

# Assessing Cancer Knowledge among Health Students in Portugal

Ana Barros<sup>a</sup> Madalena Pereiro<sup>b</sup> Rita Espanha<sup>b, c</sup>

<sup>a</sup>Sociedade Portuguesa de Pneumologia, Lisbon, Portugal; <sup>b</sup>Iscte – Instituto Universitário de Lisboa, Lisbon, Portugal; <sup>c</sup>Centro de Investigação e Estudos de Sociologia (CIES-Iscte), Lisbon, Portugal

## Keywords

Cancer knowledge · Cancer literacy · Health students

## Abstract

**Introduction:** Cancer is the second leading cause of death worldwide and its incidence has been increasing. It is estimated that almost half of all cancer cases could be prevented by lifestyles changes. Cancer knowledge may be key to addressing this growing trend. This study focused on health students and its primary objective was to evaluate students' knowledge and perceptions about cancer. **Methods:** In this study, the tool "Students Knowledge and Perceptions about Cancer" was used to retrieve quantitative data about students' knowledge. Their perceptions were evaluated using a Likert scale that ranged from "Don't know" to "Know almost everything." This tool was shared on LinkedIn and Facebook, making the sampling method non-probabilistic. **Results and Discussion:** From a sample of 170 health students, 72.4% (123) got more than half of the questions right. Lung cancer is the topic with lower knowledge. Overall, there seems to be a positive statistically significant correlation between students' knowledge and their perceptions about their knowledge ( $p \leq 0.05$ ). Despite the satisfactory levels of general knowledge about cancer, there should be more campaigns that are appealing to students that emphasise prevention as a mean to reduce cancer incidence. There is still work to be done to have

more awareness among health students, especially regarding risk behaviours and screenings related to cancer. New studies with more representative samples should be conducted.

© 2024 The Author(s). Published by S. Karger AG, Basel on behalf of NOVA National School of Public Health

## Níveis de Conhecimento sobre Cancro dos Estudantes da área da Saúde em Portugal

### Palavras Chave

Conhecimento sobre o cancro · Literacia do cancro · Estudantes de saúde

### Resumo

**Introdução:** O cancro é a segunda principal causa de morte no mundo e tem tido uma incidência crescente. Estima-se que quase metade de todos os casos de cancro poderiam ser evitados através de mudanças de estilo de vida. O conhecimento sobre o cancro pode ser a chave para enfrentar essa tendência crescente. Este estudo teve como foco estudantes da área da saúde e o objetivo principal foi avaliar o conhecimento e as percepções dos estudantes sobre o cancro. **Métodos:** Neste estudo, utilizou-se a ferramenta "Students Knowledge and Perceptions about Cancer" para recolher dados quantitativos

sobre o conhecimento dos estudantes. As percepções foram avaliadas através de uma escala que variou de “Não sei” a “Sei quase tudo”. Esta ferramenta foi compartilhada no LinkedIn e no Facebook o que torna o método de amostragem não probabilístico. **Resultados e discussão:** De uma amostra de 170 estudantes da área da saúde, constatou-se que 72.4% (123) acertaram mais da metade das questões. Observou-se que o cancro de pulmão é o tema onde há maior desconhecimento. Globalmente, parece existir uma correlação positiva estatisticamente significativa entre o conhecimento dos alunos e a percepção do que estes sabem acerca dos conteúdos abordados ( $p \leq 0.05$ ). Apesar dos níveis satisfatórios de conhecimento geral sobre o cancro, deveriam existir mais campanhas, que sejam apelativas aos estudantes, que enfatizem a prevenção como forma de reduzir a incidência do cancro. Conclui-se que ainda há trabalho a ser feito para uma maior consciencialização dos estudantes da área da saúde, especialmente em relação aos comportamentos de risco e aos rastreios relacionados com o cancro. Contudo, será necessária a realização de novos estudos com uma amostra representativa.

© 2024 The Author(s). Published by S. Karger AG, Basel  
on behalf of NOVA National School of Public Health

## Introduction

Cancer is responsible for the death of 1 in 6 people globally, with lung cancer being the most lethal, accounting for 18.4% of deaths attributed to cancer [1]. This group of diseases is the second leading cause of death in Portugal, highlighting the necessity to address this issue and explore the strategies that can minimise its impact [2]. Breast cancer (26.4%) and prostate cancer (20%) have the higher incidence rates for females and males, respectively, in Europe. Lung cancer has the highest mortality rate for European men (23%). In European women, breast cancer has the highest mortality (16.2%), closely followed by lung cancer (13.9%), according to data from the cancer observatory (Globocan) for 2022 [3].

Cancer prevention remains the most sustainable and easiest way to deal with the disease. Prevention involves a set of individual and collective attitudes aimed at preventing the onset of this condition or promoting early detection to manage and treat cancer more effectively [4]. It is estimated that smoking, alcohol consumption, and poor diet contribute significantly to increased cancer incidence and mortality. All these factors are preventable and can be addressed with measures to promote healthy

lifestyles [5]. Populations' knowledge of these factors and broader coverage and proximity of health units capable of advising and screening populations could lead to a greater awareness regarding this theme. It could also result in individuals' greater involvement in managing their health.

Smoking has the highest impact on the “avoidable mortality from cancer and the number of years of life lost to cancer” [4], and this practice often begins at very young ages. In 2015, according to a study done by the Directorate-General of Health, 39% of young people aged between 13 and 18 years in Portugal who attended public schools had smoked at least once in their lives [6]. Similarly, when the beliefs and perceptions of young people were assessed, it was revealed that 26.2% of students aged 18 years consider that consuming 1 or 2 packs of tobacco per day has no health risk or represented only a moderate risk [6], indicating a lack of knowledge regarding this risk factor, one of the most significant contributors to the onset of various diseases, including cancers. Thus, assessing the levels of cancer knowledge in young people might help devise a strategy to correct unmet needs until and during the years of higher education.

Cancer knowledge can be categorised as a dimension of a major concept: cancer health literacy (CHL). In turn, CHL is a derivation of the concept of health literacy (HL), and it includes the same dimensions as HL but focuses more on knowledge and actions about cancer prevention, diagnosis, and treatment. The definition of CHL includes the perception of the risks related to the disease that can influence personal choices daily, the aspects regarding treatment and the knowledge of strategies and services that exist to help manage not only the disease but also the underlying social and emotional implications [7]. It is essential to better understand this specific context because all the decisions surrounding the disease are impacted by the levels of knowledge of the people that come into contact with it and because even if a person has a relatively good level of HL that does not necessarily mean that that person has the sufficient knowledge regarding a specific disease such as cancer [2, 7].

A few studies aimed to identify the levels of knowledge regarding specific cancer types and gave us a better understanding of the need to explore this theme in a broader way. Key results from some of these studies are presented below.

Breast cancer is the most common type of cancer among women. Awareness about this fact has the potential to increase screening and could encourage the adoption of important preventive behaviours [8–10].

When investigating students' knowledge about breast cancer in Saudi Arabia ( $N = 506$ ), it was found that most students (93.5%) feel "embarrassed talking about breast cancer," and 92.1% never discussed this disease with their doctor [10]. In a study done with a small group of women in Portugal ( $N = 96$ ), it was found that the respondents correctly identified risk factors like family history and tobacco consumption as significant risk factors associated with the disease. At the same time, a considerable number of women (44.8%) considered that breast trauma is associated with an increased risk for this disease, and a smaller percentage (18.8%) believed that the use of a tight bra improved the likelihood of breast cancer, which is not true [11]. Understanding the existing myths is an excellent way to develop better communication tools that address these misconceptions.

A Portuguese study about cervical cancer done with high school students ( $N = 370$ ) in 2010/2011 showed that students were familiar with the correct screening test for cervical cancer (78.1%) and having unprotected sexual relations was correctly identified by 79.2% of students as a risk factor for cervical cancer. Fifty-five-point seven percent of students also selected "Lack of female hygiene" as a risk factor for cervical cancer, which showed that there are still a few misconceptions that need to be addressed, regardless of the overall positive scores on the questions posed [12]. Another study made in Portugal that aimed to understand university students' knowledge about human papillomavirus (HPV) and cervical cancer found that there is a positive correlation between these two variables, which means that people who knew more about HPV also knew more about cervical cancer. In this study, the majority of students identified the preventive behaviours related to HPV, such as reducing the number of sexual partners (76.7%) or sexual abstinence (69%) [13]. A more recent study, published in 2023, focused on young people's knowledge about HPV and cervical cancer ( $N = 274$ ) and reported an average knowledge level of 32.4%, lower than the previously cited studies [14]. With the recent addition of the HPV vaccine to the national vaccination plan for boys (2020), a primary prevention measure that can be very effective, it is interesting to understand if the knowledge among young people is increasing or if adolescents can be more prone to abandon other important measures such as condom use.

Other important type of cancer, especially in a country like Portugal where there is a high exposure to UV light, is skin cancer. A study in Turkey tried to evaluate nursing students' knowledge about skin cancer and their protective behaviours regarding this theme. A comparison was made between first- and fourth-year nursing stu-

dents, and it was found that younger students had less average knowledge scores. Still, students' behaviours towards this issue remained inadequate and insufficient for all students, independently of their school year. The study highlighted the need to design new strategies to guarantee that all students adopt protective measures. Nurses and other health professionals can be a vehicle of health promotion and education. As the authors of this article stated, it is highly relevant to add more modules to students' curricula that can fill this gap and use appealing ways of teaching to mobilise people to adhere to the protective measures such as staying in the shade, wearing protective clothing and sunglasses and avoiding direct sunlight between 11 a.m. and 5 p.m. [15]. A study published in 2014 aimed to understand "beliefs and behaviours related to sun protection" among Portuguese students between 10 and 16 years of age. This study reported that there seems to be more awareness about this issue when compared to other studies published in other countries. Still, students tend to abandon some protective measures as they get older. The investigators showed that even though younger students had less knowledge, they were the ones who reported doing more protective measures, such as using solar protection. Some of the possible reasons for this finding were that adolescents value more tanned skin as it is perceived by many as more attractive, and also, younger kids' behaviour is more controlled by their parents, so they might have to adopt more protective measures [16]. In general, adolescents tend to assume more risky behaviours, which enforces the need to develop more effective measures to address this specific population.

Data available about CHL in Portugal is scarce, but the results from the Cancer Health Literacy Test (CHLT-30 PT) suggest that cancer patients have an intermediate level of CHL, with more than 50% of the respondents answering correctly most questions. In addition, it was reiterated that the level of education is related to HL, with higher levels being associated with people with higher education [2].

Understanding whether the population has the knowledge to deal with the disease appropriately is pertinent. Cancer is a highly preventable disease, and it is estimated that more than half of the deaths attributed to oncological diseases could be avoided with changes in behaviours and preventive measures [17, 18]. Awareness about risk factors should begin as soon as possible since the earlier these issues are addressed, the easier it will be to influence life choices. One of the highly worrying and extremely relevant stages for this type of intervention is adolescence, which corresponds to a

phase of transformation in human development and where risky behaviours are often adopted and can have negative consequences in the future [19].

All the previously presented studies highlighted the need to deepen our understanding of cancer knowledge, propelling the current paper's investigation. This search was conducted to better understand health students' knowledge about cancer. That was classified as the primary objective of the study. The main research question of this study was defined as "What is the level of knowledge about cancer among Portuguese health students?" It also posed a follow-up question: "Do students' perceptions of what they know about cancer correspond to reality?" To answer these questions, the Students Knowledge and Perceptions about Cancer (SKPaC) was used, a tool that aims to assess young students' knowledge and perceptions of cancer-related aspects, from prevention, screening, diagnosis, and treatment [20].

## Materials and Methods

To understand what health students, know about cancer and what they think they know (their perceptions), the SKPaC was used. The SKPaC is an instrument developed and validated for the Portuguese context by a multidisciplinary team of experts from the University of Porto to assess students' knowledge and perceptions about cancer disease. The final version encompasses three sections (46 items): the first one explores the students' perceptions and knowledge, composed of 22 items; the second one addresses specific questions about the participants' habits, composed of 12 questions; and the third part of the questionnaire concerns the respondents' sociodemographic characterisation, which includes 12 items [20]. This tool focuses on five types of cancer: breast cancer, cervical cancer, lung cancer, colorectal cancer, and skin cancer. The general outline was kept with an adaptation regarding the questions used to characterise the sample since it was necessary to reformulate some questions to meet the specificities of the population chosen for the study, which, in this case, are Portuguese health students. The final version of the tool used for this study is available online in Annex A (for all online suppl. material, see <https://doi.org/10.1159/000542196>).

### Data Collection

Data collection was carried out using Google Forms between April and July 2022, and the invitation to participate in the study was made through LinkedIn and Facebook. Respondents were asked to share the questionnaire with other health students to obtain more data. Therefore, we can

classify the sampling as non-probability sampling by "snowballing." All the participants who completed and submitted their responses through the platform were included, and 170 valid responses were recorded for analysis. Before completing the questionnaire, the participants were asked to give their consent to participate in the study. This was performed to guarantee that respondents' anonymity was ensured and safeguarded. The Ethics Committee of Iscte approved the study (Number 38/2022).

After the implementation of this instrument, available for consultation in Annex A, its content was reviewed. Two questions were excluded: "What is the survival rate after 5 years for lung cancer?" was not specific in its formulation since it does not mention whether the 5-year survival rate for lung cancer refers to national values or global estimates. There is some variation in this value according to the perspective adopted. Question "Which of the following does not increase your risk of developing lung cancer?" was excluded because there are contradictory studies on vitamin E supplementation's influence on the risk of developing lung cancer.

### Data Analysis

The answers were then analysed using IBM® SPSS® version 28, where descriptive statistics were performed to characterise the sample. Students were evaluated based on the number of correct answers to the closed-end questions.

Students' perceptions about cancer were assessed using a Likert scale. The different concepts addressed were grouped by cancer type. The mean within the category was calculated (e.g., breast cancer – included the perception students had about mammography, measured on a scale from 0 to 10, 0 being "Don't know/Does not have information" and 10 being "Knows almost everything/has enough information to have no doubts"). The perception means for each category were calculated from the previously obtained means. The closed-ended questions were checked to see how many questions students got right. These questions were categorised by type of cancer, and subsequently, the average number of correct answers was calculated for each type of cancer addressed. The mean score of perception and mean knowledge about cancer were studied using Spearman's correlation. The results were calculated for a 95% confidence interval.

## Results

The sample of this study consists of 170 college or university students in health sciences. Their demographic characteristics are shown in Table 1. Their habits and behaviours are summarised in Annex B.

**Table 1.** Sociodemographic variables

Variables	Result (%)
Gender	
Female	147 (86.5)
Male	23 (13.5)
Nationality	
Portuguese	156 (91.8)
Foreign	14 (8.2)
Scholar qualification	
Bachelors	106 (62.3)
Masters	60 (35.3)
Phd	1 (0.6)
Other	3 (1.8)
Attending course	
Biomedical Laboratory Sciences	26 (15.3)
Pharmacy/Pharmaceutical Sciences	11 (6.5)
Medical Imaging and Radiotherapy	9 (5.3)
Dietetics and Nutrition	8 (4.7)
Clinical Physiology	7 (4.1)
Medical or Clinical Microbiology	6 (3.5)
Other courses	89 (52.4)
Did not answer	14 (8.2)
Where do you live?	
Lisbon	107 (62.9)
Setúbal	32 (18.8)
Other	31 (18.3)

Most of the respondents were women (147; 86.5%), Portuguese (156; 91.8%), and attending their bachelor's degree (106; 62.3%). A wide range of health students answered this questionnaire. 15.3% are studying Biomedical Laboratory Sciences (26), 6.5% are studying Pharmacy/Pharmaceutical Sciences (11), and others are studying Medical Imaging and Radiotherapy (9; 5.3%), Dietetics and Nutrition (8; 4.7%), Clinical Physiology (7; 4.1%), Medical or Clinical Microbiology (6; 3.5%), or other courses (89; 52.4%). Most of them live in a municipality within the district of Lisbon (107; 62.6%) (Table 1). More than half had already dealt closely with cancer (113; 66.5%), and of those, 102 (90.3%) had met this disease through a family member. Even though most respondents have already had close contact with the disease, 23 (13.5%) of the respondents do not know or have never tried to find out their family history of cancer (Table 2).

Several closed-response questions were asked from the second to the nineteenth, with only one correct answer. One of the most significant difficulties of the respondents fell on question "Which of the following behaviours decreases a woman's risk of getting breast cancer?" where 78 (45.9%) of the respondents assumed they did not know

**Table 2.** Other variables

Other variables	Result (%)
Do you have any health problem?	
Yes	61 (35.9)
No	109 (64.1)
Do you know your family cancer's history? <sup>a</sup>	
Yes	134 (78.8)
No, but I have tried	12 (7.1)
No and I never tried	23 (13.5)
Have you ever dealt closely with a cancer situation?	
Yes	113 (66.5)
No	57 (33.5)

<sup>a</sup>Contains a missing value.

what this behaviour was and only 31 (18.2%) recognised the reduction in the consumption of alcohol as a determining factor in reducing the risk of developing this pathology.

The question "Performing screening for lung cancer using computed axial tomography (CAT) decreases the probability of death from this cancer by..." also showed a relevant lack of knowledge concerning lung cancer screening. Eighty-five (50%) students answered that they did not know and only 15 (8.8%) answered "about 20%," which was the correct answer. Regarding skin cancer, it was found that most respondents know about the hours that present a higher risk for sun exposure (96.5%; 164) and acknowledge that prolonged exposure to the sun is the factor that contributes primarily to the development of skin cancer (86.5%, 147).

A considerable percentage also attributed less weight than the actual value to tobacco consumption and its impact on the development of lung cancer. Although 29.4% (50) of respondents stated that 85% of lung cancer cases are attributable to smoking, there was a similar percentage (44; 25.9%) who considered that this value is 70%, which shows a certain disregard for this habit and its impact on health. When analysing the number of correct answers by type of cancer (Table 3), it was found that students got more questions related to lung cancer wrong, a concerning finding considering this is the type of cancer that causes more deaths worldwide [1].

To the question "In a few words, tell us what cancer is for you..." most of the answers obtained were more scientific (125; 73.6%), with a generic definition of cancer, such as: "Cancer consists of an abnormal proliferation of cells in our body, resulting from a deregulation of the cell cycle caused by DNA mutations." More emotional responses were also obtained (24; 14.1%) related to the feelings people attribute to cancer, such as "scary," "nightmare," "unpredictable,"

**Table 3.** Correlations between the mean of perception and the mean of knowledge of the students

Type of cancer	$\bar{X}$ of the right answers	$\bar{X}$ of the students perceptions <sup>a</sup>	Pearson correlation
Breast cancer	3.65	5.23	0.280 <sup>b</sup>
Lung cancer	0.88	4.80	0.197 <sup>b</sup>
Cervical cancer	2.11	4.72	0.525 <sup>b</sup>
Skin cancer	2.60	4.70	0.201 <sup>b</sup>
Colorectal cancer	1.67	4.89	0.144
Overall performance	10.91	5.13	0.389 <sup>b</sup>

<sup>a</sup>Perception ranges from 0 to 10. <sup>b</sup>Correlation is significant at the 0.05 level.

“struggle,” and “a difficult disease.” There were also definitions with some inaccuracies (15; 8.8%), which showed that there are still some difficulties among young people in understanding the disease. There were certain myths surrounding the definition of cancer, as the following responses indicate: “(A) Cancer is malignant cysts for which there is no cure with complete certainty,” “(...) is a kind of manifestation of a bacterium (created or not by the body itself), which multiplies and destroys itself.” There were also 6 (3.5%) people who did not answer or admitted that they did not know what cancer is.

The existence of respondents with different backgrounds (both at academic and personal levels) may explain the interpretation given to the question and, consequently, explain the existence of different meanings assigned to cancer. A positive correlation was found between the respondents’ perception of what they know about breast and cervical cancer and lung and skin cancer (sig. = 0.05). The same is not valid for colorectal cancer (Table 2). When assessing the overall performance, which relates the mean number of total correct answers to the mean number of perceptions of all topics, we found that the correlation is statistically significant (sig. = 0.05).

## Discussion

The analysis of the answers to the closed-ended questions showed a satisfactory majority (123; 71.4%) of the respondents got more than nine questions right. Despite that, some topics may not be well consolidated and deserve a more significant investment in disseminating information and education.

Colorectal cancer was the cancer type that had the worst performance among all types of cancer evaluated in this study. This may be justified by this type of cancer having

received less emphasis in the dissemination and promotion of awareness campaigns compared to others, such as breast cancer [21]. Another important determinant that can justify this result is the fact that this type of cancer affects mainly older people [22], so it is not surprising that not all students are very familiar with all the aspects of this type of cancer. In a study made in Italy, which tried to evaluate secondary education students’ knowledge about cancer, 89.3% of the students did not consider colorectal cancer as one of the most frequent types of cancer. This shows the lack of awareness of the impact that this type of cancer has today [23]. This finding is similar to the results obtained in our study.

Both in terms of average knowledge and perceptions about breast cancer, the results were the highest among all types of cancer, consistent with the results previously obtained in primary and secondary school students [21]. One of the reasons for this value is the existence of awareness-raising campaigns on this topic, along with good coverage of the national screening for this pathology [21, 23]. However, when asked about the risk behaviours that reduce the likelihood of a woman developing breast cancer, only 18.2% (31) of respondents believe that reducing alcohol consumption is the correct answer, and there is a higher percentage (31.2%; 53) who believe that the use of antiperspirants is the factor that should be avoided. Nevertheless, most studies aimed to understand the impact of the use of deodorants did not find a relationship between the two events or consider the risk low [24].

Cervical cancer seemed to be one of the most familiar topics to some of the respondents. A study conducted in Portugal among university health students found that the knowledge about this type of cancer was satisfactory. However, there was some lack of knowledge about HPV [25], which was in line with the results observed in this study. It is worth noting that the screening for cervical cancer starts at an earlier age. According to the



Portuguese Gynaecology Society, screening (cervical cytology) should start at 20–30 years. This may justify the satisfactory results in this item [26].

Concerning skin cancer, it was possible to confirm that most respondents seemed to act by their knowledge. When asked about the use of sunscreen students admitted using it “always” or “often” (71.2%; 121) and almost all of them apply it on the body and face (92.9%; 158). These attitudes are fundamental to preventing the disease.

One of the reasons we can find a different range of correct answers is the academic year in which the students were. It can also be influenced by the course itself (not all health courses represented in this study will have the same curricula, and not all will give this much attention to this disease). On the other hand, it should be noted that with the increased incidence of oncological disease due to the ageing of the population [1, 27], these students may also one day suffer from an oncologic disease or know someone who is going through this situation. This makes it highly relevant that these students, regardless of their attending course, know how to deal with the disease and recognise the warning signals inherent to this pathology. Students and young people in general are critical points for a paradigm shift. They could potentially stop this increase by being included in the prevention and screening process from an early age [28]. Students’ curricula should be revised to include specific modules about this disease. This strategy has the potential to put all health students at the same level, when it comes to cancer prevention and could be relevant not only to encourage preventive measures among students but also to spread this knowledge to other people.

It is also worth noting that it is equally important that students use the available tools to empower the citizens and can communicate effectively with a very diverse population, especially those with problematic or insufficient levels of health literacy. This study has shown that a considerable number of students need to increase their knowledge to be more confident talking about this specific disease and all the particularities inherited to cancer. Another study that tried to assess nursing students’ health literacy found that “the health literacy of the majority of students was low” [29]. It highlighted the need to invest in students’ training to deal with a vulnerable population that needs special attention and requires a more practical explanation about preventive attitudes that should be adopted to avoid cancer. Also, other determinants, such as how to live with the disease and navigate the health system, could potentially empower citizens and lower the pressure on specific services, such as the emergency department [2, 4].

A statistically significant positive correlation was also found between what students know about all types of cancer studied (except colorectal cancer) and what they think they know (their perceptions) (Table 2), which indicates that those who feel more confident about a given topic get more questions right. Those who feel less confident get them wrong or assume they do not know more often, which is also a sign of good self-knowledge of individual limitations on the topic. The same was found for the overall performance, which sought the relationship between the mean of the total number of correct answers given and the mean of all perceptions assessed, which reiterates the relationship between the respondents’ knowledge and perceptions, corroborating the idea that students can make a good self-assessment of what they know about cancer.

The small size of the sample and its lack of diversity is one of the limitations of this study. The sample is not representative of the population studied. To have a representative and diverse sample, more students from each individual health course should have been included. Another limitation is the fact that the data collection was made using a self-responding questionnaire which can result in bias related to the respondents’ self-assessment. Future studies should reproduce this study with a representative sample. These studies could help corroborate the findings of our study or highlight other important issues.

## Conclusion and Recommendations

Most health students surveyed have adequate knowledge about cancer prevention and screening. This finding is desirable but also expected since we are considering healthcare students. There are still several myths associated with cancer that exist in this population, such as the strong belief in the relationship between the use of antiperspirants and the development of breast cancer (31.2%; 53). This finding re-enforces the need to assess students’ knowledge and address these misconceptions to make sure that future health professionals are not spreading misinformation or acting on wrong assumptions.

When evaluating the knowledge about lung and colorectal cancer, the information did not seem to be well consolidated. Therefore, more investment is needed to educate young people about these topics.

This weakness in knowledge is more evident in the case of lung cancer, which becomes worrying as this is the type of cancer with the highest overall mortality rate. Thus, there is a need to deepen students’ knowledge about cancer, particularly lung cancer, and to find strategies to

promote greater awareness and less stigmatisation of the disease.

It is important to work on improving young people's knowledge, ideally starting at an early age, to prevent pathologies such as cancer. It is advisable to develop engaging interventions that could help demystify fears, myths, stigmas, or misinformation about cancer in a holistic and integrative way, including all health students. Student's curricula should also be reviewed. This could boost additions and changes so that this gap in cancer knowledge could be filled. Besides the school curricula, more health promotion actions could be implemented in schools that could potentially enhance cancer knowledge. The dissemination of information by health authorities on social media interactively and appealingly could also increase the spread of knowledge within this target population.

In addition to these interventions, new studies that replicate the application of the SKPaC to a more robust sample would allow for a broader analysis of this subject. The presentation of this tool to participants should be re-evaluated to minimise possible bias and attract more respondents. It would also be interesting to know which academic year the student is attending because that could significantly change their knowledge about the subject.

## Statement of Ethics

Written approval was obtained from the ISCTE Ethics Committee before initiating this study with the number 38/2022. All procedures performed in studies involving human participants

were in accordance with the ethical standards of the Institutional Research Committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants. All data were confidential and protected at all stages of the study.

## Conflict of Interest Statement

The authors have no conflicts of interest to declare.

## Funding Sources

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## Author Contributions

Ana Barros participated in the preparation of the instrument, conception, design, and interpretation of data and review of the article. Madalena Pereiro participated in data collection, interpretation of data, and writing and review of the article. Rita Espanha participated in the conception, design, and review of the article.

## Data Availability Statement

The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials.

## References

- 1 World Health Organization. WHO report on cancer: setting priorities, investing wisely and providing care for all. Geneva: World Health Organization; 2020.
- 2 Barros A, Santos H, Moreira L, Santos-Silva F. Translation and cross-cultural adaptation of the cancer health literacy test for Portuguese cancer patients: a pre-test. *Int J Environ Res Public Health*. 2022;19(10):6237. <https://doi.org/10.3390/ijerph19106237>
- 3 Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2024;74(3):229–63. <https://doi.org/10.3322/caac.21834>
- 4 Portugal. Ministério da Saúde. Direção Geral da Saúde. Programa Nacional para as Doenças Oncológicas. Lisboa: Direção Geral da Saúde; 2020.
- 5 Diviani N, Schulz PJ. First insights on the validity of the concept of cancer literacy: a test in a sample of Ticino (Switzerland) residents. *Patient Educ Couns*. 2012;87(2):152–9. <https://doi.org/10.1016/j.pec.2011.08.016>
- 6 Portugal. Ministério da Saúde. Direção-Geral da Saúde. Programa Nacional para a Prevenção e Controlo do Tabagismo. Lisboa: Direção Geral da Saúde; 2019.
- 7 Sorensen K, Makaroff LE, Myers L, Robinson P, Henning GJ, Gunther CE, et al. The call for a strategic framework to improve cancer literacy in Europe. *Arch Public Health*. 2020;78(1):60–4. <https://doi.org/10.1186/s13690-020-00441-y>
- 8 Altay B, Avci IA, Rizalar S, Oz H, Meral D. Breast and cervical cancer knowledge and awareness among university students. *Asian Pac J Cancer Prev*. 2015;16(5):1719–24. <https://doi.org/10.7314/apjcp.2015.16.5.1719>
- 9 Tomic M, Vescan ML, Ungureanu MI. Exploring female medical students' knowledge, attitudes, practices, and perceptions related to breast cancer screening: a scoping review. *J Med Life*. 2023;16(12):1732–9. <https://doi.org/10.25122/jml-2023-0412>
- 10 Islam MA, AlShayban DM, Nisa ZU, Al-Hawaj GAM, Al-Eid GHA, Alenazi AMM, et al. What is the current state of awareness, knowledge, and attitudes toward breast cancer? A cross-sectional survey among health and non-health college students. *Front Public Health*. 2022;10:838579. <https://doi.org/10.3389/fpubh.2022.838579>
- 11 Gonçalves ACB. Prevenção do cancro da mama: conhecimento, atitude e prática. Coimbra: Faculdade de Medicina da Universidade de Coimbra; 2015. (Dissertação de Mestrado).
- 12 Ferreira C, Matos AA, Oliveira B, Bettencourt J. Cancro do colo do útero: o que sabem as jovens? *Rev Port Medicina Geral Familiar*. 2013;29(4):226–34. <https://doi.org/10.32385/rpmgf.v29i4.11107>



- 13 Agostinho MIR. Conhecimentos dos jovens universitários sobre HPV e cancro do colo do útero, na era da vacina. Porto: Instituto de Ciências Biomédicas Abel Salazar; 2012. (Dissertação de Mestrado).
- 14 Gomes NC. Avaliação do conhecimento de jovens adultos sobre o vírus do papiloma humano e cancro do colo do útero. Porto: Faculdade de Medicina da Universidade do Porto; 2023. (Dissertação de Mestrado).
- 15 Yilmaz M, Yavuz B, Subasi M, Kartal A, Celebioglu A, Kacar H, et al. Skin cancer knowledge and sun protection behavior among nursing students. *Jpn J Nurs Sci*. 2015; 12(1):69–78. <https://doi.org/10.1111/jjns.12049>
- 16 Rodrigues A, Fernandes-Machado S, Neves Alves M, Corrêa MDP, Correia O, Césarini P. Proteção solar em crianças e jovens portugueses: um estudo transversal. *Psic Saude Doencas*. 2014;15(3). <https://doi.org/10.15309/14psd150321>
- 17 Barros A, Santos H, Moreira L, Ribeiro N, Silva L, Santos-Silva F. The Cancer: educate to prevent model: the potential of school environment for primary prevention of cancer. *J Cancer Educ*. 2016;31(4):646–51. <https://doi.org/10.1007/s13187-015-0892-2>
- 18 Colditz GA, Wei EK. Preventability of cancer: the relative contributions of biologic and social and physical environmental determinants of cancer mortality. *Annu Rev Public Health*. 2012;33:137–56. <https://doi.org/10.1146/annurev-publhealth-031811-124627>
- 19 Abraham O, Szela L, Feng E, Egbujor M, Gay S. Exploring youth perceptions about cancer prevention and preferences for education: a qualitative study. *J Cancer Educ*. 2023;38(1): 50–9. <https://doi.org/10.1007/s13187-021-02077-0>
- 20 Barros A, Moreira L, Santos H, Ribeiro N, Santos-Silva F. Development of a measurement tool to assess students' knowledge and perceptions about cancer (SKPaC). *J Cancer Educ*. 2019;34(3):556–61. <https://doi.org/10.1007/s13187-018-1341-9>
- 21 Barros ACR. Health communication: a new model to promote cancer prevention campaigns at schools. Porto: Faculty of Sciences of the University of Porto; 2014. (PhD Thesis).
- 22 Portugal. Ministério da Saúde. Direção Geral da Saúde. Rastreio do cancro colo-retal. Lisboa: Direção-Geral da Saúde; 2018.
- 23 Ferreira PM, Lunet N, Silva S. A informação sobre saúde dos portugueses: fontes, conhecimentos e comportamentos. In: Lisboa: Associação para a Investigação e Desenvolvimento da Faculdade de Medicina; 2017.
- 24 Yelton B, Lead JR, Adams SA, Brandt HM, Kulkarni S, Lewis KR, et al. How do African-American community members' perceptions about environmental risks of breast cancer compare with the current state of the science? *J Cancer Educ*. 2021;36(6):1193–200. <https://doi.org/10.1007/s13187-020-01748-8>
- 25 Galvão AM, Costa C, Gomes MJ, Noné AR. Literacia sobre o Papiloma Vírus Humano (HPV) e Cancro do Colo do Útero (CCU): estudo exploratório em estudantes da área da saúde do ensino superior. Lisboa: Ordem dos Psicólogos Portugueses; 2016.
- 26 Pedro A, Pacheco A, Sousa R, Mendinhos G, Miranda M, Urzal C, et al. Consensus guidelines for the management of abnormal cervical cancer screening tests by the SPCPTGI. *Acta Med Port*. 2023;36(4):285–9.
- 27 Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2021;71(3):209–49. <https://doi.org/10.3322/caac.21660>
- 28 Di Giuseppe G, Pelullo CP, Mitidieri M, Lioi G, Pavia M. Cancer prevention: knowledge, attitudes and lifestyle cancer-related behaviors among adolescents in Italy. *Int J Environ Res Public Health*. 2020;17(22):8294. <https://doi.org/10.3390/ijerph17228294>
- 29 Ozen N, Bal Ozkaptan B, Coskun S, Terzioğlu F. Health literacy of nursing students and its effective factors. *Nurs Forum*. 2019;54(3):396–402. <https://doi.org/10.1111/nuf.12346>