Saudi Pharmaceutical Journal (2025) 33:5
https://doi.org/10.1007/s44446-025-00014-6

RESEARCH ARTICLE

Assessment of prostate cancer awareness and screening knowledge among men in Najran, Saudi Arabia: a cross-sectional study

Yousif A. Kariri[1]

Received: 7 February 2025 / Accepted: 10 April 2025 / Published online: 24 April 2025

Abstract

Prostate cancer (PCa) is one of the most common male cancers and the second leading cause of cancer-related deaths among males worldwide. Efforts to increase men's awareness, understanding of the symptoms and risk factors, and provision of early medical assistance are crucial for the prevention and detection of PCa. This study assessed the level of awareness, knowledge, and screening for PCa among male participants in Najran, Saudi Arabia. A cross-sectional study was conducted with 341 male participants from 19 June 2024 to 25 September 2024. An online questionnaire was used to collect data. Bivariate data were analyzed and associations were considered significant when the p-value was ≤ 0.05. A total of 341 completed survey samples were collected. The mean age of the participants was 42 years (SD $\pm$ 8.17). The study found that most participants (70.4%) had adequate knowledge of PCa. However, only 30.5% were aware of the prostate-specific antigen (PSA) test, while a small minority (3.2%) had visited a specialized physician regarding PCa. The findings suggest that about 70% of male participants in Najran, Saudi Arabia, have an adequate level of awareness regarding the risk factors and screening for PCa. Recommendations include organizing more awareness campaigns, sharing information on social media, encouraging men to undergo screening tests, providing health education to primary care physicians and public-based organizations, and conducting further studies with larger numbers of participants to increase PCa awareness in Najran Province, Saudi Arabia.

Keywords Awareness · Attitude · Knowledge · Public health · Prostate-specific antigen · Risk factors

1 Introduction

Prostate cancer (PCa) is a life-threatening disease that primarily affects elderly and middle-aged men. It is the second most common malignant neoplasm leading to male mortality and ranks as the fifth leading cause of death among all malignant neoplasms worldwide (Cornford et al. 2024; Shan et al. 2022). PCa is one of the most common cancers in men globally, with reported incidences in 105 out of 185 countries (Bray et al. 2024). It is also a leading cause of cancer-related deaths in developing countries (Sung et al. 2021). This high mortality rate can often be attributed to insufficient initiatives to promote awareness and knowledge about the importance of early PCa screening, which is important to detect PCa at an early stage and significantly improve patient survival rates (Rao et al. 2023).According to reports, PCa has the highest incidence in many developed countries located in North America, Europe, and Australia, and it is the second most common cancer globally. There are several reports on the incidence of PCa in Saudi Arabia, which show regional differences (Otifi et al. 2022). The first PCa screening trial in Saudi Arabia was initiated in 2001 to reduce the incidence rate and improve the survival chances of Saudi citizens (Taha and Kamal 2005). A study by the World Health Organization (WHO) revealed that 693 new cases of PCa, with 204 deaths, were reported in 2020 alone in Saudi Arabia (Organization 2019). Similarly, another study revealed a high incidence of PCa in the kingdom with an 8.7% incidence rate in the Asir region between 2008 and 2018 (Otifi et al. 2022). Another study reported a very high incidence of 28.5% in the Western region of the country (Mosli et al. 2009). Furthermore, the incidence rate of PCa in Saudi Arabia is on the rise, in contrast to several other European countries reporting a decrease in PCa (Alasker et al. 2024). All these reports suggest that PCa should be of greater concern in Saudi Arabia than in other countries.

✉ Yousif A. Kariri
Ykuriri@su.edu.sa

[1] Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, Shaqra University, Shaqra, Saudi Arabia

A common characteristic among men in the Arab world is their lack of awareness and negative attitudes towards PCa screening and examination procedures (Alahmadi 2022).

Despite the fact that prostate cancer has a complex etiology, the impact of regional and ethnic variations indicates that metabolic issues, environmental variables, lifestyle factors, and food may all significantly affect the onset and course of the illness (Wilson and Mucci 2019). According to epidemiological evidence, obesity, and a high body mass index have been linked to both the advancement of prostate cancer and a higher probability of developing it (Matsushita et al. 2020). There is a strong association between obesity rates and Saudi Arabia population, which is considered a major factor that leads to an increase in the incidence of PCa in the country (Jarb et al. 2022). Research indicates a strong correlation between dietary habits, demographic characteristics, and the prevalence of overweight and obesity among Saudi adults in various regions of the Kingdom (Al-Raddadi et al. 2019; Al-Nbaheen 2020). Another major factor increasing PCa incidence is Saudis prefer to seek medical attention only when they are ill (Al-Nbaheen 2020). Together, bad lifestyle and reluctance to seek for healthcare are the major factors that increase the incidence of PCa in Saudi Arabia.

There are limited studies on knowledge and attitudes toward prostate cancer (PCa) in the Saudi Arabian population. In 2022, a study was conducted involving 368 males over the age of 40 years revealed a deficiency in both knowledge and attitudes: only 64.5% of respondents had heard of prostate cancer, and merely 20.3% were aware of the PCa screening test (Alothman et al. 2022). Another cross-sectional study conducted in 2020 among 1,212 men in Medina, Jeddah, and Makkah reported that 77% had heard of PCa, but only 52.5% were aware of screening tests. Knowledge levels were low, with only 10.6% having good knowledge, 41.9% having fair knowledge, and 47.5% having poor knowledge. Furthermore, only 3.9% had undergone prostate-specific antigen testing. The study concluded that there is a low level of knowledge regarding PCa and recommended efforts to increase awareness (Jarb et al. 2022). In contrast to the above studies, a third study from Tabuk city in Saudi Arabia reported good awareness and knowledge about PCa. This study was conducted with 417 males, utilizing structured interviews based on a questionnaire. The results revealed that a significant majority (86.8%) of men had heard about prostate cancer, and approximately 67.6% were aware of prostate cancer screening tests, while 32.4% had no prior knowledge of prostate cancer or screening methods. Overall, the findings indicated a good level of awareness and a positive attitude toward prostate cancer screening (54.7%), with participants demonstrating substantial knowledge of prostate cancer symptoms and the importance of regular examinations (Shaqran et al. 2023).

This lack of awareness and negative attitudes can be conceptualized using the Health Belief Model (HBM), which explains that health behaviours such as undergoing PCa screening are influenced by perceived susceptibility, perceived severity, perceived benefits of action, perceived barriers, and cues to action. Recent study conducted by Khalil et al., revealed that HBM involves to increase the participants' knowledge level, perceptions, practices, and intentions to PC screening (Khalil et al. 2024). The components of the HBM in this previous study, included the healthy believes and its importance, basic information about PCa, preventive health practices for PCa, and skills to avoid getting ill or decreasing risk. Many men may not perceive themselves as susceptible to PCa or may underestimate the severity of its consequences, which, coupled with barriers such as mistrust of doctors and anxiety about screening tests, impacts on their willingness to undergo screening (Kotwal et al. 2012).

PCa is known to be a multi-factorial disease, and the key factors underlying its occurrence and development are still under investigation (Wasim et al. 2022). However, age is one of the most significant factors in the development of PCa, with the majority of new cases occurring in men over 50 years of age (Vrieze et al. 2024). Additionally, genetic factors play a significant role in the development of the disease (Rafikova et al. 2023).

There is insufficient data to suggest that PCa screening tests are more beneficial than harmful (Pinsky et al. 2017). Despite the low number of PCa cases in Saudi Arabia compared to developed countries, the incidence rate has been increasing in recent years (Alasker et al. 2024). Encouraging men to have a PCa test might help to decrease the incidence of PCa in Saudi Arabia.

The Kingdom of Saudi Arabia has seen improvements in healthcare facilities in recent years, particularly with the introduction of an e-health strategy. However, the incidence of chronic diseases, including PCa, has increased in the kingdom. Therefore, increasing awareness plays a crucial role in improving PCa patients'survival rates through early diagnosis and detection of malignant masses, facilitating treatment in the early stages. The current study collected demographic data and assessed the adequacy of knowledge and awareness of PCa, risk factors, and screening tests. Demographics are important to understand differences in knowledge and awareness among different groups with respect to age, educational qualifications, income levels, marital status, job background and history of cancers. Knowledge and awareness were assessed through participants' responses to the risk factors, factors that prevent PCa, screening test duration and the importance of screening. The study results will help in increasing awareness and knowledge about the importance of early screening for PCa in order to prevent subsequent morbidity and mortality. This study evaluated the level of awareness of PCa and screening for it among the population in Najran region, Saudi Arabia.

2 Methods

2.1 Research setting and participants

This study was conducted using a cross-sectional design to evaluate levels of awareness, knowledge, and attitudes towards PCa among male participants in Najran Province, Saudi Arabia, and adhered to the STROBE guidelines for reporting observational studies.

The sample size for this study was calculated using a standard formula for estimating proportions in population-based studies. The formula used was as follows: Sample size (N) $= [(Z_{1-\alpha/2})^2 * P(1-P)]/E^2$, where $Z_{1-\alpha/2}$ (standard normal variate) corresponds to a 5% type I error ($p < 0.05$), set at 1.96. The expected proportion of the population exhibiting the characteristic of interest, denoted by P, was based on findings from a previous study and was set at 0.724 (Alshammari et al. 2021). The absolute error or precision level (E) chosen for this study was 0.05. Therefore, $N = (1.96)^2 * 0.724\ (1–0.724)/(0.05)^2$ indicated 307 participants. However, 10% of the participants were added to the target sample to ensure sufficient data collection from the final sample size of 338 participants.

This study data was collected through an online questionnaire distributed to the general population living in Najran. The survey instrument was adapted from a tool previously published by Maluf et al. (Maluf et al. 2021), to align with the unique context of the people in Najran, a province located in the southern part of Saudi Arabia, with a population of approximately 381,431 citizens (GaFSIS 2019). The main inclusion criterion was male individuals over 20 years of age, while females and individuals under 20 years old were excluded from participation.

2.2 Data collection

An anonymous online survey was developed using the Google Forms platform for electronic dissemination and collection of survey data. It was distributed via social media to the target population, and they were encouraged to forward the survey to relevant individuals. The survey was available from 19 June 2024 to 25 September 2024 to maximize the participation rate.

Prior to conducting the survey, participants were required to give their informed consent. The absence of such consent resulted in immediate cessation of the questionnaire. Moreover, to minimize missing data, participants were required to answer all survey questions.

2.3 Research tools and validation

The survey questions were initially written in English and then translated and back-translated to Arabic, following the Beaton guidelines (Beaton et al. 2000). Face validity and content validity were checked by a panel of experts in public health. The content validity index (CVI) was found to be excellent, with a score of 0.96, while Cronbach's alpha was 0.81.

The question sequences were arranged in alphabetical Arabic order to avoid bias, except for the options "I do not know the answer" and "Other", placed at the end of options.

The survey tool featured three parts with a total of 22 items, employing a mix of closed-ended formats such as tick boxes and rating scales, along with spaces for open-ended comments. It was structured to be completed quickly, in approximately 3 to 7 min, to maximize the response rate from participants facing time constraints. Additionally, using closed-ended questions simplified statistical analysis, allowing for the detection of correlations or trends in the data.

Demographic information regarding participants'age, income level, education level, marital status, occupation and source of awareness was collected in the first part of the questionnaire. Income level classification was roughly based on criteria set by Human Resources and Social Development in Saudi Arabia. The Saudi Arabian riyal (SAR) is tagged to the United States dollar (USD) with the conversion being constant, 1 USD is equivalent to 3.75 SAR.

The second part consisted of seven questions to assess participants'awareness of PCa, risk factors, and screening tests. Each participant answer was scored 1 for correct and zero for incorrect. Total scores ranged between 0 and 7. They were divided into adequate and inadequate knowledge based on the median score (2.0): inadequate knowledge < 2 and adequate knowledge ≥ 2.

The clarity of the translated version was confirmed by the participants'feedback during a pilot study. Content validity of the questionnaire was assessed by a panel of three experts in public health.

2.4 Data analysis

Following data collection, the data set was transferred into an electronic format suitable for analysis in Microsoft Excel. Subsequent to data entry, meticulous quality control steps were implemented to maintain accuracy. These included error checks, validation through techniques like frequency analysis and cross-tabulation, and manual adjustments, as needed.

Statistical analyses were performed using IBM SPSS Statistics (version 23). Continuous data were presented using mean and standard deviation, while categorical data were displayed using frequency and percentage. The categorical study variables were compared using the Chi-square test. For variables with expected cell counts of less than 5, Fisher's exact test was utilized to ensure the validity of the statistical analysis. Binary Logistic regression analysis was performed to assess the predictors (Demographics) of good or poor knowledge regarding prostate cancer. Statistical significance was set at $p < 0.05$.

3 Results

3.1 Demographics

The mean age of the participants in this study was 42.00 ± 8.17 years. The highest percentage of participants, 54.0%, were over 60 years of age, 38.4% of the participants were aged from 40–60 years, and 7.6% were less than 40 years old. The majority of the participants were married (89.9%), while none of them were in a consensual marriage or were widowers. Moreover, very few participants were single because the average participants' age in the study was more than 40 years. Most participants (71%) had a bachelor's degree or higher, with incomes ranging from 15,001 SAR and above (76.6%). Additionally, 70.1% of the participants were non-healthcare professionals, and 99.1% had no history of cancer (Table 1). The majority of participants were informed about PCa through social media/television (70.1%), followed by friends (20.6%), and a minority of the participants (9.3%) got information from other sources such as websites, news reports, etc.

Table 1 Summary of the sample's demographic characteristics (N = 341)

Variable	*N* (%)
Age	
< 40	26 (7.6)
40–60	131 (38.4)
> 60	184 (54.0)
Mean ± SD	42.00 ± 8.17
Material status	
Single	30 (8.8)
Married	306 (89.7)
Divorced	5 (1.5)
Educational level	
Elementary	2 (0.6)
Intermediate	3 (0.9)
High school	35 (10.3)
Diploma	57 (16.7)
Bachelor or above	244 (71.6)
Incomes (SAR)/month	
< 5000	10 (2.9)
5,001–10,000	11 (3.2)
10,001–15,000	59 (17.3)
15,001–20,000	151 (44.3)
> 20,000	110 (32.3)
Job	
None-healthcare professional	241 (70.7)
Healthcare professional	100 (29.3)
History of Cancer	
No	338 (99.1%)
Yes	3 (0.9%)

Results expressed as mean±standard deviation or n/total *n* (%)

3.2 Knowledge of PCa

When participants' knowledge about most common cancer type in men was investigated, all the participants answered incorrectly. The options given for the most common cancer included oral, esophageal, gastric, liver, intestine, breast, pancreas, skin, penile, prostate, lung, kidney with other options; "I do not know" and "other". While the participants' knowledge about PCa gender was good and 98.9% answered correctly about the gender incidence of PCa. However, there was insufficient knowledge about the role of PCa risk factors. Most of the participants believed that eating fruits (62.2%), routine blood tests (66.9%), and body weight control (78.6%) will not help in preventing PCa, while a little more than half of the participants (50.4%) were correct in identifying physical exercise as a factor to prevent PCa. Likewise, the participants' knowledge about PCa test duration, visiting physician and types of screening tests were insufficient (Table 2).

In terms of overall PCa knowledge, 70.4% demonstrated adequate knowledge, while 29.6% showed inadequate knowledge. There was no statistically significant association between participants'knowledge of PCa and age ($p = 0.119$), marital status ($p = 0.232$), educational levels ($p = 0.072$), incomes levels ($p = 0.089$), or history of cancer ($p = 0.100$). In contrast, a significant association was observed between the participants' knowledge and occupations; as being a healthcare professional ($p = 0.006$; Table 3).

The Cox & Snell R^2 (0.067) and Nagelkerke R^2 (0.095) of the logistic regression analsysis suggest that the model explains a relatively small proportion of the variance in the knowledge level realted PCa.

The occupation variable (non-healthcare vs. healthcare professional) is statistically significant (p = 0 0.018) with an Exp(B) of 0.477, indicating that healthcare professionals are less likely to experience the outcome compared to non-healthcare professionals. Other variables, such as Age Group, Marital Status, Education, Income, and History of Cancer, are not statistically significant ($p > 0.05$), suggesting that these factors may not strongly influence the dependent variable in this model (Table 4).

3.3 Attitude towards screening of PCA

Analysis of the last PCa screening revealed that most of the participants had never been screened for PCa. The association of age with PCa screening was significant (p = 0.013). To illustrate this, most of the participants under 60 years

Table 2 Frequency distribution knowledge of the study participants related Prostate cancer ($N = 341$)

Statements	Incorrect *N* (%)	Correct *N* (%)
Most prevalent cancer among male	341 (100)	0 (0)
Prostate Cancer Gender	3 (1.1)	338 (98.9)
Prostate Cancer Risk Factors		
Family History of Cancer	241 (70.7)	100 (29.3)
Age	222 (65.1)	119 (34.9)
Obesity	299 (87.7)	42 (12.3)
Race/ethnicity	334 (98)	7 (2)
Factors Prevents Prostate Cancer		
Eat Fruits and Vegetables	212 (62.2)	129 (37.8)
Physical Exercise	169 (49.6)	172 (50.4)
Routine Blood Test	228 (66.9)	113 (33.1)
Body Weight Control	268 (78.6)	73 (21.4)
Prostate Cancer Test Duration	250 (73.3)	90 (26.7)
Visting Prostate Cancer Physician	330 (96.8)	11 (3.2)
Prostate Cancer Screening Test Type		
Digital Rectal Exam	316 (92.7)	25 (7.3)
Blood Test/PSA	237 (69.5)	104 (30.5)

of age had never undergone PCa screening. As expected, a very significant association was seen between education level and PCa screening ($p < 0.001$). However, there was no association between income level and screening for PCa ($p = 0.491$; Table 5).

4 Discussion

The aim of this study was to evaluate the participants'awareness of PCa and their knowledge about the importance of screening tests in Najran region, Saudi Arabia. The survey was conducted using Google Forms and responses from the required number of participants were collected at approximately 3 months.

Despite PCa being the second most prevalent cancer that affects men and leads to mortality globally (Bergengren et al. 2023), overall knowledge of PCa still needs a boost (70.4%). This aligns with recent findings for Saudi Arabia (Alasker et al. 2024; Jarb et al. 2022). Extensive studies in several Middle Eastern countries, including Jordan (MaY et al. 2022), Oman (Al-Azri et al. 2020), the United Arab Emirates (Eladl et al. 2024), Lebanon (Boustany et al. 2021), Egypt (Khalil et al. 2024), and Turkey (Sungur and Caliskan 2020), have demonstrated inadequate understanding of and an impartial approach towards PCa testing and screening procedures. Similar observations have also been made in recent studies in other countries, including Brazil (Maluf et al. 2021), Serbia (Panajotović et al. 2022), Rwanda (Benurugo et al. 2020), Nigeria (Farazi et al. 2019), and Ethiopia (Gebru et al. 2023). Studies from developed countries, such as the United States of America (Leonard et al. 2017) and Australia (Kannan et al. 2019), have also shown the importance of raising awareness through campaigns to increase PCa screening. Another recent study conducted in 14 different Middle Eastern countries, including countries neighbouring Saudi Arabia, such as Kuwait, Bahrain, the United Arab Emirates, and Iran, revealed that Middle Eastern men are aware of prostate cancer as a health threat. However, the participants in this study lacked adequate knowledge of the risk factors, screening, and disease outcomes (Sayan et al. 2024).

This study revealed that more than 80% of participants were held a diploma degree or above that represent their solid educational background. However, there was no statistical significance between respondents' knowledge and education level, which may be explained by the targeted community of this study, which has included whole Najaran community. This finding is in agreement with findings from previous research in Saudi Arabia (Alothman et al. 2022; Salah et al. 2024). To address this lack of knowledge, initiatives must be made to educate men to ensure that they can make informed decisions about PCa screening. Moreover, it is hypothesized that poor knowledge is a major cause of not understanding the importance of testing for the prostate-specific antigen (PSA), which boosts the probability of detecting PCa within lower grades and increases those patients' survival (Maladze et al. 2023). Therefore, increased educational attainment and school enrolment are important milestones in cancer prevention.

In the current study, a significant association was observed between type of occupation and knowledge for the prevention of PCa. Participants with a healthcare background had better knowledge rate of PCa as compared to others. This may due to their engagement in health process, whereas reasonable rate was observed for non-healthcare professionals. Healthcare professionals who participated in the study included physicians, physical therapists, pharmacists, nurses, ophthalmologists, orthopaedicians, and dentists. It is known that people with a higher income have more awareness and knowledge of healthcare. This fact aligns with previous studies in Ethiopia, Namibia, and Denmark (Gebru et al. 2023; Kangmennaang et al. 2016; Hvidberg et al. 2014). People with higher incomes are more concerned about their health as compared to those from other income classes. Higher income groups have more access to health-related information, which helps in the prevention of diseases. Hence, people with a higher income are less likely to suffer from chronic diseases (Mitsutake et al. 2023). Overall, participants with healthcare background and more income a had better knowledge of PCa.

Investigation of PCa screening among the participants showed age and education levels were important factors.

Table 3 Relationship between the participants knowledge level regarding prostate cancer and their demographics ($N = 341$)

Demographics	Total N (%)	Knowledge		(Chi-Square)/ Fisher test p-value
		Inadequate (%)	Adequate (%)	
Age				
< 40 years	26 (7.6)	10 (38.5)	16 (61.5)	(4.266)
40—60 years	131 (38.4)	45 (49.1)	86 (65.6)	0.119
> 60 years	184 (54.0)	46 (25.0)	138 (75.0)	
Marital Status				
Single	30 (8.8)	13 (43.3)	18 (58.1)	FE/
Married	306 (89.7)	87 (28.4)	219 (71.6)	
Divorce	5 (1.5)	1 (25)	3 (75)	0.232
Education Levels				
Elementary	2 (0.6)	1 (50)	1 (50)	
Intermediate	3 (0.9)	2 (66.7)	1 (33.3)	
High school	35 (10.3)	17 (48.6)	18 (51.4)	
Diploma	57 (16.7)	15 (26.3)	42 (73.7)	FE/
Bachelor or above	244 (71.6)	66 (27.0)	178 (73.0)	0.072
Incomes levels (SAR/month)				
< 5000	10 (2.9)	3 (30)	7 (70)	
5,001–10,000	11 (3.2)	3 (27.3)	8 (72.7)	
10,001–15,000	59 (17.3)	26 (44.1)	33 (55.9)	
15,001–20,000	151 (44.3)	46 (30.5)	105 (69.5)	FE/
> 20,000	110 (32.3)	23 (20.9)	87 (79.1)	0.089
Occupation				
Non-healthcare	241 (70.7) 100 (29.3)	82 (43)	159 (66.0)	7.654/
Healthcare professional		19 (19)	81 (81.0)	0.006**
History of cancer				
No	338 (99.1%)	100 (29.6)	238 (70.4)	FE/
Yes	3 (0.9%)	1 (33.3)	2 (70.4)	0.100

*$p < 0.05$, **$p < 0.001$

There was a significant difference in PCa screening tests between participants aged ≥ 60 years and < 60 years. The results are in agreement with the risk factors for PCa. It has been reported that screening for PCa among people less than 55 years is uncommon (Hussein et al. 2015). Furthermore, PCa is more common in people aged over 65 years (Daniyal et al. 2014). PCa knowledge scores were higher in the high-income group, but the same was not true for PCa screening. Participants'reluctance to undergo screening may be due to their own beliefs, that they are not at high risk of PCa. There was a positive association of education level with PCa testing, and significant differences between various educational levels were observed. This result accords with PCa knowledge scores. Therefore, education and age were important factors that enhanced participants' knowledge and awareness of PCa screening. The Kingdom of Saudi Arabia has adopted an e-health strategy. There are no more paper reports available to the patients. This has encouraged the citizens and residents to avail of medical services with ease without hesitation. The medical records are accessible only to patients and medical personnel. This has helped a lot to remove stigmas and taboos related to chronic diseases. Despite this, the method of PCa screening may contribute to lower screening among the population due to their religious beliefs.

The study results revealed that only 70% of the participants in the Najran region of Saudi Arabia had adequate knowledge of PCa. This indicates insufficient media campaigns to highlight the importance of PCa screening tests, which can reduce patients' mortality by detecting PCa within lower grades. Similar results have been reported in earlier studies carried out in Saudi Arabia and Italy (Jarb et al. 2022; Morlando et al. 2017). The respondents claimed that utilizing social media care was their primary source of detailed knowledge about PCa. Social media can promote successful health-promoting interventions, especially among typically more underprivileged groups, such as the elderly, young people, those from low-income backgrounds, and people living in rural areas (Welch et al. 2016). However, utilizing social media to influence

Table 4 Binarl logistic regression analsysis of demographic assocaued with the levels of knowldgre realted PCa among the paricpants

Demographics	B	S.E	Sign	Exp(B)	95% C.I. for EXP(B)	
					Lower	Lower
Age	Refernece		0.092			
< 40 years						
40—60 years	− 0.717-	0.486	0.140	0.488	0.188	1.265
> 60 years	− 0.518-	0.268	0.053	0.596	0.353	1.008
Marital Status	Refernece		0.381			
Single						
Married	− 0.922-	1.260	0.465	0.398	0.034	4.703
Divorce	− 0.278-	1.188	0.809	0.750	0.073	7.704
Education Levels	Refernece		0.315			
Elementary						
Intermediate	− 0.895-	1.460	0.540	0.409	0.023	7.142
High school	− 2.144-	1.436	0.141	0.121	0.007	2.015
Diploma	− 0.713-	0.416	0.087	0.490	0.217	1.108
Bachelor or above	− 0.061-	0.361	0.866	0.941	0.464	1907
Incomes levels (SAR/month)	Refernece		0.442			
< 5000						
5,001–10,000	0.814	0.891	0.361	2.257	0.394	12.937
10,001–15,000	0.508	0.812	0.532	1.661	0.338	8.145
15,001–20,000	− 0.386-	0.404	0.339	0.680	0.308	1.499
> 20,000	− 0.294-	0.305	0.335	0.746	0.410	1.355
Occupation (Non-healthcare VS Healthcare professional)	− 0.747-	0.313	0.018	0.477	0.258	0.880
History of cancer (No VS Yes)	− 0.112-	1.294	0.931	0.894	0.071	11.302
Constant	2.420	1.767	0.171	11.249		

*p< 0.05, **p< 0.001

Table 5 Analysis of participants' prostate cancer screening according to demographic characteristics (N = 341)

Variable	Total N (%)	This year	Before 1 year	2–5 years	Never	(Chi-Square) p-value
Age, years						(16.114)0.013*
< 40	26 (7.6)	0 (0.0)	0 (0.0)	1 (3.8)	25 (96.2)	
40–60	131(38.4)	3 (2.3)	3 (2.3)	5 (3.8)	120(91.6)	
> 60	184(54.0)	8 (4.3)	18 (9.8)	16 (8.7)	142(77.2)	
Incomes levels (SAR/month)						(11.443)0.491
< 5000	10 (2.9)	0 (0.0)	0 (0.0)	1 (10.0)	9 (90.0)	
5,001–10,000	11 (3.2)	0 (0.0)	0 (0.0)	0 (0.0)	11 (100.0)	
10,001–15,000	59 (17.3)	1 (1.7)	3 (5.1)	5 (8.5)	50 (84.7)	
15,001–20,000	151 (44.3)	8 (5.3)	8 (5.3)	6 (4.0)	129 (85.4)	
> 20,000	110 (32.3)	2 (1.8)	10 (9.1)	10 (9.1)	88 (80.0)	
Education Level						(34.957) < 0.001**
Elementary	2 (0.6)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	
Intermediate	3 (0.9)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)	
High school	35 (10.3)	0 (0.0)	2 (5.7)	3 (8.6)	30 (85.7)	
Diploma	57 (16.7)	5 (8.8)	6 (10.5)	1 (1.8)	45 (78.9)	
Bachelor or above	244 (71.6)	5 (2.0)	12 (4.9)	18 (7.4)	209 (85.7)	

*p < 0.05, **p < 0.001

individuals' behaviour is still controversial (Neiger et al. 2012). The second source of PCa knowledge was information provided by healthcare professionals. There were similar findings in previous studies conducted in Spain (Carrasco-Garrido et al. 2014), and Italy (Morlando et al. 2017). These findings supposed that participants who received information from a healthcare professional had better opportunities to know about and undergo a PSA test, as they can inform them about PSA screening. In contrast, among the respondents of this study, only around 31% were aware of the importance of PSA screening tests. Therefore, improving and activating healthcare centres' role in educating the population about the severity of PCa and the importance of having a screening test might help to raise community awareness.

The study also found that the majority of participants (99.1%) claimed to have no family history of prostate-related problems or previous admission to a medical institution due to issues connected with their prostate. Although raising community awareness about PCa and screening tests is a fundamental requirement of an efficient health system, there is still insufficient scientific data to demonstrate the benefits of implementing screening programmes. Moreover, there can be effects on one's quality of life and psychological outcomes following therapy. For these reasons, physicians should clarify the benefits and limitations of a test to prospective patients, taking into consideration their age, risk factors, and life expectancy. The study included adult males aged above 18 years to determine and improve their knowledge about prostate cancer, which might help in the detection of this cancer in its early stages, which may then boost the possibility of survival. The age of the participants is in agreement with several other studies, wherein more than 50% of the surveyed participants were aged less than 20 years (Jarb et al. 2022; Maluf et al. 2021; Gebru et al. 2023; Morlando et al. 2017). This study focused only on awareness in the Najran region of risk factors and PCa screening. The influence of demographics was assessed. Since all the participants were from one particular region, with similar sociocultural backgrounds, the influence of these on the outcome results could not be assessed.

Health literacy is essential to prevent and manage chronic diseases in the general population. Literacy can be achieved through workshops, seminars, campaigns and questionnaires in the general population (Chimezie 2023). The current study is an attempt to increase the level of awareness of PCa and the importance of screening for it. The findings of this study will help in better organization of health education among the target population, which may directly or indirectly influence the participants to have an early screening test for PCa, leading to the prevention and management of PCa. This highlights the pivotal role of cross-sectional studies in the prevention and management of chronic diseases.

This study has some limitations. This study has a cross-sectional design; hence, there is no direct correlation between the independent and dependent variables. It is possible that a few answers might have been shared between the participants. Additionally, internet access and technological literacy among participants may have influenced some correct answers in the questionnaire. The questionnaire had important questions related to knowledge and awareness of PCa. The number of questions was limited to facilitate completion in a short time. The study duration was short, which resulted in limited sampling. Third, the survey was self-administered, participants could only report what they believed to be appropriate and not necessarily how they actually behave. The surveys were completed at home, and some participants probably sought information online before responding. The study is limited to the Najran region, a province in the south of Saudi Arabia.

To address the aforementioned limitations, organizing more awareness campaigns, sharing information on social media, encouraging men to have a screening test, better health education from primary care physicians and public-based organizations, and further studies with larger samples representing different demographic variables are all warranted. Predictive modelling could also help policymakers test the potential results of awareness campaigns and early screening programmes, making strategies more effective. Furthermore, studies utilizing stratified random sampling to ensure a more diverse and representative sample are recommended. The addition of more questions would lead to a better understanding of participants' knowledge and awareness of different aspects of PCa, and more studies focusing on levels of awareness and knowledge in other regions of Saudi Arabia are warranted.

5 Conclusions

The study findings indicate that 70% of male participants in Najran, Saudi Arabia, have adequate awareness of the risk factors and screening procedure for PCa. This study offers useful insights that can improve public health strategies, especially in areas with similar healthcare issues. For instance, using a geographic information system could help to map out where prostate cancer awareness and screening are lacking in the Najran region.

Abbreviations *PCa*: Prostate cancer; *PSA*: Prostate-specific antigen (PSA)

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s44446-025-00014-6.

Acknowledgements The author would like to thank the Deanship of Scientific Research at Shaqra University for supporting this work.

Authors contribution Single author.

Funding The author declares that no funds, grants, or other support were received during the preparation of this manuscript.

Data availability The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests The authors have no relevant financial or non-financial interests to disclose.

Ethics approval and consent to participate This study was approved by the Local Committee at Shaqra University (HAPO- 01-R- 128). Informed consent was obtained through confidential communication, ensuring participant privacy by using anonymized data collection without requiring personal identification. Participation in the survey was voluntary, and it was distributed to citizens via social media applications. Written up on the title page to maintain confidentiality as per author guidelines.

Consent for publication Not Applicable.

References

Alahmadi E (2022) Prostate cancer awareness and knowledge among men residents in Al-Madinah Al-Munawarah, Saudi Arabia: a surveillance study. Acta Sci Med Sci (ISSN: 2582–0931) 6

Alasker A, Arabi TZ, Alghafees MA et al (2024) Prostate cancer among Saudis: a registry review. Ann Med Surg (Lond) 86:56–61

Al-Azri M, Al-Hinai AS, Al-Ghafri MH et al (2020) Knowledge and awareness of prostate cancer among Omani men attending a teaching hospital. J Cancer Educ 35:1002–1010

Al-Nbaheen MS (2020) Impact of weight loss predictors in severe-morbid obesity patients in the Saudi population. Saudi J Biol Sci 27:2509–2513

Alothman AM, Altamimi AF, Alhenaki AW et al (2022) The knowledge and attitude towards prostate cancer and screening practices among males in Saudi Arabia. J Family Med Prim Care 11:2637–2642

Al-Raddadi R, Bahijri SM, Jambi HA et al (2019) The prevalence of obesity and overweight, associated demographic and lifestyle factors, and health status in the adult population of Jeddah, Saudi Arabia. Ther Adv Chronic Dis 10:2040622319878997

Alshammari S, Alojayri R, Aljehani M et al (2021) The association between the knowledge on prostate cancer screening with the beliefs and behaviors of Saudi men attending King Khalid University Hospital. J Family Med Prim Care 10:4423–4430

Arabia GaFSIS (2019) Population in Jazan region by gender, age group, and nationality (Saudi/Non-Saudi). In

Beaton DE, Bombardier C, Guillemin F et al (2000) Guidelines for the process of cross-cultural adaptation of self-report measures. Spine 25:3186–3191

Benurugo G, Munyembaraga E, Chironda G et al (2020) Awareness on prostate cancer and screening practices among men attending outpatient at a referral hospital in Kigali, Rwanda: a quantitative study. Int J Africa Nursing Sci 13:100241

Bergengren O, Pekala KR, Matsoukas K et al (2023) 2022 update on prostate cancer epidemiology and risk factors-a systematic review. Eur Urol 84:191–206

Boustany J, Abdessater M, Akl H et al (2021) Prostate cancer awareness in the Lebanese population: a cross sectional national survey. BMC Public Health 21:1744

Bray F, Laversanne M, Sung H et al (2024) Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 74:229–263

Carrasco-Garrido P, Hernandez-Barrera V, Lopez De Andres A et al (2014) Awareness and uptake of colorectal, breast, cervical and prostate cancer screening tests in Spain. Eur J Public Health 24:264–270

Chimezie RO (2023) Health awareness: a significant factor in chronic diseases prevention and access to care. J Biosci Med 11:64–79

Cornford P, Van Den Bergh RCN, Briers E et al (2024) EAU-EANM-ESTRO-ESUR-ISUP-SIOG guidelines on prostate cancer-2024 update. Part I: screening, diagnosis, and local treatment with curative intent. Eur Urol 86:148–163

Daniyal M, Siddiqui ZA, Akram M et al (2014) Epidemiology, etiology, diagnosis and treatment of prostate cancer. Asian Pac J Cancer Prev 15:9575–9578

De Vrieze M, Al-Monajjed R, Boschheidgen M et al (2024) Prostate cancer screening in young men. J Pers Med 14(8):818

Eladl M, Hesham B, Adra S et al (2024) Assessment of knowledge, practices, and attitudes toward prostate cancer and its screening among men aged 40 years and older in the United Arab Emirates: a cross-sectional study. Cureus 16:e75108

Farazi PA, Siahpush M, Maloney S et al (2019) Awareness and attitudes of Nigerian men living in Abuja on prostate cancer and screening. J Cancer Educ 34:1107–1111

Gebru T, Mekonnen H, Getahun N et al (2023) Awareness of prostate cancer and its associated factors among male patients attending care in the urology unit at Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia. BMJ Open 13:e073602

Hussein S, Satturwar S, Van Der Kwast T (2015) Young-age prostate cancer. J Clin Pathol 68:511–515

Hvidberg L, Pedersen AF, Wulff CN et al (2014) Cancer awareness and socio-economic position: results from a population-based study in Denmark. BMC Cancer 14:581

Jarb AF, Aljuaid AK, Alghamdi SM et al (2022) Awareness about prostate cancer and its screening in Medina, Jeddah, and Makkah, Saudi Arabia population. Urol Ann 14:27–32

Kangmennaang J, Mkandawire P, Luginaah I (2016) What prevents men aged 40–64 years from prostate cancer screening in Namibia? J Cancer Epidemiol 2016:7962502

Kannan A, Kirkman M, Ruseckaite R et al (2019) Prostate cancer awareness, case-finding, and early diagnosis: interviews with undiagnosed men in Australia. PLoS ONE 14:e0211539

Khalil MIM, Ashour A, Shaala RS et al (2024) Effect of health belief model-based educational intervention on prostate cancer prevention; knowledge, practices, and intentions. BMC Cancer 24:289

Kotwal AA, Schumm P, Mohile SG et al (2012) The influence of stress, depression, and anxiety on PSA screening rates in a nationally representative sample. Med Care 50:1037–1044

Leonard JA, Wells JB, Brandler ES (2017) Awareness of prostate cancer and screening modalities among long island men. Am J Mens Health 11:365–368

Maladze N, Maphula A, Maluleke M et al (2023) Knowledge and attitudes towards prostate cancer and screening among males in Limpopo Province, South Africa. Int J Environ Res Public Health 20(6):5220

Maluf FC, Saporito FMF, Corrêa Júnior RA et al (2021) Prostate cancer awareness in the city of São Paulo. Einstein (Sao Paulo) 19:eAO6325

Matsushita M, Fujita K, Nonomura N (2020) Influence of diet and nutrition on prostate cancer. Int J Mol Sci 21(4):1447

MaY A, Al-Samman R, Matalgah O et al (2022) Early detection of prostate cancer: self-reported knowledge and attitude of physicians in Jordan. Inquiry 59:469580221095822

Mitsutake S, Takahashi Y, Otsuki A et al (2023) Chronic diseases and sociodemographic characteristics associated with online health information seeking and using social networking sites: nationally representative cross-sectional survey in Japan. J Med Internet Res 25:e44741

Morlando M, Pelullo CP, Di Giuseppe G (2017) Prostate cancer screening: knowledge, attitudes and practices in a sample of men in Italy. A Survey. Plos One 12:e0186332

Mosli HA, Abdel-Meguid TA, Al-Maghrabi JA et al (2009) The clinicopathologic patterns of prostatic diseases and prostate cancer in Saudi patients. Saudi Med J 30:1439–1443

Neiger BL, Thackeray R, Van Wagenen SA et al (2012) Use of social media in health promotion: purposes, key performance indicators, and evaluation metrics. Health Promot Pract 13:159–164

Organization WH (2019) International agency for research on cancer

Otifi HM, Abdul-Wahab OMS, Al-Shyarba MH et al (2022) Clinicopathological features and prevalence of prostate cancer in Aseer, Saudi Arabia. Saudi Med J 43:755–759

Panajotović T, Panajotović N, Vukcević M et al (2022) Awareness of prostate cancer among the sportsmen in the Republic of Serbia. J Environ Public Health 2022:8400768

Pinsky PF, Prorok PC, Kramer BS (2017) Prostate cancer screening - a perspective on the current state of the evidence. N Engl J Med 376:1285–1289

Rafikova G, Gilyazova I, Enikeeva K et al (2023) Prostate cancer: genetics, epigenetics and the need for immunological biomarkers. Int J Mol Sci 24(16):12797

Rao AG, Dkhar W, Sharath S et al (2023) Knowledge, awareness and practice towards screening for prostate cancer: a systematic review and meta-analysis. Ethiop J Health Sci 33:547–554

Salah M, Zaitoun Y, Fakhry B et al (2024) Knowledge, attitude, and practices concerning prostate cancer and its prevention in the Lebanese population. Sci Rep 14:28551

Sayan M, Eren AA, Tuac Y et al (2024) prostate cancer awareness in the Middle East: a cross-sectional international study. JCO Glob Oncol 10:e2400171

Shan J, Liu Z, Geng X et al (2022) The influence of age on prostate cancer screening index. J Clin Lab Anal 36:e24098

Shaqran TM, Alanazi RM, Haider AM et al (2023) Knowledge and awareness of screening for prostate cancer risk factors and symptoms among the general population in Tabuk City, Saudi Arabia. Cureus 15:e46472

Sung H, Ferlay J, Siegel RL et al (2021) Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 71:209–249

Sungur M, Caliskan S (2020) AAwareness of prostate cancer diagnosis and management among Turkish males: a cross sectional study from Çorum. Aging Male 23(3):202–205

Taha SA, Kamal BA (2005) Screening program for prostate cancer at a university hospital in eastern Saudi Arabia. Saudi Med J 26:1104–1106

Wasim S, Lee SY, Kim J (2022) Complexities of prostate cancer. Int J Mol Sci 23(22):14257

Welch V, Petkovic J, Pardo Pardo J et al (2016) Interactive social media interventions to promote health equity: an overview of reviews. Health Promot Chronic Dis Prev Can 36:63–75

Wilson KM, Mucci LA (2019) Diet and lifestyle in prostate cancer. Adv Exp Med Biol 1210:1–27