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ORIGINAL PAPER

Public knowledge of cancer in southern Poland

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ABSTRACT

Introduction and aim. Due to the constantly growing number of cancer cases in Polish society, our study aimed to check the respondents' knowledge of the broadly understood topic of cancer. The aim was to check the knowledge of Polish society and compare it according to age, gender, level of education, place of residence, and marital status.

Material and methods. Our study was held in Podkarpackie and Malopolskie voivodeiship where participants completed a questionnaire containing 31 questions on the topic of cancer. The survey was completed by 360 people, 248 women, and 112 men. The study locations were diverse and the interviewees came from different backgrounds, age groups, and education.

Results. The study revealed generally high awareness of cancer among 360 respondents, with 93% of whom recognized the importance of early detection, but significant gaps were identified in knowledge about prevention methods, including vaccinations (36%) and viral causes (50%). Older adults and those with lower educational levels showed significantly lower awareness ($p<0.05$), highlighting the need for targeted educational initiatives.

Conclusion. The survey we conducted clearly shows that the state of knowledge about cancer in Polish society is not yet fully satisfactory. The conclusion that arises from our survey concerns the dissemination of knowledge about primary cancer prevention.

Keywords. cancer knowledge, cancer prevention, health education, southern Poland

Introduction

Cancers are a broad group of diseases that include focal lesions with a good prognosis and malignant systemic processes, where long-term survival is rare. Tumors have affected multicellular living things for more than 200 million years, and there is evidence of cancer among the ancestors of modern humans dating back well over a million years. Unlike infectious diseases, parasites, and many environmental diseases, cancers are not primarily caused by some entity foreign to our bodies. Their destructive agents are human cells that have, as it were, lost control of themselves and have been recruited and, to some extent, transformed into pathological organisms or building blocks of tumors.[1]

Since the mid-1960s, the number of cancer cases in Poland has increased approximately 2.5 times and continues to rise. The reasons for this phenomenon are related to factors such as an increase in the average life expectancy

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and changes in lifestyle, such as tobacco smoking, an unhealthy diet, and lack of physical activity.[2] While the Polish healthcare system has achieved some progress in the field of cancer treatment, access to modern therapies and research remains a challenge. Combating cancer in Poland requires an integrated approach that includes prevention, early detection, effective treatment, and support for patients and their families. Government and health organizations continue to work to improve oncological care through investments in advanced diagnostics, targeted therapies, radiation therapy, and the development of preventive programs. However, fighting cancer requires the participation of all of society, education about healthy lifestyles, and regular screening tests to achieve positive results in combating this serious disease. Early detection of malignant tumors is crucial for effective treatment and an improved prognosis. Therefore, regular preventive screenings and early response to concerning symptoms are essential to reduce the risk associated with this serious disease.[3]

In 2020, the Polish National Cancer Registry received information on nearly 146,200 new cancer cases and 99,900 deaths from them. Compared to 2019 registry, malignant tumors are still the second leading cause of death in Poland, causing 21.8% of deaths in men and 20% of deaths in women in 2020. They represent a significant health problem primarily in young and middle-aged people. This phenomenon is particularly evident in the female population, where for several years, cancer has been the most common cause of death before the age of 65, accounting for 28.3% of deaths in young women and 41.6 % of deaths in middle-aged women.[4] As claimed by the European Cancer Inequalities Registry from 2023 cancer mortality in Poland is higher than the EU average, and the cause of this may be the delay in diagnosis and restricted access to the best treatment. For that reason, the Polish National Oncological Strategy has taken steps to improve quality of health care benefits by: increasing the amount of health care providers to reduce the waiting time for diagnosis, investing in popularization of healthy eating habits, conveying the importance of physical activity that is key to primary prevention, increasing funding for more technologically advanced systems of secondary prevention, as well as financing more research to find a way for the most effective treatment and diagnostics available.[4,5]

It has been shown that about 30–50% of cancers are preventable. According to forecasts based on the GLOBOCAN study, the upward trend is expected to continue and by 2030, new cancer cases in Poland could exceed 220,000 individuals. Malignant tumors have become a serious threat to Polish society, and if the growing trend in the incidence of cancer persists, they may soon become the leading cause of death before the age of 65, surpassing deaths due to cardiovascular diseases.[4,5]

That is why it is so important to have knowledge in society about cancer, its prevention, and mechanisms of formation, as prevention is definitely better than cure. There are many cancer education and prevention campaigns available in our country that reach a wide audience.[5] The widespread European Cancer Code and the 12 ways to be healthy contained therein are an excellent source of knowledge about cancer. In the media, such as television, radio, and the Internet, there are articles, informational programs, and advertisements related to the risks of cancer and treatment options. However, the level of awareness in society can vary. Some people may be more aware of the risks and importance of prevention, while others may have limited knowledge on this topic.

Aim

The aim of our paper was to evaluate whether the citizens of Podkarpackie and Malopolskie voivodeships in Poland know the basic facts about this diverse and devastating group of diseases.

Material and methods

We created a survey consisting of 31 closed questions, which was completed by 360 people, including 248 women and 112 men. This gives us 6 metrics and 2 main elements, which are the survey and the group of respondents.

The study was conducted in various social groups, including, among others: factors: age, gender, residence, education, occurrence of cancer in the family. Consent was obtained by conducting a survey. Surveys were sent online to people interested in participating in the study.

Data were collected from different age groups from 14 to 65 years old, which differed in gender, education, place of residence, and marital status. Data collection and organization were performed using Excel. The study was carried out in both paper form in various centers and in the form of online surveys. The geographical area covers two voivodeships: Podkarpackie and Malopolskie.

The questionnaire was designed in accordance with the principles of survey methodology to ensure its reliability, completeness, and acceptability to respondents. The questions were created based on research in the previous literature to ensure their validity. The research team analyzed the questions to ensure that they were understandable and not misleading to the respondents. The questionnaire was tested in a small group of respondents as part of a pilot study. This was to assess whether the questions were understandable and the time needed to complete the questionnaire was acceptable. The comments collected were used to modify the questionnaire.

Statistical analysis was performed using Statistica 13.1 (Statsoft, USA). The Pearson χ^2 test was used to examine interactions between qualitative variables. The significance level of $\alpha=0.05$ was assumed. Abbreviations and symbols used: p – statistical significance value, if $p<0.05$ – there is a significant difference between the groups.

Our study obtained a positive opinion from the Bioethics Committee of Rzeszow University (Resolution number: 2022/101 date; 07 December 2022).

Table 1. Demographic characteristics of the respondent group

Demographic feature	Category	Number (n)	Percentage (%)
Age	14–17	114	32%
	18–24	106	29%
	25–34	6	2%
	35–50	28	7%
	51–64	42	12%
	65+	64	18%
Gender	Male	112	31%
	Female	248	69%
Marital status	Married	87	24%
	Single	229	64%
	Divorced	9	2%
	Widow	31	9%
	In separation	4	1%
Professional situation	Student	215	60%
	Full-time	50	14%
	Retired	2	0.5%
	Unemployed	5	1%
	Entrepreneur	6	2%
	Pensioner	79	22%
	Hired work	2	0.5%
Cancer history	Yes	22	6%
	No	338	94%

Table 2. Knowledge of cancer prevention

Question	Answer	Number (n)	Percentage (%)
Do you think that viruses can cause cancer?	Yes	180	50%
	No	121	33.6%
	Don't know	59	16.4%
Do you believe that mental attitude can speed up recovery?	Yes	252	70%
	No	57	15.8%
	Don't know	51	14.2%
Was cancer knowledge adequately conveyed during your education?	Yes	139	38.6%
	No	220	61.1%
	Don't know	1	0.01%
Are there vaccines that can prevent/reduce cancer risk?	Yes	121	33.6%
	No	109	30.2%
	Don't know	130	36.1%
Can obesity increase the risk of developing cancer?	Yes	220	61.1%
	No	84	23.3%
	Don't know	56	15.5%

Results

The study involved 360 respondents, diverse in terms of age, gender, marital status, education, professional situation, and history of cancer (Table 1). The majority of the respondents (94%, n=338) had no personal experience with cancer, while 6% (n=22) reported having or currently having cancer. In turn, 61% (n=219) of the respondents admitted that their family had a history of cancer, which may influence perception of risk factors and knowledge of the disease. The age structure of the respondents was varied, but the largest group were people aged 50–64 (29%, n=106). Knowledge of cancer in the study group was generally good, although there were significant gaps in some areas. As many as 93% of respondents agreed with the statement that early detection of cancer increases the chances of survival. However, only 46% of the respondents were convinced that early detection of cancer can lead to complete cure, which indicates a lack of full understanding of the importance of prevention and early diagnosis. More than 90% (n=360) of the respondents believed that a family history of cancer increased the risk of developing cancer, indicating a high awareness of the genetic determinants of the disease. Significant gaps in knowledge concerned prevention based on vaccinations and the association of obesity with cancer. Only 36% of respondents were aware that there are vaccines that can prevent some types of cancer, such as cervical cancer. Furthermore, only 50% of respondents knew that viruses can cause cancer, which indicates a need for education on viral risk factors for cancer, such as the HPV virus. Most respondents (61%, n=220) were aware that obesity can lead to the development of cancer, but still as many as 39% had limited knowledge on this subject or were not sure. The analysis showed a varied level of knowledge depending on demographic factors. Older respondents (over 65 years of age) and those with a lower level of education showed significantly lower levels of knowledge about cancer compared to younger and better educated participants ($p<0.05$). Furthermore, people with a family history of cancer were characterized by a greater awareness of risk factors and available methods of cancer prevention, suggesting that direct experience with the disease has a positive impact on the level of oncological knowledge. The analysis of the relationships between knowledge and demographic factors included variables such as age, marital status, professional situation, and personal and family history of cancer. The results indicate that age, education, and personal experience with cancer are significant predictors of the level of knowledge about cancer (Table 2). Respondents who had personal experience with cancer, both in their own life and in their family, had a higher level of knowledge about risk factors, prevention, and available treatments. In summary, the results of the study indicate a satisfactory level of knowledge among respondents regarding basic information about cancer, but significant gaps concern prevention, in particular vaccinations and factors related to obesity. The groups with the lowest level of knowledge are older people and those with lower levels of education, which suggests the need to direct educational activities to these populations (Table 3).

Table 3. Prognostic factors related to knowledge about cancer prevention

Factor	Category	Question	Answer	Number (n)	Percentage (%)	p
Age	<65	Do you believe mental attitude speeds up recovery?	Yes	196	66.2%	0.05
			No	40	13.5%	
			Don't know	50	16.8%	
	≥65		Yes	56	87.5%	
			No	1	0.02%	
			Don't know	7	0.1%	
Education level	Higher	Do you think that HPV vaccinations fully protect against cervical cancer?	Yes	15	28.8%	<0.001
			No	18	34.6%	
			Don't know	19	36.5%	
	Lower		Yes	44	14.3%	
			No	130	42.4%	
			Don't know	132	41.3%	
Marital status	Married	Do you think obesity leads to cancer?	Yes	43	50%	0.009
			No	18	20.9%	
			Don't know	25	29%	
	Single		Yes	156	68.1%	
			No	25	10.9%	
			Don't know	48	20.9%	

Discussion

The aim of the survey conducted among residents of the Podkarpackie and Lesser Poland was to determine the percentage of correct answers given by respondents to questions regarding cancer risk factors. The study aimed to analyze the level of awareness of these factors among the local community. The work presented here shows that a significant percentage of respondents who have ever had cancer are people of retirement age. While this may seem expected, the increasing number of cancer cases among those under 65 years of age deserves special attention. This may indicate changing risk patterns that include environmental factors, lifestyle, and early detection. Therefore, it is a need to tailor prevention and education programs to younger age groups to effectively reduce the increasing incidence of cancer in this population.

Our own study shows that only 61.2% consider obesity as a risk factor for the development of cancer, and equally half agree with the statement that excessive sugar consumption may increase the risk of cancer. According to the American Institute for Cancer Research, inadequate nutrition, as well as overweight, obesity and low physical activity, have a significant impact on cancer risk.[6] In nearly 30% of cancers, the influence of an incorrect diet on the onset and development of the disease has been proven, including colon, esophagus, mouth and stomach.[7]

Promoting a life without substances should become a basic element of cancer prevention. Tobacco smoking is the main cause of cancer, which has been confirmed in numerous studies. When asked whether smoking traditional cigarettes and electronic cigarettes increases the risk of developing cancer, a significant number of study participants agreed with this statement. In the study "Knowledge of high school students about smoking tobacco as a risk factor for lung cancer and its treatment" Both girls (53.8% - yes) and boys (40% - yes) definitely claim that smoking has a carcinogenic effect.[8] However, when asked about passive smoking, 86% of respondents answered affirmatively, while in the study "Knowledge of cancer and attitudes related to this issue among adolescents and young adults aged 15-30", as many as 95% of respondents agreed that passive smoking increases the risk of developing cancer.[9] A high percentage of respondents acknowledge that tobacco smoking increases the risk of developing cancer. This is a positive signal, suggesting that awareness of the link between smoking and cancer is quite widespread.

Tobacco smoke contains several thousand harmful substances, including substances with proven carcinogenicity.[5] The percentage of smokers among lung cancer patients is approximately 90%.[10] The influence of alcohol consumption on the development of cancers of the mouth, throat, larynx, esophagus, liver and breast has also been demonstrated.[11,12]

50% of respondents believe consuming a lot of sugar accelerates cancer development, while a significant 40% do not know. Misunderstanding of the relationship between sugar intake and cancer is probably the reason. Although sugar does not directly cause cancer, it contributes to obesity, which is a risk factor. The solution could be to clarify the role of sugar in obesity and its indirect link to cancer, rather than suggesting direct causality, through public health education and nutritional guidance.

More than half of the respondents (56%) believe that benign tumors do not become malignant, which highlights a common misconception. This misunderstanding probably stems from an oversimplification of the differences between benign and malignant tumors. While benign tumors are generally noncancerous, there is a small risk that some may transform into malignant ones over time. To address this knowledge gap, public health initiatives must focus on educating the public about the characteristics of both types of tumors and the potential, though rare, for benign tumors to become cancerous.

The vast majority of respondents consider early detection crucial for effective cancer treatment. This pos-

itive attitude may contribute to a greater willingness to undergo screening tests. Despite the positive approach to early detection, there is some misunderstanding about whether early diagnosis guarantees complete cure. This may require additional information on the cancer treatment process.

Although early diagnosis is a key factor in cancer prognosis, there are nuances and challenges associated with its outcomes. It does not always lead to higher cure rates, and there is also potential risk associated with over diagnosis and overtreatment. Furthermore, the concept of a "time window" from the moment ctDNA becomes detectable to when cancer becomes incurable emphasizes the existence of a period when early diagnosis may be most effective. However, the length of this time window can vary significantly depending on the type of cancer and individual cases.[14]

Less than half of the respondents believe that there are vaccines preventing or reducing the risk of certain types of cancer. This may indicate the need to increase awareness of available vaccinations.

Currently, all approved anticancer vaccines used in clinical practice focus on combating viruses-causing cancers, known as oncoviruses.[15] One of the most commonly used vaccines is the human papillomavirus (HPV) vaccine, known as Gardasil. Approved by the FDA for the first time in 2006, it is recommended for women aged 9 to 26 to prevent cervical cancer and other HPV-related cancers, such as vaginal, vulvar, anal, and oral cancers.[16] Results from phase III clinical trials indicate that the HPV vaccine effectively protects against more than 90% of infections caused by HPV 16 or 18 in females who received three doses of the vaccine.[17]

Another example of a prophylactic vaccine is the hepatitis B virus (HBV) vaccine, which provides protection against chronic HBV infection, significantly increasing the risk of hepatocellular carcinoma. Similar to the HPV vaccine, its mechanism of action relies on stimulating an antibody response to prevent initial HBV infection.[18-23]

The results of the study indicate the need to educate the public in the field of cancer prevention and diagnosis. We can compare them with the study conducted in 2017 in Lublin. According to the authors, knowledge on this subject is at different levels depending on the profile of the university. As expected, medical university students have the broadest knowledge in this field. The need for deeper education in secondary schools, as well as in higher education institutions, especially with technical and non-medical profiles is revealed.[24]

HPV vaccination is most effective when done before the onset of sexual intercourse, but adults who were not vaccinated as teenagers can also benefit from delayed vaccination. Even if someone already has an active HPV infection or disease, vaccination can still benefit by reducing the risk of further HPV-related illness. The US Advisory Committee on Immunization Practices (ACIP) recommends routine HPV vaccination by age 26. For those aged 27-45 years who have not been adequately vaccinated, shared clinical decision making is recommended, taking into account individual risks and benefits of vaccination. In particular, immunocompromised individuals such as people with HIV, transplant recipients, people undergoing immunotherapy, men who have sex with men (MSM), and transgender people may particularly benefit from supplemental HPV vaccination.

The international recommendations for HPV vaccination vary in some countries, vaccines are recommended for people between the ages of 9 and 45, while in others they are only recommended until age 45. In countries with limited resources, vaccination may be considered outside the standard indications, especially for those at increased risk. Vaccination of children in areas with limited screening capacity can significantly reduce the risk of cancer that would go undetected in the precancerous stage. In areas with low potential for post-treatment evaluation, follow-up vaccination may also reduce the risk of recurrence and cancer. The consideration of these aspects can provide important insights into the benefits and challenges of implementing vaccination in different settings.[25]

A significant 61% of the respondents felt that their cancer education during school was insufficient. This likely stems from a lack of emphasis on cancer awareness within the school curricula. To resolve this, schools should incorporate more comprehensive modules that cover cancer prevention, the importance of early detection, treatment options, and common myths surrounding the disease. By improving cancer education, students can be better equipped with the knowledge needed to make informed health decisions throughout their lives.

Conclusion

The results of the study provide important information on the state of knowledge of Polish society about cancer and also allow for the identification of areas requiring special attention and improvement. Although the overall level of awareness of cancer can be considered satisfactory in the context of basic information, such as the role of tobacco smoking in the development of cancer, many key areas remain poorly understood. The results of the study clearly indicate significant gaps in knowledge about prevention, in particular vaccinations and lifestyle factors such as obesity and lack of physical activity. The most important conclusion of the study is the need to expand education on primary cancer prevention. Only 36% of the respondents knew that there are vaccines to prevent some types of cancer, indicating a low level of awareness in this area. In particular, vac-

cinations against oncogenic viruses, such as HPV, are key to preventing cancer, and knowledge on this subject is still insufficient. Educational campaigns should therefore focus on spreading knowledge about available prevention methods, including vaccinations, which can significantly reduce the risk of developing cancers caused by viruses. Another significant problem is the lack of awareness of the link between obesity and cancer. Although 61% of the respondents were aware that obesity can lead to the development of cancer, up to 39% were unsure or did not know whether such a link existed. Considering that obesity is considered a significant risk factor for many types of cancer, these results show the urgent need to increase awareness in this area. Campaigns promoting a healthy lifestyle, including a healthy diet and regular physical activity, could significantly reduce the risk of cancer in society. Analysis of the results also showed that the level of knowledge about cancer is closely related to demographic factors, such as age, education, and a family history of cancer. Older people (over 65 years) and those with a lower level of education showed a significantly lower level of knowledge about cancer compared to younger and better educated respondents. Furthermore, people with a family history of cancer were more aware of risk factors, suggesting that direct experience of the disease may contribute to a better understanding of issues related to cancer prevention and treatment. These results suggest that educational activities should be aimed primarily at groups most at risk of low levels of knowledge, in particular the elderly and those with lower education. Educational programs could be implemented through public campaigns, but also within the education system, both at the school level and as part of continuing education for adults. Including cancer prevention in school curricula could contribute to raising awareness in the younger generation, as well as better preparing society for the health challenges associated with the increasing number of cancer cases. One of the key areas that requires further intervention is also understanding the differences between malignant and benign tumors. The results of the study show that 56% of respondents are unaware that benign tumors can, in some cases, develop into malignant tumors, which indicates insufficient knowledge of the mechanisms of cancer development. Education in this area should emphasize understanding the risks associated with benign tumors and the need for regular health checks. Although the results of the study indicate a relatively high awareness of the importance of early cancer detection – 93% of the respondents believe that early cancer detection increases the chances of the recovery – only 46% of respondents were convinced that it can lead to complete recovery. This shows that despite the general acceptance of the role of early diagnosis, there is a lack of complete understanding of the cancer treatment process and its potential outcomes. Public education in this area should focus on explaining the real options for cancer treatment at different stages of the disease, as well as what factors influence therapeutic success. The conclusions of the study clearly indicate the need to intensify educational activities on cancer prevention and early diagnosis. In particular, the focus should be on increasing awareness of available vaccines, the relationship between lifestyle and risk of developing cancer, and the importance of regular screening tests. To achieve positive results in the fight against cancer, the cooperation of the entire society is necessary, including health organizations, educational institutions, and the media. In summary, despite general awareness of some risk factors for cancer, there are still many areas that require improvement. It is particularly urgent to increase knowledge about vaccinations, obesity, and lifestyle, which can significantly reduce the number of cancer cases.

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Author contributions

Conceptualization, A.S. and B.S.K.; Methodology, S.S., M. J.; Software, P.S.; Validation, Kl.Z., Ka.Z. and A.L.; Formal Analysis, A.S.; Investigation, A.S.; Resources, J.K. and J.F.; Data Curation, A.S.; Writing – Original Draft Preparation, A.S.; Writing – Review & Editing, A.S.; Visualization, A.A.; Supervision, B.S.K.; Project Administration, K.W.; Funding Acquisition, C.L.

Conflicts of interest

Authors declare no conflicting interest.

Data availability

The data sets generated and/or necessary during the research are available from the authors.

Ethics approval

Our study obtained positive opinion of the Bioethics Committee at Rzeszow University (Resolution number: 2022/101 date; 07 December 2022).

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