Original paper

Cancer prevention awareness among young adult Polish females on the basis of the assessment of knowledge and health behaviours

Świadomość młodych, dorosłych Polek w zakresie profilaktyki nowotworów – na podstawie oceny wiedzy i praktyk zdrowotnych

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Abstract

Introduction: The accelerating rate of incidence of malignant cancers in Polish women as compared to men and the higher mortality due to these diseases as compared to other regions in Europe is an important medical and social problem.
Aim of the research: To attempt an assessment of cancer prevention awareness among young adult Polish females on the basis of the analysis of their knowledge as well as of the prevalence of negative health behaviours.
Material and methods: The study was conducted in 270 young Polish females: students of nursing and pedagogy. The study was conducted using a proprietary questionnaire, the Inventory of Health Behaviour, the Fagerström Test for Nicotine Dependence, and Nina Schenider's Motivation for Quitting Smoking Test.
Results: The highest percentages of negative behaviours included low intake of fruit and vegetables (76.3%), whole-grain products (78.9%), and fish (93.3%), as well as tanning (56.7%) and smoking (37%) and health check behaviours (breast self-exams 60.7%, cervical cytological screening 36%).
Conclusions: Despite the relatively high level of knowledge, cancer risk-related lifestyles and behaviours unfavourable for the possibility of early diagnosis were observed among the subjects. The less favourable model of cognitive and behavioural competence in health and cancer prevention was observed at bachelor-level students of pedagogy at the ages below 24 years. Development of skills and motivation for pro-health behaviours and the awareness of behaviour models presented by educators are, along with appropriate knowledge, the most desirable strategies for the success of health education in the area of cancer prevention.

Streszczenie

Wprowadzenie: Przyspieszenie tempa wzrostu zachorowań na nowotwory złośliwe u kobiet w Polsce w porównaniu z mężczyznami oraz wyższa niż w innych regionach Europy umieralność z ich powodu stanowi poważny problem medyczny i społeczny.
Cel pracy: Próba oceny świadomości młodych, dorosłych Polek w zakresie profilaktyki nowotworów na podstawie analizy poziomu wiedzy i rozpowszechnienia negatywnych zachowań zdrowotnych.
Materiał i metody: Badaniami objęto 270 młodych Polek, studentek pielęgniarstwa i pedagogiki. Do badań wykorzystano kwestionariusz własnego autorstwa, kwestionariusz IZZ, Test uzależnienia od tytoniu Fagerströma oraz Test motywacji do zaprzestania palenia według Niny Schneider.
Wyniki: Negatywne zachowania dotyczyły głównie nawyków żywieniowych – niskiego spożycia warzyw i owoców (76,3%), produktów pełnoziarnistych (78,9%) oraz ryb (93,3%). Problem stanowiły również zachowania związane z opalaniem się (56,7%), paleniem tytoniu (37%), a także kontrolą zdrowia (samobadanie piersi – 60,7%, badanie cytologiczne – 36%).
Wnioski: U badanych kobiet, mimo dosyć wysokiej wiedzy, obserwowano onkologicznie ryzykowne cechy stylu życia oraz zachowania niesprzyjające wczesnej diagnostyce. Mniej korzystny model kompetencji poznawczych i behawioralnych w zakresie zdrowia i profilaktyki onkologicznej dotyczył studentek pedagogiki na poziomie licencjackim, w wieku poniżej 24 lat. Kształcenie umiejętności i motywacji do prozdrowotnych zmian oraz świadomości wzorów zachowań prezentowanych przez edukatorów to obok wiedzy pożądane strategie edukacji zdrowotnej skutecznej w profilaktyce nowotworów.

Introduction

Malignancies are among the most serious health problems worldwide and also specifically in Poland; epidemiological data suggest a continuous increase in cancer incidence rates and cancer-related mortality [1–5]. According to the GLOBOCAN (IARC) data, a total of 14,067,894 new cases of cancer were recorded worldwide in 2012 (ASR $182.0/10^5$) together with 8,201,575 deaths due to cancer in male and female patients combined (ASR $102.4/10^5$) [2]. In the female population, the incidence and mortality were lower, amounting to $165.2/10^5$ and $82.9/10^5$, respectively. In this group, the most common cancers were breast cancer ($43.1/10^5$) and colon cancer ($14.3/10^5$). Breast cancer was also the most common cause of cancer-related deaths ($12.9/10^5$) while the second most common cause was lung cancer ($11.1/10^5$). Higher risk of cancer was observed among the residents of areas characterised by better economic development ($239.9/10^5$ and $86.2/10^5$, respectively) as compared to women residing in less developed regions ($135.8/10^5$ and $79.8/10^5$, respectively) [2].

In Poland, the cancer incidence rate was $205.6/10^5$ and was higher than that for the overall global population as well as that for other 10 countries within the Central and Eastern Europe region ($193.5/10^5$). On the other hand, it was lower than the rates for the entire Europe ($225.5/10^5$) or the European Union ($241.4/10^5$) [2]. In Polish women, breast cancer ($51.9/10^5$) and colon cancer ($18.2/10^5$) were reported most frequently. The following most common cancers included lung cancer ($17.1/10^5$), endometrial cancer ($15.1/10^5$), ovarian cancer ($10.8/10^5$), and cervical cancer ($8.9/10^5$) [5]. In the case of mortality, the ratio was at the level of $100.0/10^5$ and was higher not only as compared to the worldwide and Central and Eastern European values ($91.6/10^5$) but also as compared to the values obtained for the entire Europe ($87.6/10^5$) and the European Union ($86.1/10^5$) [2]. The analysis of the causes of deaths in the female population in Poland revealed that lung cancer was the most prevalent reason ($16.4/10^5$). Breast cancer was the second most common cause of death ($14.1/10^5$). The other most common cancers included colon cancer ($10.6/10^5$), ovarian cancer ($6.4/10^5$), pancreatic cancer ($5.2/10^5$), and cervical cancer ($4.8/10^5$) [5].

In Poland, similar as in the entire world, the highest cancer incidence and mortality rates are observed in the male population. However, the analysis of these values in individual age groups suggests that young and middle-aged women are at higher risk of cancer as compared to their male counterparts. The incidence in young women (20–44 years old) is nearly two-times higher than in the group of young Polish males. Peak incidence is also earlier, as it occurs in the age group of 50–79 years (55–79 years in males). In addition, acceleration of the incidence rate growth is observed within the last decade in females as compared to males [5].

It is pointed out that the high risk of malignancies in Poland is associated, among other factors, with the changes in the age structure and the aging of society [1, 6] as well as by high exposure to risk factors [4, 6]. Among the risk factors, high importance is ascribed to lifestyle and negative health behaviours. These include smoking, improper nutrition, alcohol consumption, obesity, or lack of physical activity [7–10]. High mortality rates associated with malignant tumours in Poland as compared to other European countries [2] are also caused by limitations in secondary prevention strategies. Delays in the introduction of population-wide programs for early diagnostics and treatment of cancer and limited response from target groups are particularly highlighted [4]. Educational strategies are listed along with effective diagnostic, therapeutic, economic, and logistic measures as the elements required for the improvement of cancer incidence and mortality rates [1]. Role models are also important in the propagation of proper attitudes. Therefore, health competences obtained by students of health- or education-related specialties are particularly important because they not only contribute to their own health but may also influence pro-health choices of individuals around them.

Aim of the research

The objective of this study was to attempt an assessment of cancer prevention awareness among young adult Polish females on the basis of the analysis of their knowledge as well as of the prevalence of negative health behaviours.

Material and methods

The study was conducted in 2014 in a group of 270 young female students within the Świętokrzyskie Province: 135 students of nursing (group I) and 135 students of pedagogy – early school and pre-school education (group II). The mean age of subjects was 23.4 years (SD = 2.19). The study group was characterised by prevalence of rural residents (63%), second-degree students (60.7%), and unmarried subjects (89.3%).

Study material was gathered by means of a diagnostic survey. The knowledge of issues related to cancer, risk factors, and health behaviours specific to cancer prevention was tested using a proprietary questionnaire that was also analysed as part of the measurement strategy. Depending on the correctness of the results, knowledge was assessed in the score range of 0–15, and health behaviours were assessed in the score range of 0–40. The higher the results, the better the desirable cancer prevention knowledge and behaviours. The accuracy of scales was assessed by determination of correlation with the Inventory of Health Behaviour (knowledge:

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$r = 0.48$; $p < 0.000$; behaviours: $r = 0.53$ and $p < 0.001$). Smoking behaviours were assessed using the Fagerström Test for Nicotine Dependence and Nina Schenider's Motivation for Quitting Smoking Test; both recommended by the National Health Fund for use in prophylactic investigations of nicotine-related disorders. The dependence test consists of six scored questions, with the answers determining the dependence as small (0–3 points), moderate (4–6 points), or strong (7–10 points). The motivation test consists of 12 questions with two alternative answers "yes" or "no". A majority of positive answers ("yes") (> 6) indicates motivation to quit smoking whereas a majority of negative answers ("no") indicates no motivation [11]. The overall model of health behaviours was assessed using the Inventory of Health Behaviour. The 24-question inventory assesses the overall intensity of pro-health behaviours within four categories including proper dietary habits, prevention activities, practical health behaviours, and positive mental attitudes. Subjects provide their answers using a five-point scale to obtain the total score in the range of 24–120 points; 6–30 points per category. The higher the score, the higher the intensity of health behaviours [12].

Completion of the survey was entirely voluntary, and all responders agreed to participate in the study. Before starting the survey all students were informed on the study objective, confidentiality of data to be used only for research purposes, and the possibility to refuse completion of the survey and of withdrawal from the study at any time. The surveys were taken by a trained pollster. Questionnaires were collected in sealed envelopes preventing personal identification of the responders.

Statistical analysis

The collected material was subjected to statistical analysis using the χ^2 test of independence, Mann-Whitney test, and Kruskal-Wallis test. The use of non-parametric tests was caused by non-normal distribution of variables as verified using the Kolmogorov-Smirnov test. Inter-variable correlations were examined using the Spearman correlation test.

Results

Subjects' knowledge of cancer prevention was analysed within three domains including the knowledge of risk factors, understanding the importance of early detection, and readiness for self-examination of health status, which indicate high awareness levels. The lowest percentage of correct answers were provided in the self-examination domain (89.3% to 74.1%). Knowledge deficits were observed more often in pedagogy students ($p < 0.05 – p < 0.001$) (Table 1).

Table 1. Cancer Prevention Knowledge – distribution of positive (P) and negative (N) responses in the overall population and per field of study

Cancer Prevention Knowledge	Group I Nursing		Group II Pedagogy		P-value	Overall	
	P (%)	N (%)	P (%)	N (%)		P (%)	N (%)
Development of cancer may be associated with:							
Lifestyle (diet, smoking)	100.0	0.0	99.3	0.7	NS	99.6	0.4
Alcohol consumption	100.0	0.0	98.5	1.5	NS	99.3	0.7
Exposure to sunlight	94.8	5.2	66.7	33.3	< 0.001	80.7	19.3
Hereditary factors	96.3	3.7	37.0	63.0	< 0.001	66.7	33.3
Early detection of cancer:							
Increases the chance for curing	100.0	0.0	100.0	0.0	NS	100.0	0.0
Depends on systematic examinations	100.0	0.0	98.5	1.5	NS	99.3	0.7
Is possible thanks to examinations such as:							
cervical cytological screening	100.0	0.0	92.6	7.4	< 0.01	95.6	4.4
Breast self-exam	100.0	0.0	95.6	4.4	< 0.05	97.8	2.2
Preparation for health checks:							
Breast self-examination technique	97.0	3.0	81.5	18.5	< 0.001	89.3	0.7
Breast self-examination time points	88.1	11.9	55.5	44.5	< 0.001	71.9	28.1
Cervical cytology time points	92.6	7.4	55.5	44.5	< 0.001	74.1	25.9

Table 2. Cancer Prevention Behaviours – distribution of positive (P) and negative (N) habits in the overall population and per field of study

Cancer Prevention Behaviours	Group I Nursing		Group II Pedagogy		P-value	Overall	
	P (%)	N (%)	P (%)	N (%)		P (%)	N (%)
Fruit and vegetables[1]	30.4	69.6	17.0	83.0	< 0.001	23.7	76.3
Whole grain bread and cereal products[1]	25.2	74.8	17.0	83.0	< 0.001	21.1	78.9
Fish[2]	10.4	89.6	3.0	97.0	< 0.01	6.7	93.3
Red meat[3]	98.5	1.5	95.6	4.4	NS	97.0	3.0
Fast food[4]	85.9	4.1	40.0	60.0	< 0.001	63.0	37.0
Hot spices[4]	43.7	56.3	20.6	79.4	< 0.001	31.9	68.1
Alcohol[4]	93.3	6.7	98.5	1.5	< 0.05	95.9	4.1
Sunbathing and solarium tanning	55.5	44.5	31.1	68.9	< 0.001	43.3	56.7
Physical activity	70.4	29.6	90.4	9.6	< 0.001	80.4	19.6
Smoking – active	72.6	27.4	53.3	46.7	< 0.01	63.0	37.0
Smoking – active or history	65.2	34.8	51.1	48.9	< 0.05	58.1	41.9
Systematic cervical cytological screening	94.7	5.3	33.6	66.4	< 0.001	64.0	36.0
Systematic breast self-examination	66.2	33.8	12.7	87.3	< 0.001	39.3	60.7

[1]Every day, [2]more than 1 time a week, [3]1 time a week or less, [4]less than 1 time a week.

In the case of the analysis of cancer prevention behaviours (Table 2), a large proportion of the subjects were shown to present behaviours that had an impact on their health. The largest percentage of negative behaviours was associated with the intake of protective products. Recommended quantities of fruit and vegetables, whole grain bread and cereal products, and fish were eaten by as few as 23.7%, 21.1%, and 6.7%, respectively. Improper behaviours were more seen often in pedagogy students ($p < 0.001 – p < 0.05$).

Exposure to the carcinogenic effects of tobacco smoke (Table 2 and Figure 1) were a significant problem in the subject group. More than 1/3 of students (37%) were active smokers, with the percentage being statistically higher in the group of pedagogy students ($p < 0.01$).

Extended assessment of smoking behaviours using the Fagerström Test for Nicotine Dependence and Nina Schenider's Motivation for Quitting Smoking Test (Figure 2) revealed a predominance of subjects with low level of nicotine dependence (60%) and subjects with motivation to quit smoking (92%).

Subjects' knowledge of cancer prevention was analysed as part of the measurement strategy. It con-
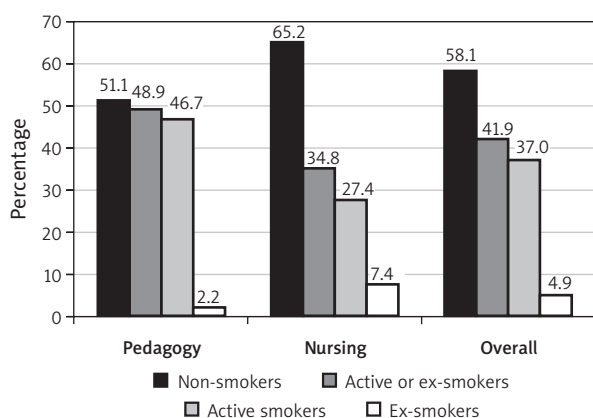
Figure 1. Smoking in the overall population and per field of study
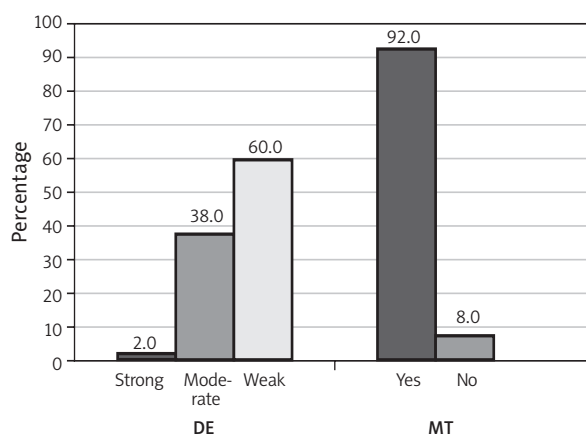
Figure 2. Level of nicotine dependence (DE) and motivation (MT) to quit smoking in the tested student population

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firmed a high level of awareness in the entire population of subjects (x = 12.55 in a 0–15 scoring range). The model of health behaviours was less favourable (x = 25.1 in a 0–40 range) – Figure 3 and Table 3.

As shown by the data in Table 3, the level of cancer prevention knowledge and behaviours was statistically higher in nursing students as compared to pedagogy students ($p < 0.001$), as well as in second-degree students ($p < 0.001$) and residents of small urban and rural areas ($p < 0.05$). It was also associated with the age of the subjects ($p < 0.001$).

The assessment of the overall model of health behaviours using the Inventory of Health Behaviour (Table 4) indicates moderate intensity of these behaviours (x = 82.2) in the subject group, with the results being statistically higher in nursing students ($p < 0.001$), second-degree students ($p < 0.001$), older subjects ($p < 0.05$), and married subjects ($p < 0.01$). The lowest average score was obtained in the category of practical health behaviours (x = 18.6).

Discussion

In the face of the risk of cancer diseases that are determined by largely controllable risk factors, the role of awareness of health-related issues in society becomes increasingly important [1, 8, 13–16]. This is a serious challenge for preventative activities because one of their objectives is to prevent the development of unfavourable models of social behaviours. This article presents the results of a study carried out in order to attempt to assess the awareness of cancer risk factors and prevention and the model of dominant behaviours in light of pro-health attitudes and cancer prevention in a group of young Polish females.

The knowledge of selected aspects of the etiology and early detection of cancer in the study group was relatively high (x = 12.55, score range of 0–15). As could be expected, higher level of awareness was presented by nursing students (group I) as compared to pedagogy students (group II), with scores of x = 13.6 and x = 11.5, respectively; $p < 0.001$. In contrast to the high knowledge scores, significant shortfalls were demonstrated with regard to cancer prevention behaviours. The average score of x = 25.1 (score range of 0–40) is indicative of moderate level of behaviours, with higher shortfalls being observed in pedagogy students (x = 28.4 and x = 21.9 for nursing and pedagogy students, respectively; $p < 0.001$).

The vast majority of students were aware of the contribution of lifestyle, i.e. smoking and diet (99.6%) or alcohol consumption (99.3%) to the aetiology of cancer diseases. A lower percentage, i.e. 80.7% of subjects (94.8% in group I and 66.7% in group II; $p < 0.001$) related the risk of malignancy to the exposure to ultraviolet radiation. Lower importance was also ascribed to genetic predisposition to cancer diseases (66.7%).

Table 3. Cancer prevention knowledge and behaviour versus selected variables

| Variable	Knowledge 0–15		Behaviour 0–40	
	Mean	SD	Mean	SD
Nursing	13.6	0.9	28.3	4.4
Education	11.5	1.4	21.9	3.8
	< 0.001		< 0.001	
Studies of 1st degree	11.8	1.5	22.9	4.8
Studies of 2nd degree	13.0	1.4	26.5	5.0
	< 0.001		< 0.001	
Large urban	11.9	1.7	22.3	4.0
Medium urban	11.9	2.0	25.1	4.4
Small urban	12.8	1.5	25.3	5.9
Rural	12.7	1.5	25.7	5.1
	< 0.05		< 0.01	
Age 19–23 years	12.1	1.6	23.7	4.9
Age 24–25 years	12.9	1.4	26.0	5.2
Age above 25 years	13.2	1.6	28.4	4.0
	< 0.001		< 0.001	
Unmarried	12.5	1.6	24.9	5.2
Married	12.9	1.6	26.7	4.8
	NS		NS	
Entire group (N = 270)	12.55	1.56	25.1	5.19
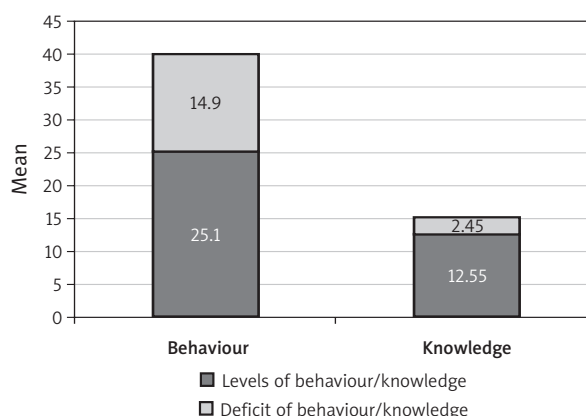
Figure 3. Cancer prevention knowledge and behaviour levels

One of the most important health behaviour-related problems consisted of too low a share of protective food products in the diet, with biologically active components of foods having the potential to reduce

Table 4. Categories of health behaviours according to the Inventory of Health Behaviour versus selected variables

Variable	Dietary habits 6–30		Preventive behaviours 6–30		Mental attitude 6–30		Health behaviours 6–30		Overall index 24–120	
	x	SD	x	SD	x	SD	x	SD	x	SD
Nursing	23.2	2.5	22.2	2.5	22.2	2.8	19.5	2.9	87.0	5.5
Pedagogy	20.4	4.4	18.9	2.3	20.5	2.5	17.6	2.5	77.4	6.8
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
Studies of 1st degree	20.6	4.1	19.3	2.8	21.0	2.5	18.2	2.7	79.1	7.7
Studies of 2nd degree	22.5	3.5	21.3	2.7	21.6	2.9	18.8	2.9	84.2	7.2
	$p < 0.001$		$p < 0.001$		NS		NS		$p < 0.001$	
Large urban	20.5	4.5	20.3	3.2	20.4	2.5	18.3	3.2	79.5	8.3
Medium urban	21.2	3.6	20.1	2.3	21.2	3.5	18.3	2.8	80.8	8.6
Small urban	21.3	4.2	20.9	2.8	22.4	2.8	18.7	3.0	83.3	8.9
Rural	22.3	3.5	20.6	2.9	21.3	2.6	18.6	2.7	82.7	7.2
	NS		NS		$p < 0.05$		NS		NS	
Age 19–23 years	21.2	4.0	19.9	3.0	21.3	2.7	18.5	2.8	81.0	8.1
Age 24–25 years	22.2	3.7	21.2	2.7	21.2	2.7	18.6	3.0	83.1	7.7
Age of above 25 years	22.8	2.8	20.4	2.6	22.2	3.0	18.8	2.0	84.1	4.8
	$p < 0.05$		$p < 0.01$		NS		NS		$p < 0.05$	
Unmarried	21.5	3.8	20.4	2.9	21.3	2.7	18.5	2.8	81.7	7.9
Married	23.9	2.9	21.7	2.8	22.0	2.9	18.8	3.0	86.4	5.8
	$p < 0.01$		$p < 0.05$		NS		NS		$p < 0.01$	
Entire group ($n = 270$)	21.8	3.8	20.5	2.9	21.3	2.7	18.6	2.8	82.2	7.8

the risk of cancer [17–21]. Biopositive compounds include a wide group of polyphenols, polyunsaturated fatty acids, carotenoids, vitamins (D, E, C, folic acid), minerals (Se, Zn, Ca), and dietary fibre [19, 21]. Diets rich in these elements consist mainly of vegetables, fruit, and cereals [21]. It is suggested that the risk of cancer is lower by one half in individuals eating at least five servings of fruit and vegetables a day [19]. This study showed that the recommended quantities of fruit and vegetables were eaten by as few as 23.7% of subjects (30.4% in group I, 17.0% in group II; $p < 0.001$) while whole wheat products were eaten by as few as 21.1% of subjects (25.2%, in group I, 17.0% in group II; $p < 0.001$). Consumption of fish, being an important source of omega-3 polyunsaturated fatty acids, was also very low. Only 6.7% of subjects (10.4% in group I, 3.0% in group II; $p < 0.01$) ate fish more often than once a week. The results confirm low consumption of fruit and vegetables in Poland, particularly among young people. According to a 2010 HBSC study, only 15% of boys and 20% of girls aged 17–18 years ate fruit every day; vegetables were eaten by 15% and 25%, respectively. The data were lower than those obtained in 2002 and 2006 [22]. Deficits of vitamins and deficits in the diet of the residents of Świętokrzyskie Province were pointed out in the results of the pilot PONS study (a Polish-Norwegian project) carried out in 3862 of province's residents aged 45–64. The authors of the study stressed that insufficient intake of these elements should be eliminated by increased consumption of fruit, vegetables and cereals [23].

Some nutrients may have carcinogenic effects and thus initiate or stimulate tumour growth [19]. Diet-related risk factors include high intake of saturated fatty acids, red meat, and alcohol [18–20, 24]. Consumption of red meat (beef, pork, lamb, veal, and mutton) in developed countries is high [25] and is associated with the risk of colon cancer [19, 25]. The obtained results were quite favourable in terms of the aforementioned

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risk factors. As many as 97% of subjects declared very low consumption of red meat, with 63% of subjects (85.9% in group I, 40.0% in group II; $p < 0.001$) avoiding fast food products. Positive alcohol-related behaviours were also declared by 95.9% of subjects (93.3% in group I, 98.5% in group II; $p < 0.05$). Low consumption of alcohol in women was also demonstrated in the pilot PONS study. Only 2% of women drank alcohol more often than one time a week, with drinking patterns being independent of educational status or site of residence [13].

Active smoking or history of smoking was declared by 41.9% of the subjects in our study. At the same time, the review of the literature shows that smoking is considered the main cause of cancer – particularly within the respiratory tract [7, 8], but also within the gastrointestinal, urinary, or genital system [7, 9, 14, 21, 26]. Smoking is estimated to be responsible for about 30% of cancers in individuals above the age of 30 years in highly developed regions [7]. Attempts to assess the relationship between smoking and the risk of cancer in women were made e.g. in relation to colorectal cancer [26, 27]. Gram *et al.* [27] believe that the epidemics of smoking observed in women over the last four decades may explain the significant increase in the global incidence rate of this type of cancer. The results of large prospective studies conducted by the authors in a large cohort of subjects (57,600 women) demonstrate that one in eight cases could have been prevented in Norway every year should the subjects be non-smokers. On the other hand, in the studies consisting of a 15-year follow-up of a large cohort of teachers in California, it was demonstrated that active smokers were at a 30% higher risk of colorectal cancer as compared to women who had never smoked [26]. The impact of smoking is also highlighted in relation to the incidence of cervical cancer. Smoking favours HPV infections which play an important role in the aetiology of this malignancy [14]. It is also suggested that the risk of cancer depends on the intensity and duration of smoking and pertains to passive female smokers as well [14, 26, 28]. Detailed analysis of smoking-related data obtained in this study demonstrated that women who had never smoked comprised 58.1% of the entire population (65.2% of group I and 51.1% of group II; $p < 0.05$). Current active smokers comprised 37% of the study population (27.3% of group I and 46.7% of group II; $p < 0.01$), while ex-smokers comprised 4.9% of the overall population. The percentage of women who had never smoked as reported in the PONS was similar and amounted to 54.5%. The percentage of current active smokers was significantly lower (15%) while the percentage of ex-smokers was significantly higher (30%) [13]. Such a distribution of results may suggest that positive modification of this behaviour can be observed in future in the study population. Considering the low level of dependence among the subjects (60% – low; 38% – moderate; 2%

– high) and readiness to modify this adverse behaviour (92%) there is a high chance that this behaviour would be limited in future.

According to the reports from the WHO, lack of physical activity is the fourth most important risk factor for global mortality (after smoking, alcohol and inappropriate dietary habits). This negative behavior is responsible for about 21–25% of breast and colon cancers [29, 30]. In this study, engagement in sports activities was declared by 80.4% of the overall study population (70.4% in group I, 90.4% in group II; $p < 0.001$). Thus, 2/10 of the overall population and 3/10 of health science students are not engaged in any physical activity. Meanwhile, according to WHO recommendations, adults (18–64 years old) should engage in moderate physical activity for at least 150 min a week or intense physical activity for at least 75 min a week [29]. The results of the pilot PONS study showed that lack of any physical activity lasting more than 10 min a week was declared by 33.3% of subjects. The authors of the study confirm the observation that a large proportion of adult Poles are physically inactive [30].

Behaviours including health checks and self-checks play an important role in cancer prevention [14, 24, 31]. A very positive manifestation of the subjects' knowledge was their declaration that early detection increases the chance of curing (100%) and is associated with undergoing systematic health checks (99.3%). Breast self-exam is an important and simple method of self-examination [31]; however, it is not a screening examination and should not replace mammography [24]. Regular breast exams have a positive impact on the number of diagnostic biopsies [24]. As shown in this study, nearly all students (97.8%) recognized the importance of breast self-checks in the detection of pathological lesions (100% in group I and 95.6% in group II; $p < 0.05$). However, the knowledge of self-examination techniques was declared by only 89.3% of subjects (97.0% in group I and 81.5% in group II; $p < 0.001$), and examination time points could be properly identified by slightly more than 70% of the overall population, mostly nursing students ($p < 0.001$). Breast self-exams should be performed by every woman regularly each month, starting from the age of 20 years [31]. The usefulness of irregular exams is limited [24]. Meanwhile, only 39.3% of subjects declared that they examine their breasts regularly; this was significantly more common in nursing students (66.2% in group I and 12.7% in group II; $p < 0.001$). Cytological cervical screening is recommended for early detection of cervical cancer [14]. As in the case of breast self-exams, the vast majority of subjects (95.6%) were aware of the importance of cervical screenings (100% in group I and 92.6% in group II; $p < 0.01$). However, only 64% of subjects reported regularly for examinations (94.7% in group I and 33.6% in group II; $p < 0.001$). This might be partially due to the subjects' age. According to the data from the National Cancer

Registry, only 27% undergo screening and as many as 40% of cervical cancer cases are diagnosed at an advanced clinical stage [32].

Moderate results were also obtained with regard to the pro-health behaviours model assessed using the Inventory of Health Behaviour ($x = 82.2$, score range of 24–120) ($x = 87.0$ in group I and $x = 77.4$ in group II; $p < 0.001$). The highest deficit of pro-health behaviours was observed in relation to practical health behaviours (physical activity, recreation, sleep and rest, smoking), with the mean score of $x = 18.6$ ($x = 19.5$ in group I and $x = 17.6$ in group II; $p < 0.001$).

In conclusion, it should be pointed out that the group of young Polish female students included in the study was characterised by a relatively high level of health and cancer prevention knowledge as well as a less favourable model of health behaviours. The discrepancy between the knowledge and everyday behaviours indicates that cognitive competence does not warrant pro-health choices being made. As expected, the pursuit of nursing education was the strongest factor determining good preparation as well as actual practice of pro-health behaviours.

Conclusions

Despite the relatively high level of knowledge of cancer prevention issues, cancer risk-related lifestyles and behaviours unfavourable for the possibility of early diagnosis were observed among in the tested population of young adult Polish females. The less favourable model of cognitive and behavioural competence in health and cancer prevention was observed at bachelor-level students of pedagogy at ages below 24 years. Development of skills and motivation for pro-health behaviours and the awareness of behaviour models presented by educators are, along with appropriate knowledge, the most desirable strategies for the success of health education in the area of cancer prevention.

Conflict of interest

Authors report no conflict of interest.

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