Rzeszów University Press 2025
ISSN 2544-1361 (online)
doi: 10.15584/ejcem.2025.3.25

http://www.ejcem.ur.edu.pl
European Journal of Clinical and Experimental Medicine
Eur J Clin Exp Med 2025; 23 (3): 674–681

ORIGINAL PAPER

The knowledge of society regarding health-promoting behaviors in oncology

Adrianna Antoszewska [1], Aldona Sokołowska [1], Maria Jasiewicz [1], Paweł Słoma [1], Sabina Skrzynecka [1], Aleksandra Lasek [1], Cezary Lubas [1], Julia Florek [1], Klaudia Zacher [1], Katarzyna Znamirowska [1], Julia Michalik [1], Natalia Ziaja [1], Beata Sas-Korczyńska [2]

[1] Student Scientific Club in the field of Oncology, Medical College, University of Rzeszów, Rzeszów, Poland
[2] Department of Oncology, Radiotherapy and Translational Medicine, Medical College, University of Rzeszów, Rzeszów, Poland

ABSTRACT

Introduction and aim. Enhancing awareness, early detection, and fostering health-seeking behavior is imperative to address the growing problem of cancer, advocating for basic health education from an early age to reduce morbidity and mortality.

Material and methods. The survey was carried out in two forms: paper and online. The research tool was a questionnaire, consisting of 25 closed-ended questions.

Results. While 95.5% denied the presence of personal cancer, 63% reported family history. Despite awareness of the impact (83% women; 81% men), 44% consume fast food monthly. Self-examination rates are low: only 37% perform it regularly; 45% of men lack knowledge of testicular examination.

Conclusions. Health campaigns across all age groups are necessary to promote cancer prevention and early detection, with a focus on educating both men and women on self-examination due to inadequate knowledge levels.

Keywords. cancer prevention, health behavior, health promotion

Introduction

Cancer is the second most common cause of death in developed countries. Awareness of risk factors affecting the formation and development of cancer is an important element in the fight against this disease, as proper health-promoting behaviors can significantly reduce the risk of developing cancer. The best results would come from the promotion of health at an early age, which could influence the quality and lifestyle that accompany a person over the years, and thus the risk of the disease. Health awareness encompasses knowledge of cancer prevention, health behaviors, factors detrimental to health and the resulting risks, as well as ways to prevent and eliminate them.[1] Contrary to popular belief, currently only a small proportion of cancers are conditioned by the inheritance of certain genetic predispositions. The vast majority of these diseases result from the long-term accumulation of DNA damage. The accumulation of such abnormalities in genetic material causes cells to start dividing uncontrollably. Scientists emphasize that a healthy lifestyle can limit the accumulation of such damage.[2] Given the currently available methods of cancer prevention, it is necessary to impart sound knowledge on the significant risk factors that occur in the later years of life

Corresponding author: Adrianna Antoszewska, e-mail: adaantoszewska@gmail.com

Received: 3.01.2025 / Revised: 5.05.2025 / Accepted: 13.05.2025 / Published: 30.09.2025

Antoszewska A, Sokołowska A, Jasiewicz M, et al. The knowledge of society regarding health-promoting behaviors in oncology. *Eur J Clin Exp Med.* 2025;23(3):674–681. doi: 10.15584/ejcem.2025.3.25.

for women and men. Above all, it is important to make the public aware of how crucial leading a healthy lifestyle is in reducing the risk of cancer.[3] By analyzing data from the National Cancer Registry from 2010 to 2020, a clear upward trend in cancer incidence can be observed. The number of cases increased, as has the number of cases and deaths per 100,000 inhabitants. The same upward trend is also observed in the age-standardized morbidity (mortality) rate, which determines how many diseases (deaths) would occur in the studied population if the age structure of this population were consistent with the age structure of the population accepted as the standard (in this comparison: the standard world population and the standard European population). Increasing awareness and promoting proactive health behaviors can have a significant impact on cancer prevention and improving public health outcomes.

Aim

The aim of this work will be to examine the role of increasing awareness of risk factors, early detection, and promoting a healthy lifestyle in the context of the growing incidence of cancer. We want to investigate what educational strategies can be implemented to effectively inform society about key aspects of cancer prevention and early detection, aiming to reduce the number of cases and associated mortality.

Material and methods

We organized a questionnaire survey containing 25 questions, filled out by 315 adults, including 220 female participants and 95 male participants. Our study obtained positive opinion of the Bioethic Committee of Rzeszow University (Resolution number: 2022/099 date; 07 December 2022).

The study was conducted in paper and online form (according to the level of computerization of the participants), distributed at different locations: high schools, universities, seniors' clubs, and health department venues. The survey form included questions concerning age, sex, education, relationship status, place of residence, and occupation, as well as knowledge about neoplasm / cancer,, family history of neoplasm/cancer and awareness of various pro-health behaviors, the implementation of which allows reducing the chances of cancer. Both paper and online surveys were completed anonymously through sheets that do not require the submission of personal data and through anonymous Google Forms surveys.

The geographic area of the study comprises two Polish provinces: Podkarpackie and Małopolskie.

Participation in the study was voluntary.

The choice of the number of 315 respondents in this study is statistically justified. The sample size was selected to ensure representativeness and the ability to generalize the results to the population of residents of the Podkarpackie and Małopolskie provinces. In addition, the use of both paper and online versions of the questionnaire, as well as the selection of respondents from different age groups, genders, and education levels increases the representativeness and diversity of the sample, which positively affects the reliability of the results.

The survey was carried out over a three-month period and involved people who voluntarily expressed their willingness to participate by completing a questionnaire. Random sampling was used among the enrolled participants, allowing a representative survey group. The inclusion criteria were originating from the above-mentioned Voivodeships, high schools, universities, membership of senior clubs and attendance to health department sites. The only exclusion criterion was not agreeing to complete the survey.

The data analysis took into account the comparison of results in different groups of subjects according to variables, i.e., age, place of residence, and level of education. The data obtained were processed and analyzed using the Statistica package.

Results

The vast majority of respondents denied having or currently having cancer (95.5%; n=314).

Significantly, 63% (n=198 (Table 1) of the respondents indicated that there was a family history of cancer. Still, 7% (n=22) (Table 1) of the respondents state that alcohol abuse does not affect the development of cancer. A large group of respondents (94%; n=296) (Table 1) answered in affirmative to the question of whether smoking cigarettes and other tobacco products can contribute to the development of cancer. Of the respondents, 91% (n=286) (Table 1) believe that excessive sunbathing can contribute to the development of cancer. However, up to 70% of respondents report that they regularly expose their bodies to sunlight. Furthermore, 65% (n=204) (Table 1) of the survey participants agreed with the statement that lack of physical activity can lead to the development of cancer. Also in this group of respondents, when asked "Do you do physical activity?" 51 people, representing 16% (n=50) answered that "no".

A group of 208 people, representing 66% (n=207) of the respondents, associated good hygiene with a reduced incidence of certain cancers. In the group surveyed, 77% (n=242) (Table 2) believe that fast food can increase the risk of cancer. When asked how often they eat fast food, respondents reported: 44% (=138) 12 times a month; 16.5% (=51) 12 times a week. On average, 82% (n=258) agreed that a good, healthy diet reduces cancer risk. Of these, 83% (n=261) of women believe that an adequate diet can reduce the risk of cancer. Similarly, 81% (n=255) of the men surveyed also indicate a correlation between diet and reduction in cancer risk.

Approximately half (49.6%; n=156) of the respondents agreed with the statement that viral diseases may be responsible for the development of cancer.

Of the 314 people in the survey group, only 209 know how to perform a testicular/breast self-examination. When asked whether respondents conducted such self-examination, only 37% (=116) indicated a yes answer. It should be noted that 28% (n=88) of the women in the survey group do not know how to perform such an examination and 45% (n=141) of the men report that they do not know how to perform a testicular self-examination (Tables 3 and 4).

When asked which factors they thought had the greatest impact on their health, respondents indicated, in order, lifestyle (49.6%; n=156), genetic factors (35%; n=110), physical environment (3%; n=40), health care (3.5%; n=11) (Fig. 1).

The responses regarding lifestyle correspond in percentage to the health fields. However, we see disagreements about genetic factors, physical environment, and health care. In our study, they are 35%, 3% and 3.5%, respectively, and according to Lalonde's concept, they are 16%, 21% and 10%.

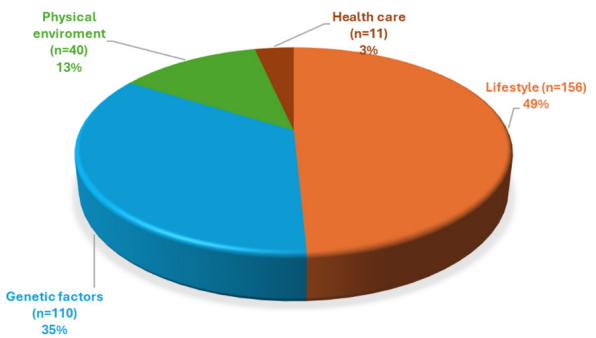

Fig. 1. Factors that have the greatest impact on cancer incidence according to respondents

Table 1. Demographic characteristics of the respondent group (n=314)

Demographic feature	Category	Number (n)	Percentage (%)
Age	14–17	118	37%
	18–24	72	23%
	25–34	2	1%
	35–50	20	6%
	50–64	37	12%
	65+	65	21%
Gender	Male	95	30.2%
	Female	219	69.8%
Marital status	Married	80	25%
	Single	195	62%
	Divorced	5	2%
	Widow	30	10%
	In separation	4	1%
Cancer history	Yes	14	5%
	No	300	95%

Table 2. Knowledge of cancer prevention

Question	Answer	Number (n)	Percentage (%)
Do you think viruses can cause cancer?	Yes	156	50%
	No	42	13%
	Don't know	116	37%
In your opinion, can excessive sunbathing contribute to the development of cancer?	Yes	287	91%
	No	7	2%
	Don't know	20	7%
Do you think eating fast food can increase your risk of cancer?	Yes	244	78%
	No	29	9%
	Don't know	41	13%
In your opinion, can an appropriate diet reduce the risk of cancer?	Yes	244	78%
	No	29	9%
	Don't know	41	13%
Do you know how to perform a testicular self-examination/breast self-examination?	Yes	209	66.5%
	No	105	33.5%

Table 3. Prognostic factors related to the knowledge of society about health-promoting behaviors in oncology

Factor	Category	Question	Answer	Number (n)	Percentage (%)	p
Age	<65	Do you think alcohol abuse can contribute to cancer development?	Yes	212	67.5%	0.02
			No	15	4.5%	
			Don't know	22	7.5%	
	≥65		Yes	42	13.5%	
			No	7	2.0%	
			Don't know	16	5.0%	
Education level	Higher	In your opinion, can performing certain professions increase the risk of developing cancer?	Yes	38	12.0%	<0.001
			No	5	1.5%	
			Don't know	10	3.0%	
	Lower		Yes	235	75.0%	
			No	3	1.0%	
			Don't know	23	7.5%	
Marital status	Married	Do you regularly perform testicular self-examination/ breast self-examination?	Yes	41	13.0%	0.008
			No	39	12.0%	
	Single		Yes	76	24.0%	
			No	155	51.0%	

Table 4. Comparison of selected responses by gender

Question	Women (n=219)	Men (n=95)	Remarks
Do you think that an appropriate diet reduces cancer risk?	83% (181)	81% (77)	Similar high awareness in both groups
Do you know how to perform breast/testicular self-examination?	72% (158)	54% (51)	Significant difference; women show higher awareness
Do you regularly perform self-examinations?	41% (90)	27% (26)	Women more often declare regular self-examinations
Can a lack of physical activity lead to cancer?	68% (149)	58% (55)	10 percentage points difference
Does fast food consumption increase the risk of cancer?	79% (173)	76% (72)	Similar results
Does alcohol abuse affect cancer risk?	92% (202)	85% (81)	Women more often indicate the relationship
Can excessive exposure to the sun lead to cancer?	93% (204)	88% (84)	High awareness in both, higher among women

Discussion

The survey results reveal a significant gap between awareness and practice of cancer prevention among the respondents. Although most understand that factors such as smoking, excessive tanning, alcohol abuse, and physical inactivity can contribute to the development of cancer, many do not take steps to minimize these risks. Despite a high awareness of the factors that contribute to cancer, there appears to be a gap between knowledge and practice, as evidenced by discrepancies in self-examination and lifestyle choices.

The phenomenon of an increase in cancer incidence is a consequence of changes in the demographics of society and the evolution of risk factors. At the same time, the cost of treating cancer patients is increasing, which poses a challenge to effective prevention. It is estimated that up to 40% of cancer cases in Europe could be prevented by adequate understanding of risk factors and preventive measures.

The survey included 315 respondents, of whom 219 (69.8%) were women and 95 (30.2%) were men. This gender imbalance may have influenced the results of the survey, especially in terms of health awareness and declared preventive behaviors. Numerous previous studies show that women are statistically more likely to participate in preventive activities, are more interested in health topics, and show a higher level of awareness of health risks, including cancer. This may lead to an overestimation of the overall level of knowledge and pro-health attitudes observed in the survey, which does not necessarily reflect the actual state of awareness in the general population. Additionally, in the context of questions on self-examination (e.g. breast or testicular self-examination), the unequal participation of men and women may have affected the overall result, for example, the higher number of responses from women, who are more likely to know and perform breast self-examination, may have hidden the low level of knowledge among men about testicular self-examination. Therefore, the results obtained should be interpreted with this imbalance in mind.

International studies show that the level of knowledge of breast and testicular self-examination can vary significantly depending on socioeconomic and cultural conditions. Examples from countries such as Pakistan and Nigeria indicate extremely low levels of awareness and practice of self-examination, especially among men. This kind of data underscores that effective health education requires not only imparting knowledge, but also taking into account broader contexts such as access to information, level of education, and meeting basic life needs. In countries with lower socioeconomic status, limited access to preventive care can exacerbate health inequalities, highlighting the need for integrated public health interventions that include education, systemic support, and improved living conditions.

Regular physical activity can significantly improve the survival rate of cancer patients. The authors point out that physically active individuals have a lower risk of disease recurrence and cancer death, as well as a better quality of life. These findings underscore the need to incorporate recommendations for physical activity into care plans for cancer patients, during and after treatment.[4]

Organizations operating around the world have developed guidelines that indicate the importance of diet and a healthy lifestyle in the prevention of cancer. Reducing alcohol consumption, as well as introducing fruits and vegetables and fiber, are documented factors that can change the risk of developing cancer. Unfortunately, there are barriers that make it difficult for society to adopt the guidelines. This is a way of conveying knowledge, among others, through the media. Knowledge about prevention is not always conveyed in a clear and understandable way. Therefore, despite the development of cancer prevention guidelines and the proven benefits that result from them, public involvement in preventive behaviors is low.[5]

A healthy lifestyle, which includes proper eating habits, physical activity, and avoidance of risk factors such as smoking, is reflected in specific metabolic profiles that can affect cancer risk. The authors showed that people characterized by the "metabolic signature" of a healthy lifestyle had a significantly lower risk of colorectal cancer. These findings underscore the importance of prevention efforts aimed at promoting healthy habits that can translate into metabolic changes that promote the reduction of cancer risk.[6-8]

Despite the relatively high level of awareness of the negative effects of fast food on health, there is a marked discrepancy between knowledge and actual eating habits. A similar phenomenon has also been noted in studies conducted in other countries, including the United States, where the percentage of people who declare regular consumption of fast food remains high despite the recognition of its harmfulness. This type of discrepancy indicates that knowledge alone is not enough to change health behavior. This may be due to convenience, the availability of such foods, as well as established cultural habits. Therefore, for effective prevention, not only educational efforts are needed, but also strategies that support real lifestyle change, for example, by promoting healthy alternatives, creating a favorable eating environment, or introducing regulations that limit the promotion of unhealthy foods.

A 2018 study highlights the important influence of diet on the anticancer immune response, highlighting the role of nutrients in modulating the gut microbiome and reducing inflammation. These findings suggest that appropriate diet interventions can promote the body's natural defenses and reduce the risk of developing can-

cer. In the context of the use of information technology and artificial intelligence in health management, these observations open up the possibility of using mobile apps, digital platforms, and AI algorithms to monitor dietary habits, personalize dietary recommendations, and identify risk factors early. Integrating such solutions into healthcare care can increase the effectiveness of preventive measures and support the conscious development of healthy lifestyles.[9]

Studies indicate that physical interventions, particularly those that combine physical activity with manual lymphatic drainage (MLD), show promising results in reducing the incidence of secondary lymphedema in patients with breast cancer. These programs, which ran from 4 months to 5 years after treatment, lasted from 3 weeks to 12 months and demonstrated significant improvements in physical function, reduced arm swelling, and better recovery. In particular, programs that combined MLD with exercise produced better results, with participants showing a lower incidence of SL and faster recovery compared to control groups.[10]

For comparison, in another study conducted among the urban community of Karachi (Pakistan), it was found that up to 43% of women and 96% of men were unable to perform breast or testicular self-examination.[11]

The results differ even more compared to regions with worse socioeconomic conditions, eg, among young Nigerian men, where the knowledge of how to perform a testicular self-examination is only 1.3%. Furthermore, none to the respondents of the cited study performs this test regularly (compared to 35% in our study). This emphasizes the need to improve quality of life and the ability to meet basic needs to improve knowledge about health and its threats.[12]

78% of the respondents stated that eating fast food can increase the risk of cancer. In addition, 44% of the respondents stated that they eat fast food once or twice a month and 16.5% once or twice a week. These data can be compared with a study conducted in the state of the Wisconsin, where 38.75% of respondents reported eating fast food 1 3 times a month, while 19,39% reported eating fast food once or twice a week. These results show that despite the awareness that fast food is harmful to health, many of the Poles and Americans surveyed use this form of eating out.[13]

These findings point to the need for more intensive education and support in translating knowledge into daily health habits, which can help reduce the risk of developing cancer.

Given the systematic increase in the number of cancer cases, it is becoming important to place a primary emphasis on prevention. Preventive measures not only benefit individuals but also form an important part of health policy strategies. Prevention not only improves the general health situation of the population, but also effectively reduces health care costs. Primary prevention, which targets healthy individuals, and secondary prevention, which aims to control risk factors in exposed individuals, represent an integrated approach to maintaining individual and societal health. In combination, these two forms of prevention play a key role in effective health management. An important prerequisite for the success of screening programs is not only broad coverage of high-risk populations but also awareness-raising. Education is an indispensable component of preventive measures, performing not only the function of raising awareness of health, but also significantly influencing health behavior, including regular screening at specific intervals. Therefore, investing in educational programs becomes crucial for effective cancer prevention, both at the individual and social levels.[6]

There is a growing consensus that environmental factors play a key role in the development of cancerous lesions, acting not only as external threats but also as factors that can directly affect the genetic material of human cells. Epidemiological studies highlight the interaction between environmental exposures and genetic susceptibility, revealing a complex relationship that contributes to cancer risk. Most importantly, this risk is not evenly distributed around the world; Geographic variation in environmental conditions means that some populations may be more exposed to specific carcinogens depending on where they live.

This geographic disparity underscores the need for location-specific cancer prevention strategies. Understanding how carcinogens in the environment are distributed and how they interact with local ecosystems and populations is fundamental to developing evidence-based, targeted health policies. Aligning prevention efforts with regional risk profiles can increase the effectiveness of public health interventions, reduce health inequities, and ultimately contribute to reducing the global burden of cancer. Therefore, integrating environmental monitoring with cancer prevention initiatives should be considered a key component of comprehensive health strategies.[14]

Survey analysis (National Cancer Institute's Health Information National Trends Survey) revealed that after controlling for differences based on gender, race, age, income and education, attention to health news was significantly associated with knowledge about cancer risks associated with food and smoking, but not for knowledge about exercise, sun or alcohol.[23]

It is now known that environmental factors are a major threat to the formation of cancerous lesions. Epidemiological studies indicate that the influence of these factors can also affect the genetic material of cells. This relationship is closely related to the spread of carcinogens in different geographic zones. This means that geo-

graphic areas with environmental differences may be exposed to specific carcinogens, which in turn affect the risk of cancerous changes in body cells. Understanding this link is the key to developing effective prevention strategies and protecting health from the effects of harmful environmental factors.[15]

Responsible use of social networking tools can help spread accurate information, generate important new scientific discoveries, share diagnostic, treatment, and follow-up protocols, and compare different approaches on a global scale. In a society that trusts scientists and doctors, the former act as providers of facts based on solid research. As such, it is our responsibility as health professionals to be leaders in the conversation on social media platforms and to provide accurate and helpful information to those looking for answers. By doing so, we can effectively shape public dialogue and support the public in making informed health decisions.[16]

The increasing prevalence of ultraprocessed food (UPF) consumption has become a pressing public health concern, particularly because of its association with an increased risk of cancer and other noncommunicable diseases. A growing body of evidence suggests a consistent and significant association between high UPF consumption and the incidence of various cancers, including colorectal, breast, and pancreatic cancers.[20] These findings point to the broader implications of dietary patterns shaped by industrialized food systems.

It is worth noting that a large UK cohort study further supports these observations, indicating that elevated UPF intake may not only contribute to a higher incidence of cancer, but also increase cancer-related mortality, particularly for ovarian cancer in women.[21] These associations underscore the need to reassess current dietary environments and food policies.

From a preventive health perspective, these insights underscore the importance of promoting access to fresh and minimally processed foods while implementing regulatory measures targeting UPF reformulation, taxation, and marketing. Such interventions could play a key role in mitigating modifiable cancer risk and promoting healthier eating habits at the population level. As such, UPF consumption is not only a nutritional issue but also a key component of cancer prevention strategies in modern societies.

An analysis of the survey (National Cancer Institute's Health Information National Trends Survey) found that after adjusting for demographic variables such as gender, race, age, income, and education, interest in health news was significantly associated with awareness of modifiable cancer risks associated with eating and smoking, but not with risks associated with physical activity, sun exposure, or alcohol consumption. These findings suggest that the media tends to emphasize certain behavioral risks more than others, which may lead to an uneven public understanding of cancer prevention strategies. As Stryker et al. pointed out, the type and frequency of cancer-related topics presented in newspapers significantly shape the public's knowledge. In particular, lifestyle factors such as diet and smoking are more frequently discussed and thus better recognized by the public, while other important risk factors, such as inadequate exercise or excessive sun exposure, remain underrepresented in media narratives.[22] This selective exposure challenges comprehensive cancer education and points to the need for more balanced communication strategies. Public health campaigns should aim to broaden the scope of information spread through mass media, ensuring that less-publicized but equally important risk factors are also addressed. Incorporating a wider range of modifiable behaviors into educational efforts can promote a more holistic awareness and promote preventive action in many areas of cancer risk.

In response to this challenge, taking policy measures aimed at reformulating products, introducing taxation and marketing restrictions associated with ultra-processed foods, while promoting fresh or minimally processed foods, is becoming a key component of primary cancer prevention. Many countries have already implemented these aspects in their official dietary recommendations, adopting the precautionary principle. Such initiatives are not only at controlling the nutritional composition of the products consumed, but also at forming healthy eating habits in the population. Limiting access to ultra-processed foods can help reduce the incidence of risk factors associated with the development of cancer and other chronic diseases. These measures are an important step toward building more health-focused societies, while also following a prevention-based approach to public health.[17]

Incidence rates of breast, prostate, and colorectal cancers increase with socioeconomic development. Due to their high frequency, these cancers are significant contributors to the overall increase in cancer incidence rates worldwide. The increasing prevalence of these cancers, along with other Group A cancers, can be attributed to risk factors that become more common as countries progress from lower to higher levels of socioeconomic development. These development-related risk factors include smoking, alcohol consumption, overweight and obesity, physical inactivity, delayed fertility, and older age at the beginning of the pregnancy.[18]

To reduce the incidence of cancer among workers, preventive strategies must be implemented in high-risk workplaces. Effective prevention of occupational cancer requires a thorough understanding of carcinogenic substances. Like many other areas of healthcare care, occupational health has benefited from information technology solutions that improve prevention, early detection, treatment, and overall efficiency and cost-effectiveness with-

in the healthcare system. Information technology plays a crucial role in the healthcare field, especially in relation to occupational cancer. High-quality data on occupational cancer and its causes can help identify workers' groups at higher risk. This information is vital for policymakers, managers, physicians, patients, and researchers. As a result, vulnerable workers can undergo screenings and receive targeted preventive interventions.[19,20]

It should be emphasized that due to the cross-sectional nature of the study, no conclusions can be drawn regarding cause-and-effect relationships. The data collected only represent relationships observed at a single point in time and do not allow us to determine the direction of influence between variables.

Conclusion

Based on the results and discussion, several key conclusions can be drawn. The research conducted revealed a varied level of knowledge on health promotion behaviors among respondents, evident in differences related to both age and marital status. A significant issue is the lack of awareness of the role of physical inactivity and hygiene in the context of cancer risk. Interestingly, married individuals and widowers/widows less frequently in any physical activity compared to single individuals, among whom a higher number participate in intense physical activity (over 5 hours per week).

A positive aspect is that approximately half of the respondents are aware of the crucial impact of lifestyle on health and cancer risk. However, a similar proportion of respondents demonstrated low awareness of the link between viral infections and cancer development. Significant differences in the level of knowledge about testicular/abdominal self-examination were observed depending on marital status, with individuals currently or previously in a marital relationship showing greater knowledge in this area.

The findings unequivocally indicate an urgent need to strengthen primary prevention efforts. A considerable proportion of the respondents are unaware of the fundamental role of sports and regular physical activity in the prevention of cancer and promoting a healthy lifestyle. Similarly, awareness of the connection between certain cancers and viral infections preventable through vaccination is not sufficient. Taking effective action requires, first and foremost, intensifying education and raising public awareness across all age groups, from schoolchildren to seniors. Educational campaigns reaching a wide audience through schools, elderly care facilities, and the distribution of informational materials in public spaces have the potential to bring about significant change.

It is important to emphasize that raising awareness of cancer risk should focus on promoting a healthy lifestyle, regular screening, and limiting exposure to carcinogens, which is crucial to improve both prevention and treatment outcomes. Regular screenings and genetic tests for individuals at higher genetic risk enable early detection and intervention.

Effective cancer control requires collaboration across different medical fields, as well as public participation and support from health policies. Investments in prevention, both primary (promoting healthy lifestyles, vaccinations, education) and secondary (early detection), constitute an integrated approach to improving public health and reducing healthcare costs. Research on the impact of diet on cancer risk suggests that balanced nutrition may play a protective role, and further studies on gene-environment interactions, including food compounds like isoflavones, may provide valuable information for prevention and treatment.

Furthermore, it is necessary to develop and implement educational strategies tailored to specific demographic groups and their levels of knowledge and marital status, as observed differences suggest the need for personalized interventions. There is also a need to investigate the reasons for the lower levels of physical activity among married individuals and widows / widows and to develop programs encouraging these groups to engage in regular activity. Increasing emphasis on education on the role of viral infections in cancer development and the promotion of vaccination as an effective preventive tool is crucial. Consideration should be given to incorporating education on testicular and breast self-examination into standard medical consultations and information campaigns, taking into account the specific informational needs of men. The results suggest that the media coverage of cancer prevention may not be sufficiently comprehensive, and efforts should be made to provide more balanced information on all relevant risk factors and preventive methods.

These conclusions have significant implications for the formulation of public health strategies, highlighting the need for targeted and evidence-based educational initiatives and interventions that promote healthy lifestyles and regular screening to reduce cancer risk and burden on the healthcare system.

Declarations

Funding

The research was funded by the authors.

Author contributions

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

Conflicts of interest

The authors declare that they have no conflict of interest.

Data availability

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

Ethics approval

Our study obtained a positive opinion from the Bioethics Committee of Rzeszow University (Resolution number: 2022/099 date; 07 December 2022).

References

1. Nowicki A, Borowa I, Maruszak M. Women health behaviours regarding prevention and early detection of precancerous lesions and cervical carcinoma. *Ginekol Pol*. 2008;79:840-849.
2. National Cancer Registry. Cancer prevention. https://onkologia.org.pl/profilaktyka/. Accessed November 23, 2023.
3. Tuchowska P, Worach-Kardas H, Marcinkowski JT. The most frequent malignant tumors in Poland – the main risk factors and opportunities to optimize preventive measures. *Probl Hig Epidemiol*. 2013;94(2):166-171.
4. McTiernan A, Friedenreich CM, Katzmarzyk PT, et al. Physical Activity in Cancer Prevention and Survival: A Systematic Review. *Med Sci Sports Exerc*. 2019;51(6):1252-1261. doi: 10.1249/MSS.0000000000001937
5. Di Sebastiano KM, Murthy G, Campbell KL, Desroches S, Murphy RA. Nutrition and Cancer Prevention: Why is the Evidence Lost in Translation?. *Adv Nutr*. 2019;10(3):410-418. doi: 10.1093/advances/nmy089
6. Lewandowska AM, Lewandowski T, Rudzki M, Rudzki S, Laskowska B. Cancer prevention - review paper. *Ann Agric Environ Med*. 2021;28(1):11-19. doi: 10.26444/aaem/116906
7. Shapiro GK. HPV Vaccination: An Underused Strategy for the Prevention of Cancer. *Curr Oncol*. 2022;29(5):3780-3792. doi: 10.3390/curroncol29050303
8. Rothwell JA, Murphy N, Bešević J, et al. Metabolic Signatures of Healthy Lifestyle Patterns and Colorectal Cancer Risk in a European Cohort. *Clin Gastroenterol Hepatol*. 2022;20(5):e1061-e1082. doi: 10.1016/j.cgh.2020.11.045
9. Soldati L, Di Renzo L, Jirillo E, Ascierto PA, Marincola FM, De Lorenzo A. The influence of diet on anti-cancer immune responsiveness. *J Transl Med*. 2018;16(1):75. doi: 10.1186/s12967-018-1448-0
10. Baumann FT, Reike A, Hallek M, Wiskemann J, Reimer V. Does Exercise Have a Preventive Effect on Secondary Lymphedema in Breast Cancer Patients Following Local Treatment? - A Systematic Review. *Breast Care (Basel)*. 2018;13(5):380-385. doi: 10.1159/000487428
11. Shallwani K, Ramji R, Ali TS, Khuwaja AK. Self-examination for breast and testicular cancers: a community-based intervention study. *Asian Pac J Cancer Prev*. 2010;11(1):145-148.
12. Onyiriuka AN, Imoebe FE. Testicular-self examination among Nigerian adolescent secondary school boys: knowledge, attitudes and practices. *J Prev Med Hyg*. 2013;54(3):163-166.
13. Bhutani S, Schoeller DA, Walsh MC, McWilliams C. Frequency of Eating Out at Both Fast-Food and Sit--Down Restaurants Was Associated With High Body Mass Index in Non-Large Metropolitan Communities in Midwest. *Am J Health Promot*. 2018;32(1):75-83. doi: 10.1177/0890117116660772
14. Wild CP, Espina C, Bauld L, et al. Cancer Prevention Europe. *Mol Oncol*. 2019;13(3):528-534. doi: 10.1002/1878-0261.12455
15. Lewandowska AM, Rudzki M, Rudzki S, Lewandowski T, Laskowska B. Environmental risk factors for cancer - review paper. *Ann Agric Environ Med*. 2019;26(1):1-7. doi: 10.26444/aaem/94299
16. De La Garza H, Maymone MBC, Vashi NA. Impact of Social Media on Skin Cancer Prevention. *Int J Environ Res Public Health*. 2021;18(9):5002. doi: 10.3390/ijerph18095002
17. Fiolet T, Srour B, Sellem L, et al. Consumption of ultra--processed foods and cancer risk: results from NutriNet-Santé prospective cohort. *BMJ*. 2018;360:k322. doi: 10.1136/bmj.k322
18. Lortet-Tieulent J, Georges D, Bray F, Vaccarella S. Profiling global cancer incidence and mortality by socioeconomic development. *Int J Cancer*. 2020;147(11):3029-3036. doi: 10.1002/ijc.33114
19. Davoodi S, Safdari R, Ghazisaeidi M, Mohammadzadeh Z, Azadmanjir Z. Prevention and Early Detection of Occupational Cancers - a View of Information Technology Solutions. *Asian Pac J Cancer Prev*. 2015;16(14):5607-5611. doi: 10.7314/apjcp.2015.16.14.5607
20. Narimatsu H, Yaguchi YT. The Role of Diet and Nutrition in Cancer: Prevention, Treatment, and Survival. *Nutrients*. 2022;14(16):3329. doi: 10.3390/nu14163329
21. Isaksen IM, Dankel SN. Ultra-processed food consumption and cancer risk: A systematic review and meta-analysis. *Clin Nutr*. 2023;42(6):919-928. doi: 10.1016/j.clnu.2023.03.018
22. Chang K, Gunter MJ, Rauber F, et al. Ultra-processed food consumption, cancer risk and cancer mortality: a large-scale prospective analysis within the UK Biobank. *EClinicalMedicine*. 2023;56:101840. doi: 10.1016/j.eclinm.2023.101840
23. Stryker JE, Moriarty CM, Jensen JD. Effects of newspaper coverage on public knowledge about modifiable cancer risks. *Health Commun*. 2008;23(4):380-390. doi: 10.1080/10410230802229894