

Cancer awareness in older adults: Results from the Spanish Onco-barometer cross-sectional survey

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ABSTRACT

Background: About half of all cancers are diagnosed in adults older than 65, making them the age group at highest risk of developing this disease. Nurses from different specialties can support individuals and communities in the prevention and early detection of cancer and should be aware of the common knowledge gaps and perceived barriers among older adults.

Objectives: The goal of the current research was to investigate personal characteristics, perceived barriers, and beliefs related to cancer awareness in older adults, with a special focus on perceptions about the influence of cancer risk factors, knowledge of cancer symptoms, and anticipated help-seeking.

Design: Descriptive cross-sectional study.

Participants: Participants were 1213 older adults (≥ 65 years old) from the representative national Onco-barometer survey conducted in 2020 in Spain.

Methods: Questions on the perceived influence of cancer risk factors, knowledge of cancer symptoms, and the Spanish version of the Awareness and Beliefs about Cancer (ABC) questionnaire were administered in computer-assisted telephone interviews.

Results: Knowledge of cancer risk factors and symptoms was strongly related to personal characteristics and was limited among males and older individuals. Respondents from lower socio-economic background recognized fewer cancer symptoms. Having personal or family history of cancer had opposite effects on cancer awareness: It was related to more accurate symptom knowledge but also to lower perceptions about the influence of risk factors and more delayed help-seeking. Anticipated help-seeking times were strongly influenced by perceived barriers to help-seeking and beliefs about cancer. Worry about wasting the doctor's time (48% increase, 95% CI [25%–75%]), about what the doctor might find (21% increase [3%–43%]) and not having enough time to go to the doctor (30% increase [5%–60%]) were related to more delayed help-seeking intentions. In contrast, beliefs that reflected higher perceived seriousness of a potential cancer diagnosis were related to shorter anticipated help-seeking times (19% decrease [5%–33%]).

Conclusions: These results suggest that older adults could benefit from interventions informing them about how to reduce their cancer risk and addressing emotional barriers and beliefs associated with help-seeking delays. Nurses can contribute to educating this vulnerable group and are in a unique position to address some barriers to help-seeking.

Study registration: Not registered.

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What is already known

- The burden of cancer can be substantially reduced through prevention and early detection efforts.
- Older adults are the age group at highest risk of developing cancer but often lack knowledge about prevention or face diverse barriers to cancer detection.

- Nurses from different specialties are in a unique position to educate and guide this vulnerable group.

What this paper adds

- Essential knowledge about cancer prevention and detection was limited among males, individuals over 75 years old, and individuals from lower socio-economic background.
- Help-seeking intentions for cancer symptoms were related to several specific barriers (e.g., worry about wasting the doctor's time) and beliefs about cancer.
- The findings from this large national survey can help design media education campaigns or nurse-led interventions targeting older adults.

1. Introduction

Cancer is a leading cause of death worldwide, accounting for about 1 in 6 deaths, the majority due to lung, colorectal, liver, stomach, and breast cancer (World Health Organization, 2022). The burden of cancer can be substantially reduced through prevention (i.e., elimination or reduction of the causes of cancer) and early detection efforts (i.e., timely diagnosis and treatment of the disease) (Anand et al., 2008; Schüz et al., 2015). The success of such efforts depends on both collective actions, such as policies to limit risk exposure to cancer causing agents or to establish screening programs, and individual actions, such as having a healthy lifestyle and seeking help for potential symptoms (Schüz et al., 2015). Importantly, for individuals to act against cancer, they need to have some basic knowledge about the disease and be aware of what the recommended actions are. In particular, three key components of cancer awareness among the general population include knowledge of cancer risk and prevention factors, recognition of cancer symptoms, and intentions to seek help if experiencing these symptoms (Simon et al., 2012; Stubbings et al., 2009; Robb et al., 2009; Waller et al., 2009).

The European Code Against Cancer (ECAC) provides essential information about established risk and protective factors for cancer prevention, with a special focus on the actions that people can take to reduce their risk (Schüz et al., 2015). However, previous studies in Europe and other high-income countries have shown that awareness of cancer risk factors is variable and generally low among the general population (Petrova et al., 2021a; Lamore et al., 2019; Lagerlund et al., 2015; American Institute for Cancer Research (AICR), 2019; Redeker et al., 2009; Ryan et al., 2015). For instance, tobacco consumption tends to be recognized by the majority of the population, whereas other relevant lifestyle factors that influence cancer risk such as healthy diet, healthy weight, physical activity, limited alcohol consumption, and sexually-transmitted infections frequently remain unrecognized (Petrova et al., 2021a; Lagerlund et al., 2015). Importantly, awareness of cancer risk factors varies strongly as a function of personal and socio-demographic characteristics, and studies consistently find lower knowledge in older individuals (Petrova et al., 2021a; Lagerlund et al., 2015; Adlard and Hume, 2003), in individuals with lower socio-economic status (Petrova et al., 2021a; Redeker et al., 2009; Wardle et al., 2001; Sanderson et al., 2009), and among men (Petrova et al., 2021a; Adlard and Hume, 2003; Wardle et al., 2001).

Longer delays between the start of cancer symptoms and the diagnosis and/or treatment are associated with worse patient outcomes such as a more advanced stage and lower survival for different types of cancer (Neal et al., 2015; Hanna et al., 2020). These results suggest that it is essential for individuals at risk to recognize the warning signs of cancer and seek help promptly after symptom discovery. However, previous population surveys have shown that knowledge of cancer symptoms is variable (Robb et al., 2009; Waller et al., 2009; van Osch et al., 2007; Rendle et al., 2019) and the majority of people identify many cancer symptoms as such when presented with a list but cannot name many of them when asked in an open-ended question (Waller et al., 2004). According to the results of a meta-analysis, recognition and/or recall of a larger number of cancer symptoms has been related to more timely help-seeking in both studies

with patients recently diagnosed with cancer and surveys of healthy populations (Petrova et al., 2020). In addition, more delayed help-seeking for cancer symptoms is found among both men and younger individuals (Robb et al., 2009; van Osch et al., 2007; Donnelly et al., 2017; Moffat et al., 2016; Petrova et al., 2021b) and among persons who experience specific barriers to help-seeking (Robb et al., 2009; Donnelly et al., 2017) or have negative beliefs about cancer (Petrova et al., 2020).

Cancer can be diagnosed at any age. However, incidence increases rapidly with age, such that about half of all cancers are diagnosed in people older than 65 (National Cancer Institute (NCI), 2021), making them the age group at highest risk to develop cancer. Older adults are also at higher risk of suffering other diverse chronic diseases (e.g., cardiovascular, infectious, neurodegenerative disorders), which can interfere in different ways with the recognition and help-seeking for cancer symptoms (Sarfati et al., 2016). Differentiating the symptoms of cancer from normal signs of aging could also be difficult and could increase the time elapsed between detection of bodily changes and perceiving the need to consult with a healthcare professional (Jones et al., 2022). Finally, compared to younger adults, older adults are often less exposed to cancer awareness campaigns or prevention information due to their limited access and less frequent use of modern technologies. This may have consequences for their help-seeking behavior (Petrova et al., 2021b), raising the need for research focused on this population group at highest risk.

Nurses are the largest group of health professionals and are well-placed to help reduce the burden of cancer (Yates et al., 2020; Challinor et al., 2016). They can lead and participate in activities across the entire cancer trajectory from cancer education to survivorship (Yates et al., 2020; Challinor et al., 2016). To illustrate, nurses from different specialties including primary care, public health, community health, outpatient care, occupational health, and oncology can contribute to cancer control because they are in an ideal position to educate patients about both prevention and early detection of cancer (*Said another way nurses' role in cancer control*, 2009). Some specific examples of the contribution of nurses to the prevention and early detection of cancer include: implementing preventive interventions at the individual or community level; identifying risk factors and communicating with individuals, families, and communities about how to change behavior and reduce cancer risk; increasing adherence to screening guidelines, and educating community health workers about when to refer patients for further evaluation due to potential cancer symptoms (Yates et al., 2020). In Europe, the key role of nurses in cancer prevention and detection is recognized by the European Oncology Nursing Society which has included in its Cancer Nursing Education Framework a core competency module on risk reduction, early detection, and health promotion in cancer care (European Oncology Nursing Society (EONS), 2018). In Spain, the latest Spanish National Health System Cancer Strategy aims to launch training courses for primary care nurses to help improve cancer diagnosis in both adults and children (Ministerio de Sanidad, 2021).

Nurses are often presented with unique opportunities to inform older adults about cancer prevention or help with early diagnosis because of their frequent contact with this group in the context of other comorbidities or health screenings. The lower exposure of older adults to modern technologies that today spread cancer prevention information also makes nurses a very valuable resource in the cancer prevention and detection setting. Nurses are trained to identify disease risk factors and have the necessary skills to communicate and teach individuals, family members, and communities to help adopt healthier lifestyles and practices that can reduce cancer risk (Challinor et al., 2016). In order to effectively guide and support older adults and their families, nurses should be aware of the common cancer knowledge gaps and perceived barriers in this population.

Previous studies about cancer awareness conducted in general population samples from Spain indicate that people's knowledge of symptoms and risk factors is generally low (Varela-Centelles et al., 2021a; Asociación Española contra el Cáncer (AECC), 2010). However, these studies focused on specific cancers or were conducted more than a

decade ago and did not report on older adults (Varela-Centelles et al., 2021a; Asociación Española contra el Cáncer (AECC), 2010). In addition, in Spain, help-seeking for cancer symptoms has been studied mostly in patients diagnosed with cancer and in relation to clinical factors (Esteve et al., 2013; León et al., 2022; Varela-Centelles et al., 2021b; Zarcos-Pedrinaci et al., 2018), leaving the role of perceived barriers and beliefs about cancer in the older population unexplored. To the best of our knowledge, no previous study from Spain or another comparable high-income country has examined diverse components of cancer awareness in the general population of older adults and in relation to socio-demographic factors, perceived barriers, and beliefs.

To address this gap, the first goal of the current research was to assess three essential components of cancer awareness in older adults from the general population: Their perceptions about the influence of diverse cancer risk factors, their knowledge of cancer symptoms, and anticipated help-seeking for cancer symptoms. The second goal of this research was to investigate personal characteristics, perceived barriers, and beliefs associated with each of these cancer awareness components.

2. Methods

This was a descriptive cross-sectional study based on the Onco-barometer, a periodic population-based survey conducted by the Spanish Association against Cancer (www.aecc.es). The Onco-barometer is a probabilistic national (i.e., representative) survey about cancer. Data collection for the 2020 edition took place in two waves: from 10 February 2020 to 13 March 2020 (wave 1) and from 24 August 2020 to 08 September 2020 (wave 2) (Petrova et al., 2021b). This was not per study design but was a result of the circumstances of the Covid-19 global pandemic that interrupted data collection.

The data were collected by a specialized research market company under contract by the Spanish Association against Cancer. A two-stage sampling design was used to obtain the study sample: first, a stratified random sample of households was selected proportional to the population sizes of the Spanish Autonomous Regions; second, sampling units were selected by applying sex and age quotas with one interview per household. The response rate was 64.1% and in the case of unit non-response, a replacement sampling unit was selected consistent with the sex and age quotas until these were filled. Interviews were conducted by telephone by experienced interviewers previously trained in the subject of the survey and were computer-assisted.

Men and women, 18 years old or older, and who were able to speak Spanish, were eligible to participate in the survey. A total of 4769 respondents completed the survey. For the current study, we selected respondents who were 65 years old or older, who did not have cancer when the survey was conducted, and had data available on all the relevant measures ($n = 1213$ respondents).

2.1. Measures

The measures administered were based on the previous edition of the Onco-barometer, conducted in 2010 (Asociación Española contra el Cáncer (AECC), 2010) and the Spanish version of the Awareness and Beliefs about Cancer (ABC) questionnaire (Simon et al., 2012; Petrova et al., 2021b) by the International Cancer Benchmarking Partnership (ICBP). Questions from the previous Onco-barometer covered personal characteristics, symptom knowledge, perceptions about the influence of risk factors, perceptions about the risk of cancer, and fear of suffering cancer. Questions from the ABC questionnaire measured anticipated help-seeking for cancer symptoms, perceived barriers to help-seeking, and beliefs about cancer.

2.1.1. Independent variables

2.1.1.1. Personal characteristics. Respondents indicated their age, sex, and civil status (single, married or cohabiting with a partner, separated or

divorced, widowed, and other). Socio-economic status was categorized into 7 groups following the methodology of the Spanish National Health Survey and the Spanish Epidemiology Society, based on information about education and income (National Statistics Institute of Spain and Ministry of Health, 2017). Respondents indicated if they had previous personal history of cancer (i.e., if a health professional ever told them they had cancer: yes vs. no) and if they ever had a close family member (e.g., first or second degree relative) diagnosed with cancer (yes vs. no).

2.1.1.2. Cancer fear rank. Respondents were asked which of the following situations would make them most afraid: neurodegenerative disease, heart attack, acquired immunodeficiency syndrome (AIDS), car accident, cancer, a mental disorder, disease different to the ones mentioned above, or none (Asociación Española contra el Cáncer (AECC), 2010). A variable "cancer fear rank" was created with the category "highest" for those respondents who had ranked cancer as the most fearful situation, and "lower" for those who had selected another option.

2.1.1.3. Perceived risk of cancer. Respondents were asked how they perceived their risk of developing any type of cancer during their lifetime, with the answer options in the categories "very high", "high", "low", "very low", or "I do not know" (Asociación Española contra el Cáncer (AECC), 2010). Due to low frequencies of use, the categories "very high" and "very low" were combined with "high" and "low", respectively.

2.1.1.4. Perceived barriers to help-seeking. Respondents were asked whether each of the following reasons would make them delay consulting their physician: being embarrassed, being worried about wasting the doctor's time, being worried about what the doctor might find, and not having enough time to go to the doctor (Simon et al., 2012). The answer to each of these potential barriers to help-seeking was recorded as "Yes, often", "Yes, sometimes", "No", and "Do not know" (or do not answer). Following previous studies (Petrova et al., 2021b; Forbes et al., 2013), each barrier was then categorized as experienced if the respondent selected any of the "Yes" options.

2.1.1.5. Beliefs about cancer. Respondents were asked to what extent they agreed with each of six statements regarding cancer (Simon et al., 2012): 1) "These days, many people with cancer can expect to continue with normal activities and responsibilities", 2) "Cancer can often be cured", 3) "Going to the doctor as quickly as possible after noticing a symptom of cancer could increase the chances of surviving", 4) "Most cancer treatment is worse than the cancer itself", 5) "I would not want to know if I have cancer", and 6) "Some people think that a diagnosis of cancer is a death sentence. To what extent do you agree or disagree that a diagnosis of cancer is a death sentence?". The answer to each statement was recorded as "Strongly agree", "Agree", "Disagree", "Strongly disagree", or "Do not know" (or does not answer). Following a previous study (Forbes et al., 2013) and due to the low frequency of use of the "strongly" options on most items, the "Strongly agree/disagree" categories were combined with "Agree" and "Disagree", respectively.

2.1.2. Outcome variables

2.1.2.1. Perceptions of cancer risk factors. Respondents were asked "How much influence do you think each of the following aspects has for a person to develop cancer?" with answer options from 1 (has no influence) to 10 (lots of influence) (Petrova et al., 2021a; Asociación Española contra el Cáncer (AECC), 2012). The question was asked for 10 factors related to cancer, including tobacco, alcohol, diet, weight, sunlight exposure, family history of cancer, atmospheric pollution, radiation, sexually transmitted diseases, and toxic substances. Following a previous study (Petrova et al., 2021a), "I don't know" answers and scores < 5 (the mid-point of the scale) were considered as unclear/low perceived influence and the number of risk factors with low perceived influence was calculated (scores ranging from 0 to 10).

2.1.2.2. *Knowledge of cancer symptoms.* This was measured using the method of unprompted recall (Waller et al., 2004). Respondents were asked if they knew any symptoms or warning signs that would make them think that they might have cancer (yes or no). Respondents who answered affirmatively were asked using an open-ended question what symptoms they knew. The interviewers recorded positive answers for up to five common cancer symptoms from among the following: a lump or nodule; a wound or sore that would not heal; persistent pain over time; a spot or mole that changes in shape, size, or color; abnormal bleeding or hemorrhages; persistent cough and/or hoarseness; changes in urinary or bowel habits; unexplained weight loss, tiredness/weakness, and fever. The number of recognized symptoms was calculated, ranging from 0 to 5.

2.1.2.3. *Anticipated times to help-seeking.* Respondents were presented with 13 possible cancer warning signs and were asked how long they

would wait before consulting their physician from the moment that they detected each symptom for the first time. Answers were unprompted (respondents answered freely) and were then assigned to one of the categories provided by the ABC instrument including “I would consult as soon as possible”, “Less than a week”, “Between 1 and 2 weeks”, “Between 2 and 3 weeks”, “Between 3 and 4 weeks”, “More than a month”, “I would not contact my physician for that”, and “I would contact another health professional” (Simon et al., 2012; Petrova et al., 2021b). Following previous studies (Robb et al., 2009; Waller et al., 2009; Petrova et al., 2021b; de Nooijer et al., 2003), the answers to each symptom were categorized as “delayed” or “not delayed”. For symptoms perceived as more urgent in the full survey sample waiting more than a week was categorized as “delayed” (i.e., for symptoms with help-seeking within a week for 50% or more respondents: unexplained bleeding, breast changes (only presented to women), unexplained lump or swelling, persistent difficulty in swallowing,

Table 1
Descriptive statistics for study variables.

Independent variables		Category	N	Percent
Personal characteristics	Sex	Female	752	62.0%
		Male	461	38.0%
	Socio-economic status ^a	Group 1 (highest)	102	8.4%
		Group 2	162	13.4%
		Group 3	193	15.9%
		Group 4	37	3.1%
		Group 5	139	11.5%
		Group 6	283	23.3%
		Group 7 (lowest)	173	14.3%
	Does not respond/missing	124	10.2%	
Civil status	Married or cohabiting	731	60.3%	
	Single	99	8.2%	
	Separated/divorced	71	5.9%	
	Widowed	306	25.2%	
	Other	6	0.5%	
Perceptions of cancer	Personal history of cancer	Yes	223	18.4%
	Family history of cancer	Yes	866	71.4%
	Cancer fear rank	Highest	311	25.6%
		Lower	902	74.4%
	Perceived risk of cancer	Do not know	243	20.0%
High		496	40.9%	
Low		474	39.1%	
Perceived barriers to help-seeking	Being embarrassed	Yes	66	5.4%
		Yes	213	17.6%
	Worried about wasting the doctor's time	Yes	229	18.9%
		Yes	128	10.6%
	Worried about what the doctor might find	Agree	906	74.7%
		Disagree	233	19.2%
	Not having enough time to go to the doctor	Do not know	74	6.1%
		Agree	1012	83.4%
	These days, many people with cancer can expect to continue with normal activities and responsibilities	Disagree	132	10.9%
		Do not know	69	5.7%
	Cancer can often be cured	Agree	1165	96.0%
		Disagree	25	2.1%
	Going to the doctor as quickly as possible after noticing a symptom of cancer could increase the chances of surviving	Do not know	23	1.9%
		Agree	490	40.4%
	Most cancer treatment is worse than the cancer itself	Disagree	550	45.3%
		Do not know	173	14.3%
	I would not want to know if I have cancer	Agree	204	16.8%
		Disagree	969	79.9%
	A diagnosis of cancer is a death sentence	Do not know	40	3.3%
Agree		224	18.5%	
	Disagree	926	76.3%	
	Do not know	63	5.2%	
Outcome variables		Mean (SD)	Min, Q1, Q2, Q3, Max	
Cancer awareness	Perceptions of cancer risk factors score	2.4 (2.2)	0, 1, 2, 4, 10	
	Knowledge of cancer symptoms score	0.5 (0.9)	0, 0, 0, 1, 5	
	Anticipated times to help-seeking score	3.0 (3.2)	0, 0, 2, 5, 13	

^a Group 1: Directors and managers of establishments with 10 or more employees and professionals traditionally associated with university degrees. Group 2: Directors and managers of establishments with fewer than 10 employees and professionals traditionally associated with university degrees. Group 3: Intermediate occupations: employees of the administrative type and professionals supporting administrative management. Group 4: Free-lancers/self-employed. Group 5: Supervisors and workers in qualified technical occupations. Group 6: Qualified workers of the primary sector and other semi-qualified workers. Group 7: Unskilled workers.

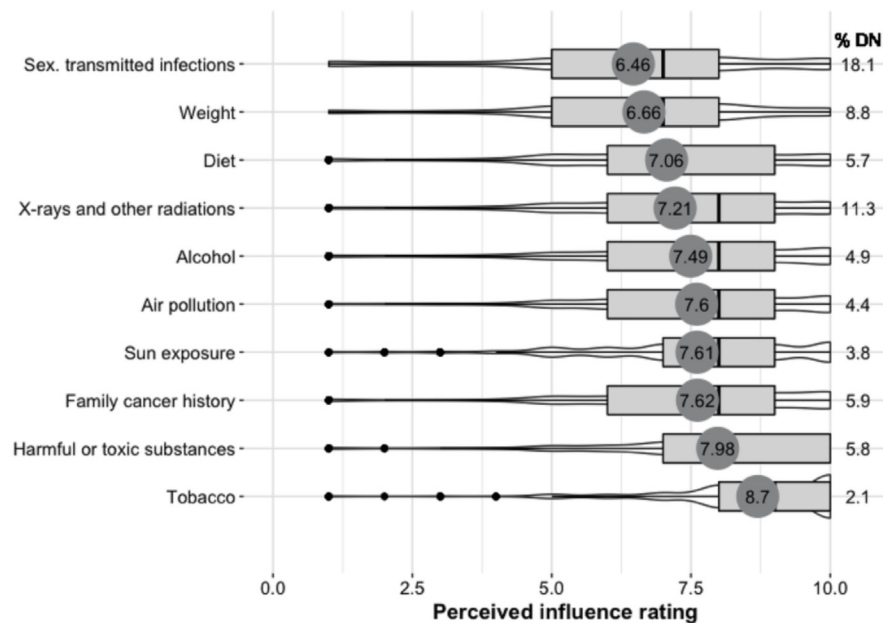


Fig. 1. Perceived influence ratings for 10 cancer risk factors on a scale ranging from 1 (no influence) to 10 (a lot of influence). The line that divides each box in two is the median; the dimensions of the box are the interquartile range; the value in the gray circle is the mean. % DN = Percentage of “I don’t know” / “Does not answer” responses.

persistent unexplained pain, change in the appearance of a mole, a sore that does not heal, and abdominal swelling). In the case of the symptoms perceived as less urgent (change in bowel or bladder habits, unexplained weight loss, persistent cough or hoarseness, unexplained night sweats, and unexplained tiredness) waiting more than 2 weeks was categorized as delayed. The number of symptoms with a “delayed” response was calculated generating a total delay score for each respondent (0 to 13). Answers indicating that the respondent would contact another healthcare professional (0.0%–0.3%) were dropped from this calculation, because the delay was not clear.

2.2. Analyses

Analyses were conducted in SPSS (v. 26) (IBM Corp, 2019) and in R (v.3.6.2) using the package “survey” (v.3.37) (Lumley, 2020). Survey sampling weights were applied in all analyses. The outcome variables of interest were the scores for perceptions of risk factor influence (ranging from 0 to 10), knowledge of cancer symptoms (ranging from 0 to 5), and anticipated times to help-seeking (ranging from 0 to 13). Because responses were non-negative integer values, we used models adequate for the analysis of count-type data. In particular, to investigate what variables were uniquely associated with the outcome variables we used generalized linear models based on maximum likelihood estimation. In the case of symptom knowledge, assumptions for using a Poisson regression were met (no off-set was needed because the scores represent individual counts and not rates). In the case of perceptions of risk factor influence and anticipated times to help-seeking scores, there was overdispersion, so instead of using a Poisson regression, we conducted negative binomial regressions that are more suitable for data with such characteristics. To determine significance, we consulted 95% Wald confidence intervals (CI) for the model coefficients. Cases with missing values on any of the variables were excluded from analyses (<0.5% for each analysis).

As sensitivity analyses, we repeated the analysis using other cut-offs to construct the scores for perceptions of risk factor influence and anticipated times to help-seeking. In particular, in the case of perceptions of risk factor influence, as an alternative strategy we categorized as unclear/low perceived influence “I don’t know” answers and scores <6. In the case of anticipated times to help-seeking, as an alternative strategy we considered waiting more than a week as “delay” for all symptoms.

3. Results

Descriptive statistics for all study variables are reported in Table 1.

3.1. Perceptions of risk factor influence

The perceived influence ratings for each cancer risk factor are displayed in Fig. 1. Tobacco was the risk factor with highest perceived influence on cancer development. In contrast, sexually transmitted infections (STIs), followed by weight, diet, radiation, and alcohol consumption had the least perceived influence. The percentage of “I don’t know” responses was highest for STIs, followed by radiation and weight.

Detailed results from a multiple regression model on the perceptions of risk factor influence scores are displayed in Table S1. Older individuals ($p = 0.002$), men ($p = 0.002$), and those with a personal history of cancer ($p = 0.023$) reported a larger number of risk factors with low perceived influence (see also Figs. S1 and S2). Compared to respondents without history of cancer, those who had personal history of cancer reported 18% (95% CI 2%–36%) more risk factors with low perceived influence. Respondents who recognized a larger number of cancer symptoms reported a lower number of risk factors with low perceived influence: for every additional symptom recognized, the number of

Table 2

Percentage of respondents (out of $n = 1213$) and 95% confidence intervals (CI) mentioning each cancer symptom in an unprompted recall question (“Do you know any symptoms or warning signs that would make you think that you might have cancer? If yes, what symptoms?”).

Symptom	Percentage (95% CI)
None	65.7 (63.0–68.3)
Lump or nodule	15.4 (13.4–17.5)
A spot or mole that changes shape, size, or color	9.0 (7.5–10.7)
Abnormal bleeding	8.7 (7.2–10.4)
Unexplained weight loss	4.8 (3.7–6.1)
Persistent pain	4.4 (3.3–5.6)
Tiredness, fatigue	3.4 (2.5–4.5)
Persistent cough or hoarseness	2.5 (1.7–3.4)
Changes in urinary or bowel habits	2.1 (1.4–3.1)
Fever	0.6 (0.3–1.1)
Wound or sore that does not heal	0.1 (0.0–0.4)

Table 3

Percentage of respondents (out of $n = 1213$) indicating anticipated help-seeking times for 13 possible cancer warning signs.

Symptom	How long would you wait to consult your physician from the moment you detect the symptom for the first time?			
	<1 week	1–2 weeks	2–3 weeks	>3 weeks
Breast changes	90.5	5.6	1.6	2.3
Unexplained bleeding	89.7	7.3	1.0	2.0
Unexplained lump or swelling	80.3	13.1	2.1	4.5
Persistent difficulty in swallowing	77.5	15.9	2.2	4.4
Persistent unexplained pain	71.3	18.0	3.7	7.0
A sore that does not heal	67.6	22.2	5.0	5.3
Change in the appearance of a mole	66.1	16.1	4.7	13.1
Change in bowel or bladder habits	64.7	21.5	4.7	9.1
Abdominal swelling	62.6	21.6	5.6	10.2
Unexplained weight loss	56.7	19.7	7.5	16.1
Persistent cough or hoarseness	50.1	26.8	6.8	16.3
Unexplained tiredness	48.2	26.7	6.8	18.3
Unexplained night sweats	46.5	21.6	6.3	25.6

risk factors with low perceived influence was 9% lower (95% CI 3%–14%, $p = 0.004$). Finally, those who had higher help-seeking delay scores reported a larger number of factors with low perceived influence: each

additional symptom with delayed help-seeking was associated with a 2% increase in the number of risk factors with low perceived influence (95% CI 0%–4%, $p = 0.022$).

3.2. Knowledge of cancer symptoms

The majority of respondents reported not knowing any cancer symptoms (see Table 2).

Men ($p < 0.001$), older individuals ($p < 0.001$), individuals with lower socio-economic status ($p < 0.014$), and those without personal ($p < 0.001$) or family history ($p = 0.002$) of cancer recognized a smaller number of cancer symptoms (see Table S1 for multiple regression results and Figs. S1 and S2). To further illustrate, the mean predicted number of recognized cancer symptoms in the lowest socio-economic group (Group 7) was 0.31 (SE = 0.01) and this increased gradually across the following groups to reach a mean of 0.87 (SE = 0.04) for the highest group (Group 1, $p < 0.001$). Respondents who had personal or family cancer history recognized 51% (95% CI 24%–83%, $p < 0.001$) and 36% (95% CI 12%–64%, $p = 0.002$) more symptoms, respectively, compared to those without history. Respondents who perceived low risk from cancer recognized a larger number of symptoms ($M = 0.56$, SE = 0.02) compared to those who perceived high risk ($M = 0.52$, SE = 0.02, $p = 0.054$) or did not know ($M = 0.39$, SE = 0.02, $p = 0.044$).

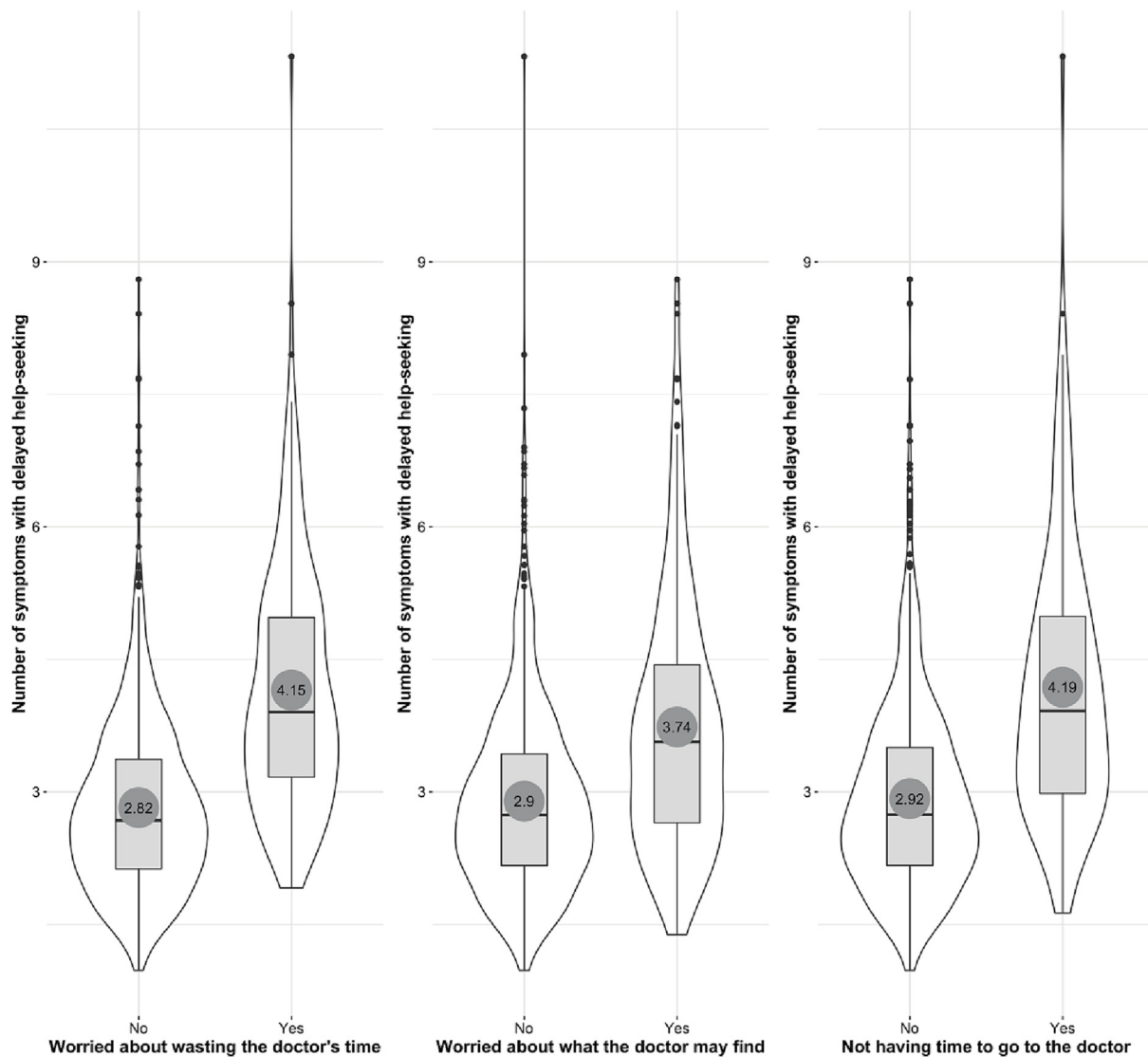


Fig. 2. Predicted anticipated help-seeking scores (i.e., number of symptoms with delayed help-seeking) as a function of reporting different barriers based on the multiple regression model adjusted for the rest of study variables. The line that divides each box in two is the median; the dimensions of the box are the interquartile range; the value in the gray circle is the mean.

3.3. Anticipated times to help-seeking

The quickest help-seeking times were reported for the symptoms breast changes, unexplained bleeding, unexplained lump or swelling, and persistent difficulty in swallowing (see Table 3). In contrast, anticipated help-seeking was slowest for unexplained night sweats, unexplained tiredness, persistent cough or hoarseness, and unexplained weight loss.

Anticipated times to help-seeking scores were larger for younger individuals ($p < 0.001$) and individuals with family history of cancer ($p = 0.048$) (see Table S1). Longer times to help-seeking were also reported by individuals who perceived barriers to help-seeking including worry about wasting the doctor's time (48% increase, 95% CI 25%–75%, $p < 0.001$), worry about what the doctor might find (21% increase, 95% CI 3%–43%, $p = 0.023$), and not having enough time to go to the doctor (30% increase, 95% CI 5%–60%, $p = 0.014$) (see Fig. 2). Beliefs about cancer were also significantly related to help-seeking scores. Individuals who agreed that cancer treatment is worse than cancer itself ($p = 0.010$), who agreed that a cancer diagnosis is a death sentence ($p = 0.010$), and who disagreed that they would not like to know if they had cancer ($p = 0.047$) had shorter help-seeking times (see Fig. S3).

3.4. Sensitivity analyses

Using the alternative scores for perceptions of risk factor influence did not change the pattern of results (see Table S2). Using the alternative anticipated times to help-seeking scores an additional pattern emerged such that respondents with lower socio-economic status (Groups 6 and 7) reported shorter help-seeking times compared to respondents with higher socio-economic status (Group 1) (see Table S2).

4. Discussion

Older adults are at highest risk of cancer but few recent population-based studies have investigated cancer awareness in this vulnerable population. In the current study, awareness of the influence of established cancer risk factors was variable, knowledge of cancer symptoms was poor, and anticipated help-seeking times were generally prompt. Essential knowledge about cancer (i.e., perceptions of cancer risk factors and knowledge of cancer symptoms) was strongly shaped by personal factors, including socio-demographic characteristics and previous experience with cancer. In contrast, anticipated help-seeking times were strongly influenced by perceived barriers to help-seeking and beliefs about cancer. These results can help nurses improve cancer prevention and detection practices targeting older adults.

Nurses are trained to identify behavioral risk factors and communicate with individuals, families, and communities to initiate behavior change (Challinor et al., 2016). The current results suggest that nurses should work to help raise awareness among older adults about potential cancer symptoms and risk factors. They should be especially vigilant not to let cancer symptoms go unnoticed among this population, especially among men, people of very advanced age, and people from lower socio-economic status. Nurses are also in a unique position to identify and address the documented barriers to help-seeking among older adults and change erroneous or extreme beliefs about cancer and its treatment that could interfere with timely help-seeking. Primary care nurses can help strengthen cancer prevention and detection efforts among the general population, whereas oncology nurses can work with survivors to help reduce behavioral risk factors for secondary cancer prevention. Nurses from all specialties, including public and community health, can be instrumental in designing and implementing individual and community interventions or research projects about cancer awareness in older adults (Yates et al., 2020; Challinor et al., 2016).

The current study was focused on older adults. However, results are consistent with those found in previous studies conducted in the

general population (Petrova et al., 2021a; Lagerlund et al., 2015; Adlard and Hume, 2003; Sanderson et al., 2009; van Osch et al., 2007; Sarma et al., 2020). These studies, conducted on general population samples from the UK, USA, the Netherlands, Sweden, and Denmark, have consistently shown a clear sex and age gradient on cancer awareness, such that knowledge about symptoms and risk factors for cancer is lower among men compared to women and among older compared to younger individuals (Petrova et al., 2021a; Lagerlund et al., 2015; Adlard and Hume, 2003; Sanderson et al., 2009; van Osch et al., 2007; Sarma et al., 2020). Our study focused on older adults shows that in this group, men and people older than 75 years old had lower knowledge about cancer risk factors and symptoms than females and relatively younger people (e.g., 65–74 years old), respectively. In particular, there was a linear effect of age such that symptom and risk factor awareness consistently decreased among older individuals, with the lowest awareness levels among individuals aged above 85 years old, followed by those aged 75–84 years old, with those aged 65–74 years old having the highest awareness. In line with recent results from the US (Sarma et al., 2020), symptom knowledge was also lower among individuals with lower socio-economic status. Overall, among older adults, knowledge about cancer appears to be lower among the socio-demographic groups at highest risk of cancer, including men, people older than 75 years old, and people from lower socio-economic background. Lower awareness about prevention and early detection could thus be one of the multiple factors contributing to the increased risk among these groups.

Having previous experience with cancer (personal or family history) had opposite effects on cancer awareness: It was related to better knowledge of cancer symptoms but also to lower perception of influence of cancer risk factors and to less prompt anticipated help-seeking. These results suggest that having experience with cancer appears to increase knowledge about the symptomatology of disease. However, the finding that people who have had cancer perceive lower influence from established cancer risk factors is surprising. Consistent with a cognitive mechanism called “availability heuristic” (Pachur et al., 2012), it is possible that one's own experience and characteristics serve as a very salient example that informs one's judgments (e.g., a person who was diagnosed with cancer despite having no family history, not smoking or drinking alcohol, may perceive less influence of those factors on the risk to develop cancer). Alternatively, lower perceptions of influence of modifiable risk factors among individuals who have experienced cancer could be a result of cognitive dissonance or avoidance coping (Roesch et al., 2005). Future studies should explore in more detail how having personal or family history shapes knowledge and beliefs about cancer, especially having in mind that in the current study people with family history of cancer reported longer help-seeking times. Finally, the proportion of respondents with experience with cancer was relatively large, suggesting that they were likely oversampled in the current survey (e.g., due to their potentially higher interest in participating in a study about cancer).

Anticipated help-seeking times for cancer symptoms were generally prompt, with at least half the sample reporting that they would not wait more than a week to seek help, even in the case of the least specific cancer symptoms such as unexplained weight loss, unexplained tiredness, or night sweats. However, we should note that anticipated help-seeking times measured in population surveys are probably a very optimistic approximation of actual help-seeking times, because experienced help-seeking times of patients diagnosed with cancer are normally much longer (McCutchan et al., 2015; Petrova et al., 2022). In addition, in many health systems, it is common to have to wait a certain number of days or weeks before receiving an appointment, which adds additional delay to the time it takes to be seen. Nevertheless, the current results are valuable because they illustrate the factors that may influence help-seeking intentions among older adults. A recent review concluded that older age is associated with prolonged symptom appraisal, such that the time from first noticing a bodily change to perceiving the

need to seek help may be longer in older adults due to symptoms being interpreted as old age or caused by existing comorbidities (Jones et al., 2022). However, once symptoms are perceived as potentially caused by cancer, older adults are quicker to seek professional help (Jones et al., 2022).

Worry about wasting the doctor's time, about what the doctor might find, and not having enough time to go to the doctor were all related to more delayed anticipated help-seeking and should be addressed in information campaigns or interventions targeting older adults. For instance, one of the most prominent barriers - worrying about wasting the doctor's time - could be addressed by giving a more prominent role to nurses in the early detection of cancer symptoms, as they can be perceived as more approachable and hence the possibility to consult with a nurse could decrease help-seeking delays. In contrast to studies from other Anglo-Saxon and Nordic countries (Donnelly et al., 2017), feeling embarrassed did not emerge as a barrier to timely help-seeking, perhaps due to cultural differences. Future research can investigate this hypothesis in cross-cultural studies including samples from different countries.

Similar to other studies, strong agreement with positive beliefs about cancer co-existed with moderate agreement with statements reflecting fears about treatment and survival (Quaife et al., 2015). It was these negative and not the positive beliefs that showed strong relationships with anticipated help-seeking. In particular, beliefs that in a way reflected more fear or perceived seriousness of a potential cancer diagnosis (i.e., equating cancer to a death sentence, believing that cancer treatment is worse than the disease itself) were related to shorter help-seeking times. These results are at odds with findings from the large international ICBP study in the United Kingdom, Australia, Canada, Denmark, Norway, and Sweden, where agreement with these negative statements was associated with longer anticipated time to help-seeking for persistent cough and rectal bleeding (Pedersen et al., 2018). It is possible that these discrepancies are due to cultural differences or age differences in the study samples, among other possibilities. In any case, the current research suggests that the psychological factors related to help-seeking intentions (e.g., perceived barriers or beliefs about cancer) differ across countries and/or cultures, and the results of previous studies on the topic cannot be easily generalized to other contexts.

Previous studies from Spain about cancer awareness or help-seeking for cancer symptoms have focused on specific cancers such as oral (Varela-Centelles et al., 2021a) and colorectal cancer (Esteve et al., 2013). Comparisons with the previous edition of the Spanish Onco-barometer in 2010 suggest that awareness of the influence of certain lifestyle factors such as diet and weight on the risk of developing cancer has increased in the general population (Petrova et al., 2021a). However, the 2020 edition of the Spanish Onco-barometer was the first to include a questionnaire on anticipated help-seeking times for cancer symptoms, so it is not possible to make comparisons with previous research.

4.1. Study limitations

The current study is limited by the potential for selection biases related to survey non-response. The sample of 1213 adults aged 65 and older was drawn from a representative national survey. Currently more than 9.5 million adults older than 65 reside in Spain (National Statistics Institute of Spain (Instituto Nacional de Estadística), 2022), thus the margin of error under 95% confidence is estimated at 3%. Data was also collected in two waves due to the Covid-19 global pandemic (something that has been addressed in detail in another publication using the full survey sample (Petrova et al., 2021b)) and this could limit the generalizability of results. The unique circumstances generated by the pandemic could have influenced the results in different ways, especially in perceived barriers and help-seeking (Quinn-Scoggins et al., 2021).

The risk factor influence measure did not include some relevant risk and prevention factors (e.g., physical activity, more detailed questions about the type of diet) which would be important to assess. In addition, the risk factor ratings can be analyzed in different ways. A previous

study with the Onco-barometer survey showed that analyzing the continuous ratings without taking the "I don't know" answers into account could introduce biases related to socio-economic status (Petrova et al., 2021a). For this reason, we constructed a score that takes these answers into account.

The symptom knowledge measure was based on unprompted recall and a maximum of 5 symptoms were recorded. Recognition of symptoms would likely have been much higher with a prompted list recognition measure (Waller et al., 2004).

Individuals who reported currently having cancer were excluded. It is possible that they were experiencing symptoms related to the cancer, which may have influenced their responses to the symptom items. Only 30 respondents who fulfilled the age criteria for inclusion reported currently having cancer, thus their number was also too small to analyze them as a separate group.

Cancer fear was not related to any of the outcome variables of interest. However, the variable used assessed fear only indirectly, because it was derived from a ranking of diseases according to how much fear they produced. Previous research shows that fear influences help-seeking after detection of symptoms. Some studies find that patients who are more afraid are more likely to delay help-seeking, whereas other studies find the opposite (Dubayova et al., 2010; Balasooriya-Smeekens et al., 2015). This suggests that fear could be both a barrier and a trigger to help-seeking and further research is needed to elucidate its role (Dubayova et al., 2010; Balasooriya-Smeekens et al., 2015).

Overall, the current results suggest that older adults could benefit from interventions informing them about ways that they can reduce their cancer risk and addressing the emotional barriers and beliefs associated with help-seeking delays. Consistent with Europe's Beating Cancer Plan aiming to make at least 80% of the population aware of the European Code against Cancer by 2025 (European Commission, 2022), the Spanish National Cancer Strategy has also emphasized distributing information about cancer prevention and risk factors among the general population (Ministerio de Sanidad, 2021), and in 2021 the Ministry of Health launched an information campaign about cancer prevention called "#CaptaElMensaje" ("#Get the message"). However, it is not clear to what extent this digital campaign has reached older adults. Nurses from different specialties have been instrumental in educating the public and implementing preventive interventions at both the individual and community levels about diverse cancer risk and protection factors such as smoking, screening, and vaccinations, to name a few; however, the potential of nurses to help reduce the burden of cancer is currently underrealized (Challinor et al., 2016). Campaigns that involve nurses have the potential to be more effective because of their frequent direct contact with older adults (e.g., in the context of other comorbidities or health screenings), the existence of a personal relationship, or the possibility to address individual or community-specific circumstances or barriers. Previous research shows that interventions delivered to individuals (Austoker et al., 2009) or community campaigns using social marketing strategies adapted to older adults can improve cancer awareness and patient help-seeking (Lai et al., 2021). The results of the current study could be helpful in the development of such media campaigns or nurse-led interventions.

Ethics approval

This study was based on analyses of anonymized secondary data: the Onco-barometer survey conducted by the Spanish Association against Cancer, for which informed consent was obtained from all respondents in accordance with the ICC/ESOMAR International Code on Market, Opinion and Social Research and Data Analytics (2016).

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CRedit authorship contribution statement

Dafina Petrova: Conceptualization, Methodology, Software, Formal analysis, Data curation, Writing – original draft, Visualization. **Marina Pollán:** Methodology, Formal analysis, Writing – review & editing, Funding acquisition. **Rocio Garcia-Retamero:** Writing – review & editing. **Miguel Rodriguez-Barranco:** Methodology, Formal analysis, Writing – review & editing. **Andrés Catena:** Methodology, Writing – review & editing. **Lucía Castillo Portellano:** Writing – review & editing. **Maria-José Sánchez:** Conceptualization, Supervision, Writing – review & editing, Funding acquisition.

Data availability

The full dataset used for the current study can be obtained after permission from the Spanish Association against Cancer (Asociación Española contra el Cáncer: www.aecc.es) and can be partially consulted on <https://observatorio.contraelcancer.es/informes/oncobarometro>.

Declaration of Competing Interest

The authors declare no competing interests.

Appendix A. Supplementary materials

Supplementary materials to this article can be found online at <https://doi.org/10.1016/j.ijnurstu.2023.104466>.

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