CI 0.81–2.81, whereas in patients characterized by passive rest higher than 1500MET the odd ratio was elevated to OR = 1.33; 95% CI 0.65–2.72. The data is shown in Table 3.

What is more, the influence of physical effort associated with professional works on the odds ratio increase was also analysed. In these calculations the...
following time spans were established: up to 10 hours of physical effort a week, 20–30 hours per week, and more than 30 hours per week.

**Discussion**

The role of physical activity in the cancer aetiology has been a subject of numerous research. In fact, it was proven in a number of analyses that regular participation in physical exercise has a substantial influence on lowering morbidity rates due to chronic diseases and cancer [8–14].

Furthermore, there are more data suggesting that in order to lower the risk of breast and colon cancer development, physical effort is optimal when it is performed 45–60 minutes at least 5 times a week. In addition, physical activity may reduce the risk of breast cancer by decreasing the time endogenous steroids affect breast gland epithelial cells, as well as by controlling a woman’s weight throughout her life [8].

What is more, Henderson et al. suggest that physical activity presents beneficial influence on breast cancer development also in terms of decreasing insulin and insulin-like growth factor (IGF-1) concentration level. It is the IGF which stimulates cell division, slows cell death and decreases glucose level, at the same time increasing hormone binding globulin concentration. Another physical effort defensive mechanism type is enhancing the immune system where regular and moderate physical activity may decrease the risk of breast cancer development by active enzyme regulation, which possess the properties of free radicals inhibitors, as well as by an increase in biogenic antioxidants [9].

The majority of research papers indicates a decrease in the risk of breast cancer development reaching 10–60% in women who are physically active as compared to those who rarely participate in physical effort [15–17].

In our research, moderate physical effort during household duties decreased the risk of developing breast cancer. The odds ratio was OR = 0.52; 95% CI 0.06–4.53 as compared to low physical activity.

Similar results were obtained by Kruk J. who observed a decrease in breast cancer development in women declaring moderate physical effort associated with household duties and work in the garden. Additionally, the research indicated that 50% decrease in developing of breast cancer was presented in women participating in moderate physical activity in comparison to those who remained inactive [16].

In the course of analysis, it is clear that not all of the authors present the protective influence of physical activity on the development of malignant tumours. Research by Dosemeci et al. is a suitable example where the protective influence of increased physical effort on the relative risk of breast cancer development was not observed. In the group of women with high activity, the relative risk was estimated at 1.4 as compared with patients characterised by low physical activity which was confirmed in our study. An increase in breast cancer development is visible in patients with physical activity established at 1500 MET when compared to subjects with low physical activity [18, 19].

Regular physical effort contributes to a decrease in the risk of breast cancer development by means of hormonal regulations, and an increase in the immune system function. However, intense physical activity may contribute to a delayed first menstruation, as well as primary or secondary amenorrhea. Furthermore, the production of steroid hormone binding globulin increases, thus decreasing oestrogen function [11, 20–22].

As far as prevention is concerned, three 30-minute intensive units of training are sufficient to reduce the risk of breast cancer development by half [12].

Therefore, physical effort should be one of the basic elements of a healthy lifestyle. What is more, in the course of health education, the importance of positive health behaviours should be stressed, particularly in terms of a proper diet, stimulants avoidance, as well as participation in regular physical activity.

**Conclusion**

1. In order to decrease the risk of breast cancer development in women, active lifestyle should be emphasised which can be expressed by participating in physical effort within moderate physical activity of 600–1500 MET.
2. Moderate and high physical effort associated with household duties decreases the risk of breast cancer development.

### Table 3. Odds Ratio for the breast cancer development on the basis of the declared passive rest

<table>
<thead>
<tr>
<th>Passive rest</th>
<th>Odds Ratio OR</th>
<th>95% Confidence Intervals</th>
<th>Level of significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>600–1500 MET</td>
<td>1.51</td>
<td>0.81–2.81</td>
<td>p = 0.1968</td>
</tr>
<tr>
<td>≥ 1500 MET</td>
<td>1.33</td>
<td>0.65–2.72</td>
<td>p = 0.4416</td>
</tr>
</tbody>
</table>
3. The promotion of increasing physical activity should be aimed at women presenting low physical activity, i.e. below 600 MET, especially in their spare time.

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References

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