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Perceptions of testicular cancer among Portuguese university students

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ABBREVIATIONS

TC	Testicular Cancer
GLOBOCAN	Global Cancer Incidence, Mortality and Prevalence
TSE	Testicular Self-Exam
SPSS	Statistical Package for Social Sciences
EAU	European Association of Urology
USPSTF	United States Preventive Service Task Force

ABSTRACT

Background: Testicular cancer (TC) is the most frequent tumor in males between 18-35 years old and has a 5-year survival rate of 99% in localized disease. Within this populations there is a general perception there is significant lack of knowledge about this disease. Thus, this study aims to determine the knowledge about TC amongst Portuguese university students.

Methods: In this cross-sectional study, 871 university students answered an online questionnaire on their perceptions about TC. They were inquired about the age-risk group for TC and detection, prognosis and impact of the disease on patients' quality of life, as well as common signs and symptoms. Male participants were also asked about their testicular self-exam (TSE) practice. Lastly, they were questioned about their motivations to learn more about the subject and preferred method of communication.

Results: 89,2% (n=777) of students had heard of TC, but only 31,8% knew the age-risk group. Students were able to recognize a palpable testicular nodule as a common (90,2%) sign of TC, but the general knowledge score was still low. TSE practice was also low, with only 53 males (n=275) performing TSE monthly. The vast majority (90,9%) were interested in learning more about TSE and TC early diagnosis. Health professionals/facilities (73,8%) and Internet/Social media (69%) were the most reported preferable sources of information.

Conclusion: We conclude that young males have poor knowledge about TC, and most still do not practice TSE monthly. Future awareness campaigns and educational interventions are needed to increase consciousness about the disease.

Keywords: Testicular Neoplasms; Awareness; Health Behavior; Self-Examination.

RESUMO

Introdução: O cancro do testículo (CT) corresponde ao tumor sólido mais frequente em homens entre os 18-35 anos de idade e tem uma sobrevivência global aos 5 anos de 99% na doença localizada. Existe uma perceção geral de que subsiste uma falta de conhecimento significativa sobre a doença dentro desta população. Assim, este estudo tem como objetivo determinar o conhecimento da população universitária Portuguesa sobre o CT.

Métodos: Neste estudo transversal, 871 estudantes universitários responderam a um questionário online relativamente às suas perceções sobre o CT. Foram questionados sobre a faixa etária com maior risco para CT e sobre a deteção, o prognóstico e o impacto da doença na qualidade de vida dos doentes, bem como sinais e sintomas comuns da doença. Os participantes do sexo masculino foram questionados sobre sua prática de autoexame testicular. Por fim, foram questionados sobre suas motivações para aprender mais sobre o assunto e o método de comunicação preferido.

Resultados: 89,2% (n = 777) dos alunos já ouviram falar em CT, mas apenas 31,8% sabiam a faixa etária de risco. Os alunos foram capazes de reconhecer um nódulo testicular palpável como um sinal comum (90,2%) de CT, mas o *score* calculado de conhecimento geral sobre a doença foi baixo. A prática do autoexame testicular é reduzida, com apenas 53 homens (n = 275) realizando o autoexame mensalmente. A grande maioria (90,9%) demonstrou interesse em saber mais sobre o diagnóstico precoce de CT e sobre o autoexame testicular. Profissionais / serviços de saúde (73,8%) e Internet / Redes sociais (69%) foram as fontes preferenciais de informação mais relatadas.

Conclusão: Concluímos que os jovens do sexo masculino possuem pouco conhecimento sobre CT, e a maioria ainda não pratica o autoexame testicular mensalmente. Futuras campanhas de consciencialização e intervenções educacionais são necessárias para aumentar a compreensão sobre a doença.

Palavras-chave: Neoplasias Testiculares; Conscientização; Comportamentos Relacionados com a Saúde; Autoexame.

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INTRODUCTION

Testicular cancer (TC) is the most frequent solid neoplasm in male young adults, between 15 and 34 years old, and represents approximately 1% of all male cancers.[1] About 95% of all cases of TC are germ cell tumors (seminomas and nonseminomas).[2] While its etiology remains undetermined, some factors have been associated with an increased risk of developing TC, such as a personal history of TC, family history of TC and testicular dysgenesis syndrome.[3] The incidence of TC continues to increase globally, followed by a decrease in mortality related to the improvement of diagnostic methods and greater treatment efficiency.[4,5] The last data from GLOBOCAN (2018) estimates 147 new cases of TC, 18 deaths, and 595 cases of prevalence of disease in 5 years, in Portugal.[6]

TC is considered a prototype of curable cancer, with a 95% 5-year survival, reaching 99% in localized disease, but with a significant reduction in survival to 72,5% in metastatic disease.[7] The delay in diagnosis is significantly related to advanced disease, particularly in non-seminomas,[8] requiring the use of chemotherapy and major surgeries, which consequentially increases treatment-related morbidity, and decreases survival rates.[8,9]

The most frequent presentation of TC is in the form of a palpable testicular nodule/mass,[2] so the regular practice of testicular self-examination (TSE) assumes an important role in the early diagnosis of this pathology. Even when detecting changes in testicular self-examination, many men fail to act promptly, which may be due, in part, to a low level of knowledge regarding TC and the importance and practice of testicular self-examination.[10–12]

Knowledge about TC and TSE of individuals in the most susceptible age group remains insufficient, despite having increased over the years.[11–13] A study including students aged 15-19 in the Netherlands revealed that 74% had never heard of TC and only 2% regularly performed TSE,[11] which is a worrying result since it is precisely at an early age (15 years) that the beginning of the practice of testicular examination should be encouraged. Among university students, the levels of knowledge and practice of TSE seem to be higher, in several European countries, with an average of 18,2% students performing it.[12]

The present study aims to assess the level of knowledge of university students in Portugal about testicular cancer and the level of practice of testicular self-examination. In addition, it

also intends to assess students' willingness to learn more about TC and TSE and their preferences regarding sources of information.

MATERIALS AND METHODS

Design of the study

For this observational, cross-sectional study, an online questionnaire was created, using the Google Forms platform, to evaluate the knowledge and perceptions of students on TC/TSE practice, and future perspectives on learning more about TC and preferable sources of information. Therefore, the questionnaire (Appendix A) was divided into 4 sections: sociodemographic, general knowledge about TC, attitudes, and information.

Prior to the divulgation of the questionnaire, a simulation of responses was carried out using a convenience sample (n=8), to ensure the questions were clear and unambiguous, as well as the correct functioning of the link. Posteriorly, the link was shared via online student groups and via e-mail. Data were collected from September 2020 to December 2020. The answers were anonymous and required the participants' informed consent. Double responses were avoided requesting the last 4 digits of the participants' phone number.

Knowledge about TC was calculated according to the participants answers to the following questions: "How prevalent do you think testicular cancer is?", "At what age group do you think testicular cancer is more prevalent?", "How do you think testicular cancer is more often detected?", and "What do you think is the cure rate of early-stage testicular cancer?". The score ranged from 0 to a maximum of 4 points, with each correct answer to each question worth 1 point, and mean scores were calculated.

Sample

This study enrolled students in higher education in Portugal. Students were selected through convenience sampling. The sample included 871 university students in Portugal from various courses.

Statistical analysis

The statistical analysis was performed using the IBM Statistical Package for Social Sciences (SPSS) version 26. Chi-square test was used for evaluation of significant statistical difference between categorical variables. Differences between knowledge score means vs. sex and course were evaluated and compared using Mann Whitney U test and Kruskal-Wallis test (with Bonferroni correction), respectively. The level of statistical significance was set at $p<0,05$.

RESULTS

A total of 871 university students participated in this study. The mean age was 20,97 ± 3,684, with ages ranging from 17 to 59 years old. More than half of the students frequented health-related courses (62%). Only 1 male participant had a personal history of testicular cancer. Demographic data are presented in Table 1.

TABLE 1. Demographic characteristics of participants.

Demographic characteristics	Categories	
	n	%
Participants	871	-
Age		
Mean ± SD	20,97 ± 3,684	-
Minimum	17	-
Maximum	59	-
Sex		
Male	275	31,6%
Female	596	68,4%
Field of Study		
Health	540	62,0%
- Medicine	435	49,9%
- Nursing	43	4,9%
- Health Technician	27	3,1%
- Health (others)[1]	35	4%
Agriculture, Forestry and Fisheries	3	0,3%
Architecture and Construction	6	0,7%
Arts	6	0,7%
Life Sciences	29	3,3%
Business Sciences	56	6,4%
Physical Sciences	5	0,6%
Social and Behavioral Sciences	26	3,0%
Veterinary Sciences	10	1,1%
Law	47	5,4%
Engineering and Related Techniques	55	6,3%
Teacher Training / Trainers and Educational Sciences	10	1,10%
Humanities	22	2,5%
Manufacturing Industries	2	0,2%
Information and Journalism	11	1,3%
Computer Science	25	2,9%

Mathematics	2	0,2%
Environmental Protection	2	0,2%
Transportation Management	1	0,1%
Personal Services	2	0,2%
Social Services	11	1,3%
Sexually Active		
Yes	506	58,1%
No	365	41,9%
Personal History of Testicular Cancer [a]		
Yes	1	0,4%
No	274	99,6%
Personal History of Benign Urologic Pathology [a]		
Yes	40	14,5%
No	235	85,5%

Notes: 1 – Health (others) includes health related courses not discriminated in the table and can be consulted in the following website: https://www.dges.gov.pt/guias/indarea.asp?area=72; a – male participant responders only.

Of the 871 participants, 89,2% reported having heard of TC. While significantly (p<0,001) more health students (94,4%) had heard of TC, no difference (p=0,137) was found between male and female responders (Table 2). A total of 42,7% of students perceive TC as a common disease (both males and females, 40,4% and 58,4%, respectively). Interestingly, more than half the students think TC age-risk group are men > 35 years old, with 16,6% perceiving men > 65 years old as the most affected age group. When asked about the TC detection, the value attributed to the ultrasound is negligible while the clinical presentation (palpable nodule) is highly valued. Interestingly is the fact that more than half of the responders thought TC as a curable disease (for localized disease) but with impact in daily life (Table 2). The responses to questions about general TC knowledge were significantly different between health students and non-health students, also between males and females (with exception of the question about the most common way of TC detection, p=0,464).

TABLE 2. Student's responses to general knowledge questions about testicular cancer.

	Males	Females	*p* value[1]	Health students	Non-Health students	*p* value[1]	Total
	n (%)	n (%)		n (%)	n (%)		n (%)
1-Have you heard of testicular cancer?							
Yes	239 (86,9%)	538 (90,3%)	0,137	510 (94,4%)	267 (80,7%)	<0,001	777 (89,2%)
No	36 (13,1%)	58 (9,7%)		30 (5,6%)	64 (19,3%)		94 (10,8%)
2-How prevalent do you think testicular cancer is?							
I don't know	45 (16,4%)	89 (14,9%)	<0,001	57 (10,6%)	77 (23,3%)	<0,001	134 (15,4%)
Rare	114 (41,5%)	133 (22,3%)		116 (30,7%)	81 (24,5%)		247 (28,4%)
Common	111 (40,4%)	348 (58,4%)		301 (55,7%)	158 (47,7%)		459 (42,7%)
Very common	5 (1,8%)	26 (4,4%)		16 (3%)	15 (4,5%)		31 (3,6%)
3-At what age gap do you think testicular cancer is more prevalent?							
I don't know	20 (7,3%)	40 (6,7%)	0,002	26 (4,8%)	34 (10,3%)	<0,001	60 (6,9%)
< 18 years old	10 (3,6%)	7 (1,2%)		16 (3%)	1 (0,3%)		17 (2%)
18-35 years old	104 (37,8%)	173 (29%)		211 (30,4%)	66 (19,9%)		277 (31,8%)
36-65 years old	94 (34,2%)	278 (46,6%)		201 (37,2%)	171 (51,7%)		372 (42,7%)
> 65 years old	47 (17,1%)	98 (16,4%)		86 (15,9%)	59 (17,8%)		145 (16,6%)
4-How do you think testicular cancer is more often detected?							
I don't know	15 (5,5%)	30 (5%)	0,464	23 (4,3%)	22 (6,6%)	<0,001	45 (5,2%)
Palpable nodule/mass on TSE	141 (51,3%)	284 (47,7%)		284 (52,6%)	141 (42,6%)		425 (48,8%)
Testicular ultrasound	24 (8,7%)	44 (7,4%)		37 (6,9%)	31 (9,4%)		68 (7,8%)
Sexual partner detects nodule	52 (18,9%)	146 (24,5%)		139 (25,7%)	59 (17,8%)		198 (22,7%)
Medical routine exam	43 (15,6%)	92 (15,4%)		57 (10,6%)	78 (23,6%)		135 (15,5%)
5-What do you think is the cure rate of early-stage testicular cancer?							
< 10%	5 (1,8%)	15 (2,5%)	<0,001	12 (2,2%)	8 (2,4%)	<0,001	20 (2,3%)
11-50%	36 (13,1%)	89 (14,9%)		53 (9,8%)	72 (21,8%)		125 (14,4%)
51-74%	79 (28,7%)	148 (24,8%)		123 (22,8%)	104 (31,4%)		227 (26,1%)
75-90%	68 (24,7%)	223 (37,4%)		189 (35%)	102 (30,8%)		291 (33,4%)
> 90%	87 (31,6%)	121 (20,3%)		163 (30,2%)	45 (13,6%)		208 (23,9%)
5-What impact do you think testicular cancer has on patients' quality of life?							
Little impact	23 (8,4%)	5 (0,8%)	<0,001	24 (4,4%)	4 (1,2%)	<0,001	28 (3,2%)
Some impact, but no limitations	107 (38,9%)	193 (32,4%)		209 (38,7%)	91 (27,5%)		300 (34,4%)
Significant impact, with limitation of some activities	129 (46,9%)	355 (59,6%)		279 (51,7%)	205 (61,9%)		484 (55,6%)
Large impact, with complete alteration of life activities	16 (5,8%)	43 (7,2%)		28 (5,2%)	31 (9,4%)		59 (6,8%)

Notes: 1- Chi-Square Test; the underlined response corresponds to the correct answer for each question.

When specifically asked about TC clinical presentation, the vast majority (90,2%) of the university students stated that palpable nodule is the most common symptom, followed by testicular pain (64,2%). Intriguingly, 89,8% of the students expect an uncommon testicular volume change in patients with testicular cancer (Figure 1).

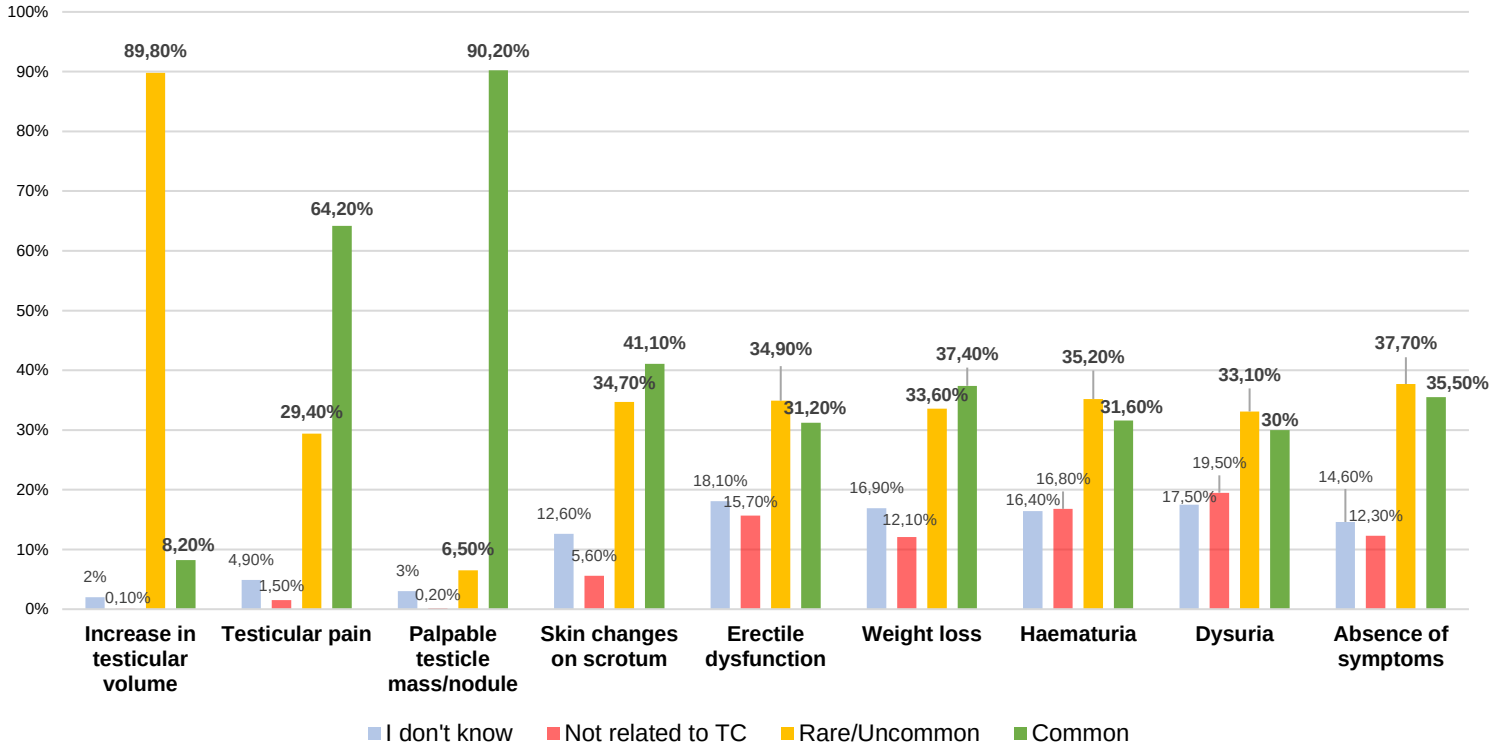

FIGURE 1. Participants' perception about signs and symptoms related to testicular cancer and frequency of occurrence. TC – Testicular cancer.

We then categorized data according to courses (Medicine, Nursing, Health Technician, Health (others), and Non-Health) (Appendix B) and scored and valued the answers about TC knowledge amongst different groups (0 to 4). Almost one fifth of non-health students never heard about testicular cancer and 47,7% rated the disease as common (Figure 2).

The total mean score was 1,16± 0,90; which reveals a low level of knowledge about testicular cancer. There was no difference (p=0,852) between male (1,19 ± 1,00) and female (1,15 ± 0,86) scores. Knowledge scores were calculated for the following course categories: Medicine (1,35 ± 0,93), Nursing (1,28 ±0,80), Health Technicians (1,33 ± 1,11), Health (others) (0,91±0,70) and Non-Health (0,91 ± 0,81). A statistically significant difference (p<0,001) was found between courses, with analysis of independent samples revealing that the only 2 groups

that were significantly different (p<0,001) in knowledge scores were Medicine and Non-Health. Only 3 participants answered all 4 questions correctly, all female and Health Technician students.

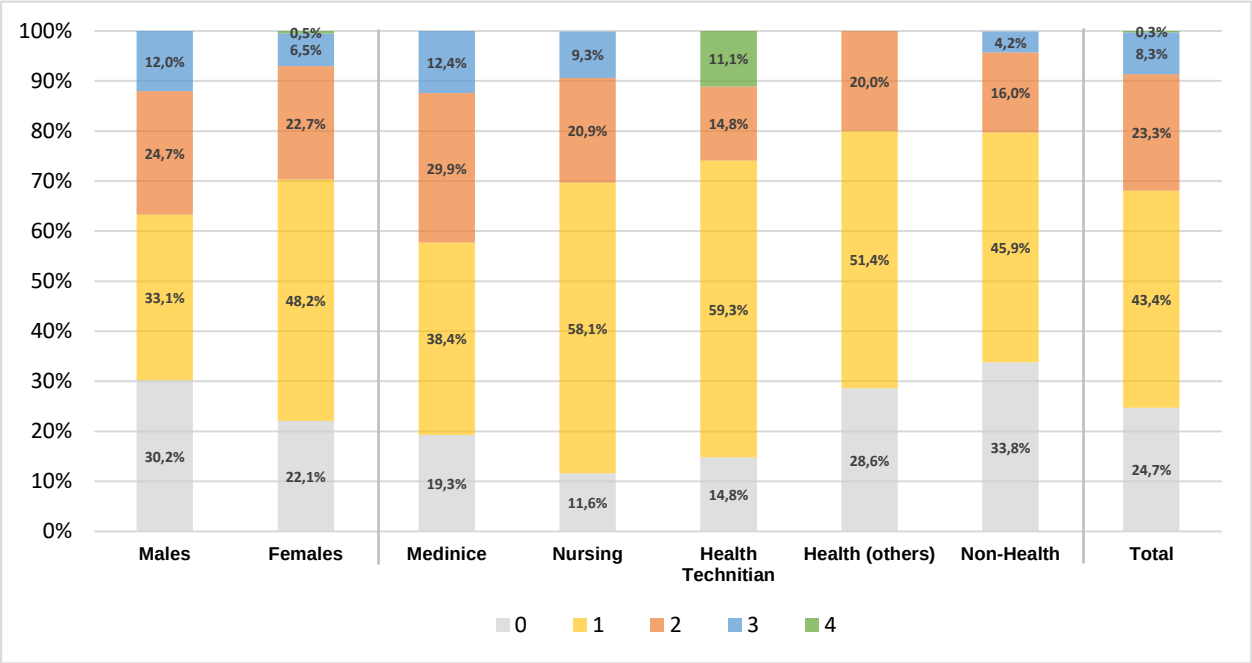

FIGURE 2. Percentages of the number of correct answers to questions on knowledge about testicular cancer (0 to 4), according to sex and course.

Generally, students gave a positive response of being afraid of having TC or a family member having TC. They also found TC to be a serious disease. Most (87,3%) agreed that early detection increases the likelihood of a cure and 55,7% acknowledge TC as a curable disease. The vast majority of students also agreed (fully or partially) that patients with TC could have their sex life (78,8%) and fertility affected (83,5%) (Appendix C).

Then we inquired about self-examination. A total of 479 (55%) students reported having heard of TSE, without differences (p=0,321). between males (57,5%) and females (53,9%). In comparison to non-health students (80,7%), the number of health students (94,4%) who have heard of TSE was significantly higher (p<0,001) On a multiple response question inquiring the reasons for not performing TSE, of the 168 males who had never performed TSE, 92,3% said they do not have information on how to do it, 10,1% reported fear/anxiety, 7,7% do not think it is important, 2,4% think it is a sin/shameful and 1,2% think it is a waste of time. Of the males who had heard of TSE, 32,9% (n=52) had never performed TSE, and 67,1% (n=106) did it at least once (Table 3).

TABLE 3. Attitudes on Testicular Self-Examination.

Males only	n	%		
Have you ever performed TSE? (n=275)				
Yes	107	38,9%		
No	168	61,1%		
Frequency of TSE practice (n=107)				
Never/only once	21	19,6%		
Weekly	13	12,1%		
Monthly	53	49,5%		
Annually	20	18,7%		
General (n=871)	**n**	**%**		
I would like to be more informed about TSE and early diagnosis of TC.				
Yes	792	90,9%		
No	79	9,1%		
			Males (%)	**Females (%)**
I am willing to learn how to perform TSE/TE.				
Yes	721	82,8%	91,6%	78,7%
No	43	4,9%	1,1%	6,7%
I don't know	107	12,3%	7,3%	14,6%
I think I can motivate my sexual partner to perform TSE/TE.				
Yes	676	77,6%	57,1%	87,1%
No	35	4%	10,9%	0,8%
I don't know	160	18,4%	32%	12,1%

Notes: TSE – Testicular Self-Examination; TC- Testicular Cancer; TE – Testicular Examination.

When questioned about the source of information they would like to receive, medical students' most preferred source was Doctor's appointment and/or information leaflets at the Health Center/Hospital (80,4%). Nursing students (75%), Health Technician students (87%), and non-Health students (79,3%) preferred Internet/Social Media, while students from other Health courses preferred Sexual Education classes (69%) (Figure 3). All participants believe that campaigns and individual stories about TC can help to change their attention on the disease, as well as the general population's attention (96,9%).

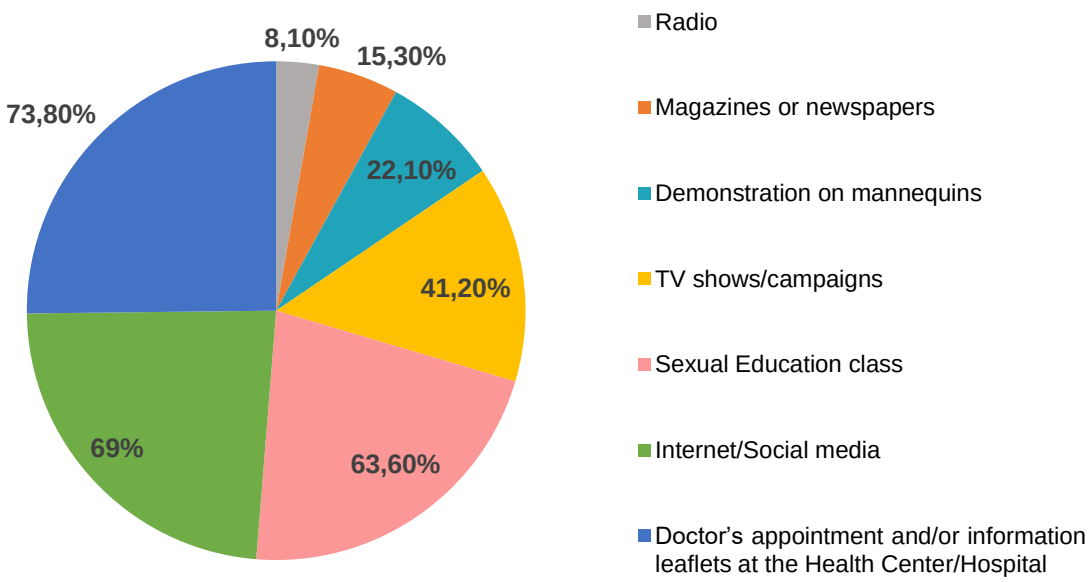

FIGURE 3. Students' preferred source of information about TSE and early diagnosis of TC. This was a multiple response question. Percentages are presented in relation to the number of responses containing each option.

DISCUSSION

Our study focused on understanding university students' knowledge about TC and their attitudes concerning the disease. Despite it being the most common solid tumor in their age range, young people continue to show little understanding regarding general aspects of TC. Participants' perceptions of age-risk group and prognosis of TC were generally inaccurate. Interestingly, participants recognize the most common symptom associated with the disease but it does not have impact in TSE, which remains insufficient. Overall, they reported being receptive to communication of information regarding TC and TSE.

A significant percentage of students (89,2%) reported having heard of TC, while a lower number of students (55%) had heard of TSE. As expected, health students are more aware about the disease than non-health students. However, we have to note that having heard of TC should not be interpreted as knowledge, but rather awareness about the disease.[14] In fact, the present study reveals that students attending Portuguese universities still have some lack of knowledge and incorrect perceptions regarding TC.

Similar to what is observed in other studies,[15,16] only few (37,8%) males correctly identified the most affected age group, meaning that there is a large proportion of men, in age-risk group, who are unaware of being part of a risk group. Interestingly, these results mimic what is verified in other countries where men between 18-30 years old had the lowest awareness score for TC.[17]

Testicular cancer was perceived as a serious disease and students reported fear of having TC, consistent with what was found in previous studies.[14] Most did not recognize the potential of overall TC curability but, when asked about it, 87,3% correctly agreed that if TC is detected early cure rates are higher, even though only 23,9% knew the cure rate might be >90% for early stage disease. Additionally, only 3,2% think TC has little impact on patients' quality of life. The incorrect perceptions about these facts may be contributing to fear. The majority also responded positively to the assumptions that men who have/had TC can have their fertility and sexual life affected, which happens as undesirable effects of treatment.[5]

However, we found that TC knowledge scores were low even within medical students' group. None of the students answered correctly the 4 questions and with only 12,4% answering correctly to 3 questions. We might justify this result with the higher percentage of students belonging to the first years of medical school, but it is undoubtedly a worrying information. However, the similar results were observed in other identical population-based studies. Only 2% of students from a medical science university in Iran were found to have good knowledge about TC [18]; and only 1,4% of medical students from 12 different medicine universities in Turkey were able to answer correctly to all questions about testicular cancer, despite 11,1% stating having good knowledge about it.[19] Despite the lack of knowledge amongst medical students, it is bothersome to verify that the knowledge was even lower in the group of non-health students. These results were also found by other authors in a study comparing medical and non-medical students performed in a German university.[20] In our study, only 3 participants answered all questions correctly. All of them were female and health technician students. Despite this, health technician students' mean score (1,33 ± 1,11) was still poor and did not differ significantly from the rest. Knowledge about TC was also found to be low in working health technicians from various hospitals in Turkey.[21] In an era of communication and easy access to information it is important to recognize this important lack of knowledge and provide young population with better healthcare policies.

We also aimed to understand what university students know about the clinical presentation of testicular cancer. We found the vast majority seemed to be able to recognize the clinical presentations and point TC as either as common or uncommon disease. In fact, the recognition of a palpable testicular mass/nodule as a common symptom of TC by 786 (90,24%) is an important finding of our study. Considering other studies, the testicular mass/nodule is referred as a presenting clinical manifestation in 25,9% to 93% of answers.[21–25] Nevertheless, student's perceptions about other symptoms as being related to TC, such as skin changes on the scrotum, erectile dysfunction, haematuria, and dysuria, highlights the need for clarification. Importantly, in our study 48,8% students answered that testicular nodule perception is the most common way of detection of TC and 22,7% referred testicular nodule detection by a sexual partner. We consider this a key finding as it highlights awareness of advantages of TSE in the early diagnosis of TC. In fact, the perception of the importance of TSE might enable TC early diagnose and seek for medical evaluation.

Currently, there is still controversy regarding recommendations for teaching about TC and TSE practice among young males. The European Association of Urology (EAU) only recommends TSE for patients with TC and the need to inform first-degree relatives to do so.[26] We found

that only 38,9% of male students performed TSE and of those, only 49,5% did it monthly (19,27% of all male participants), revealing that the prevalence of TSE practice remains at a lower level. Another study conducted in Portugal found that only 8,7% of all male students performed TSE monthly.[27] In fact, this reality seems to be frequent all over the countries with monthly TSE ranging from 3,1% [28] to 36% [29–31]. Of the 61,1% who had never performed TSE, 92,3% reported not having information on how to do it and 7,7% don´t think it is important. The lack of know-how is one of the most reported reasons for not performing TSE.[14,20] Additionally, 10,1% stated fear/anxiety as a barrier for a TSE practice. There is a possibility that anxiety can be reduced by teaching males about TSE and TC.[32] Men are unanimously in favor of education on TC and usually recognize health education potential to motivate help-seeking behaviors by reducing fear and embarrassment.[33] In our study, of the 158 males who had heard of TSE, only 67,1% performed it at least once in their lives. It is known that knowledge does not necessarily correlate with higher rates of TSE performance,[10–12,34,35] but what is true is that men who have greater knowledge about TC/TSE are more likely to perform TSE regularly.[10,13,15,36,37] Also, younger students perceived TSE as less important and were less likely to perform it more frequently, compared to older participants.[38] Some authors see this lack of awareness as a justification for a lower predisposition to perform TSE or to acknowledge TC symptoms resulting in delayed help-seeking behaviors.[39–42]

Strikingly, the United States Preventive Service Task Force (USPSTF) decision recommending against screening in asymptomatic males has been strongly criticized.[32,43] In fact, the implementation of a regular practice of testicular self-examination would be beneficial in the detection of benign urogenital pathology, including hydroceles and varicoceles,[44] also a possible source of morbidity if not detected in a timely manner.

The participants in surveys about TC usually report the need for more information, as shown in Casey´s et al analysis (97% of participants interested in receiving more information).[13] Encouragingly, 99,4% of our participants agreed that more communication is needed to provide information about TC and 90,9% demonstrated a willingness to learn more about TSE and early diagnosis. Also, 91,6% of men reported they were willing to learn to perform it.

The way healthcare providers should communicate was also matter of interrogation in our study. The preferred source of information about TSE was slightly different according to students' area of studies, but students' global preferences were doctor's appointment and/or

leaflets provided by health institutions (73,8%), followed by Internet/Social media (69%) and Sexual Education classes (63,6%) (Figure 3).

Three systematic reviews [42,45,46] plus a literary review [47] concluded that several indirect strategies (pamphlets/brochures/shower gel sachets/ videos/role-plays/TV shows with celebrities/others) can all be effective in different determinants for TC and TSE education. Intervention by direct skills-based training of TSE significantly increased school students' self-examination behaviors, intentions, and self-efficacy [48]. Also, information transmitted directly by health care professionals can positively influence young males' health behavior and self-efficacy [48]. Men with family history of TC found who had a physician recommend TSE were at least 6 times more likely to perform it regularly.[49] However, health professionals do not routinely include the teaching of TSE during health care provision.[34,47,50,51] This is an important task in TSE implementation and although 70% of pediatric residents usually included testicular exam in the physical exam, only 40% admitted teaching TSE to patients "usually or all the time".[34] Thus, doctors and nurses should proactively inform patients about TC and TSE together with social media campaigns already implemented in several countries with interesting results. Modeling future interventions' format according to the target population's preferred source of information is likely to achieve more promising results, given that it can result in higher motivation to learn and engage the attention of a greater number of people.

Since the preferred source of information were health care providers, it would also be beneficial to create awareness campaigns directed at health professionals, in order to regularly include educational information about TC and TSE practice, during routine health care.

It is known that women can play an important role in facilitating men's screening practices.[52] No significant difference was found between male and female knowledge scores. Despite this, majority (87,1%) of women in this study were motivated to encourage their partners to perform TSE, and 78,7% were willing to learn how to perform testicular examination. Braga et al [27] showed that 96,7% of females are motivated to advise male partners or friends to perform TSE. In fact, the strongest facilitating factor associated with men's help-seeking behavior is the encouragement and support of spouses and family members.[39] Therefore, it is unquestionable that women may have an important role as health advocates for their partners and should also be included as a target audience in awareness campaigns addressing men's health.

Our study has acknowledgeable limitations. First, the students answered the questionnaire according to their motivation which might have had an influence on results regarding their drive to learn more about the disease and TSE. Second, caution is needed when extrapolating these results to the entire population of university students. Lastly, the self-reporting bias is also a concern in this study, especially when it comes to reports on the frequency of TSE, as students might inclined to respond according to social desirability.

CONCLUSION

This study highlights the need to inform young people at risk about TC and the importance of TSE. The practice of TSE remains insufficient among males at age-risk for TC. Knowledge about the main symptoms of the disease and, even more, about the risk factors for TC must be improved so that males act promptly when necessary avoiding delayed diagnosis.

The vast majority of students showed interest in learning more about the subject and were motivated to learn how to perform TSE. Students believe campaigns and patients' testimonies about TC can be good strategies to achieve this. In Portugal, no major health promotion campaigns are targeting testicular cancer specifically, which may partly explain their lack of general knowledge on the topic.

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APPENDIX A

Questionnaire

1.SOCIODEMOGRAPHICS

1. Consent: *

   Check all that apply.

   ☐ I give my consent on how I voluntarily accept to participate in this study.

2. Last 4 digits of the mobile number (to avoid repeated responses): *

   _____

3. Age *

   _____

4. Sex *

   Mark only one oval.

   ◯ Male
   ◯ Female

5. Area of studies: *

   According to DGES - consult: https://www.dges.gov.pt/guias/indarea.asp?area=86

   Mark only one oval.

   ◯ Medicine
   ◯ Nursing
   ◯ Health Technician
   ◯ Health (others)
   ◯ Agriculture, Forestry and Fisheries
   ◯ Architecture and Construction
   ◯ Arts
   ◯ Life Sciences
   ◯ Business Sciences
   ◯ Physical Sciences
   ◯ Social and Behavioral Sciences
   ◯ Veterinary Sciences
   ◯ Law
   ◯ Law
   ◯ Engineering and Related Techniques
   ◯ Teacher Training / Trainers and Educational Sciences
   ◯ Humanities
   ◯ Manufacturing Industries
   ◯ Information and Journalism
   ◯ Computer Science
   ◯ Mathematics
   ◯ Environmental Protection
   ◯ Transportation Management
   ◯ Personal Services
   ◯ Social Services

6. Are you sexually active? *

Mark only one oval.

- ◯ Yes
- ◯ No

PERSONAL HISTORY OF UROLOGIC PATHOLOGY (MALES)

7. Do you have a personal history of urological (non-cancer) pathology? *

Mark only one oval.

- ◯ No
- ◯ Undescended testis
- ◯ Hypospadias
- ◯ Testicular torsion
- ◯ Varicocele
- ◯ Spermatocele
- ◯ Testicular trauma
- ◯ Infertility
- ◯ Other: _____

8. Do you have a personal history of testicular cancer? *

Mark only one oval.

- ◯ Yes
- ◯ No

2. GENERAL KNOWLEDGE ABOUT TESTICULAR CANCER

9. Have you ever heard of testicular cancer? *

Mark only one oval.

- ◯ Yes
- ◯ No

10. How prevalent do you think testicular cancer is? *

Mark only one oval.

- ◯ Rare
- ◯ Common
- ◯ Very common
- ◯ I don't know

11. At what age group do you think testicular cancer is more prevalent? *

Mark only one oval.

- ◯ < 18 years old
- ◯ 18-35 years old
- ◯ 36-65 years old
- ◯ > 65 years old
- ◯ I don't know

12. Which of the following do you think are risk factors for testicular cancer? (Multiple answer) *

Check all that apply.

- ☐ Brother with history of testicular cancer
- ☐ History of contralateral testicular cancer
- ☐ Undescended testis (cryptorchidism)
- ☐ Hypospadias
- ☐ Infertility
- ☐ Testicular atrophy
- ☐ Marijuana
- ☐ Testicular trauma
- ☐ Testicular torsion

Other: ☐ _____

13. Which of the following signs and symptoms do you think is associated with testicular cancer and how frequent: *

Mark only one oval per row.

	Common	Rare/Uncommon	Not related to TC	I don't know
Increase in testicular volume	◯	◯	◯	◯
Testicular pain	◯	◯	◯	◯
Palpable testicle mass/nodule	◯	◯	◯	◯
Skin changes on scrotum	◯	◯	◯	◯

Erectile dysfunction	◯	◯	◯	◯
Weight loss	◯	◯	◯	◯
Haematuria	◯	◯	◯	◯
Dysuria	◯	◯	◯	◯
Absence of symptoms	◯	◯	◯	◯

14. How do you think testicular cancer is more often detected? *

Mark only one oval.

- ◯ Palpable nodule/mass on testicular self-examination
- ◯ Testicular ultrasound
- ◯ Sexual partner detects nodule
- ◯ Medical routine exam
- ◯ I don't know

15. What do you think is the cure rate of early-stage testicular cancer? *

Mark only one oval.

- ◯ < 10%
- ◯ 11-50%
- ◯ 51-74%
- ◯ 75-90%
- ◯ >90%

16. What impact do you think testicular cancer has on patients' quality of life? *

Mark only one oval.

- ◯ Little impact
- ◯ Some impact, but no limitations
- ◯ Significant impact, with limitation of some activities
- ◯ Large impact, with complete alteration of life activities

17. For each of the following statements, specify your position regarding testicular cancer: *

Mark only one oval per row.

	Agree	Partially agree	Disagree	I don't know
I'm afraid of having/a family member having testicular cancer.	◯	◯	◯	◯
Testicular cancer is a very serious disease.	◯	◯	◯	◯
Testicular cancer is rarely curable.	◯	◯	◯	◯
If testicular cancer is detected early the likelihood of a cure is higher.	◯	◯	◯	◯
Sex life of people with testicular cancer is negatively affected.	◯	◯	◯	◯
People who have/had testicular cancer can have fertility problems.	◯	◯	◯	◯

3. ATTITUDES

18. Have you ever heard of testicular self-examination? *

Mark only one oval.

◯ Yes
◯ No

19. Have you ever performed testicular self-examination? *

Mark only one oval.

◯ Yes
◯ No

20. How often do you perform testicular self-examination? *

Mark only one oval.

◯ Weekly
◯ Monthly
◯ Annually
◯ Never/Only performed it once

21. Why have you never performed a testicular self-examination? (Multiple answer) *

Check all that apply.

- [ ] I don't have information on how to
- [ ] I don't think it is important
- [ ] Fear/anxiety
- [ ] I think it is a sin/shameful
- [ ] I think it is a waste of time

4. INFORMATION

22. Is there a need for more information about testicular cancer in the population? *

Mark only one oval.

- ◯ Yes
- ◯ No

23. Would you like to be (more) informed about self-examination and early diagnosis of testicular cancer? *

Mark only one oval.

- ◯ Yes
- ◯ No

24. If you answered "Yes", please indicate the preferred method (Multiple answer):

Check all that apply.

- [ ] Internet/Social media
- [ ] Demonstration on mannequins
- [ ] Doctor's appointment and/or information leaflets at the Health Center/Hospital
- [ ] TV shows/campaigns
- [ ] Radio
- [ ] Magazines or newspapers
- [ ] Sexual Education classes

25. About testicular self-exam: *

Mark only one oval per row.

	Yes	No	I don't know
I am willing to learn how to perform testicular self-exam/testicular exam	◯	◯	◯
I think I can motivate my sexual partner to perform testicular self-exam/testicular exam.	◯	◯	◯

26. Do you think that campaigns and individual stories of testicular cancer help to change your attention about the disease? *

Mark only one oval.

◯ Yes
◯ No

27. Do you think that campaigns and individual stories of testicular cancer help to change people's attention about the disease? *

Mark only one oval.

◯ Yes
◯ No

APPENDIX B

General knowledge about testicular cancer discriminated by health courses and non-health courses.

	Medicine n (%)	Nursing n (%)	Health Tech n (%)	Health (others) n (%)	Non-Health students n (%)
Have you heard of testicular cancer?					
Yes	413 (94,9%)	42 (97,7%)	25 (92,6%)	30 (85,7%)	267 (80,7%)
No	22 (5,1%)	1 (2,3%)	2 (7,4%)	5 (14,3%)	64 (19,3%)
How prevalent do you think testicular cancer is?					
I don't know	47 (10,8%)	5 (11,6%)	3 (11,1%)	2 (5,7%)	77 (23,3%)
Rare	143 (32,9%)	4 (9,3%)	9 (33,3%)	10 (28,6%)	81 (24,5%)
Common	237 (54,5%)	30 (69,8%)	15 (55,6%)	19 (54,3%)	158 (47,7%)
Very common	8 (1,8%)	4 (9,3%)	0 (0%)	4 (11,4%)	15 (4,5%)
At what age gap do you think testicular cancer is more prevalent?					
I don't know	18 (4,1%)	5 (11,6%)	0 (0%)	3 (8,6%)	34 (10,3%)
< 18 years old	15 (3,4%)	0 (0%)	0 (0%)	1 (2,9%)	1 (0,3%)
18-35 years old	183 (42,1%)	10 (23,3%)	10 (37%)	8 (22,9%)	66 (19,9%)
36-65 years old	152 (34,9%)	22 (51,2%)	12 (44,4%)	15 (42,9%)	171 (51,7%)
> 65 years old	67 (15,4%)	6 (14%)	5 (18,5%)	8 (22,9%)	59 (17,8%)
How do you think testicular cancer is more often detected?					
I don't know	13 (3%)	3 (7%)	1 (3,7%)	6 (17,1%)	22 (6,6%)
Palpable nodule/mass on TSE	237 (54,5%)	17 (39,5%)	14 (51,9%)	16 (45,7%)	141 (42,6%)
Testicular ultrasound	25 (5,7%)	6 (14%)	5 (18,5%)	1 (2,9%)	31 (9,4%)
Sexual partner detects nodule	114 (26,2%)	10 (23,3%)	5 (18,5%)	10 (28,6%)	59 (17,8%)
Medical routine exam	46 (10,6%)	7 (16,3%)	2 (7,4%)	2 (5,7%)	78 (23,6%)
What do you think is the cure rate of early-stage testicular cancer?					
< 10%	10 (2,3%)	0 (0%)	1 (3,7%)	1 (2,9%)	8 (2,4%)
11-50%	36 (8,3%)	6 (14%)	4 (14,8%)	7 (20%)	72 (21,8%)
51-74%	91 (20,9%)	15 (34,9%)	6 (22,2%)	11 (31,4%)	104 (31,4%)
75-90%	154 (35,4%)	13 (30,2%)	10 (37%)	12 (34,3%)	102 (30,8%)
> 90%	144 (33,1%)	9 (20,9%)	6 (22,2%)	4 (11,4%)	45 (13,6%)
What impact do you think testicular cancer has on patients' quality of life?					
Little impact	24 (5,5%)	0 (0%)	0 (0%)	0 (0%)	4 (1,2%)
Some impact, but no limitations	181 (41,6%)	14 (32,6%)	6 (22,2%)	8 (22,9%)	91 (27,5%)
Significant impact, with limitation of some activities	210 (48,3%)	28 (65,1%)	17 (63%)	24 (68,6%)	205 (61,9%)
Large impact, with complete alteration of life activities	20 (4,6%)	1 (2,3%)	4 (14,8)	3 (8,6%)	31 (9,4%)

APPENDIX C

Perceptions of students about testicular cancer.

	Agree	Partially agree	Disagree	I don't know
I am afraid of having/a family member having testicular cancer.	**66,5%**	**20,3%**	9,6%	3,6%
Testicular cancer is a very serious disease.	**47,2%**	**36,2%**	9,2%	7,5%
Testicular cancer is rarely curable.	2,3%	18%	**55,7%**	24%
If testicular cancer is detected early the likelihood of a cure is higher	**87,3%**	9,1%	0,7%	3%
Sex life of people with testicular cancer is negatively affected.	**41,1%**	**37,7%**	8,3%	12,6%
People who have/had testicular cancer can have fertility problems	**53,6%**	**28,9%**	2,8%	14,7%

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