Determinants of Behavioral Intentions to Screen for Prostate Cancer in Omani Men

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ABSTRACT

Objective: This study aimed at exploring the perceived barriers and intention to screen for prostate cancer (PCa). **Methods:** A survey questionnaire and a descriptive design were used to collect data from 129 Omani men above the age of 40 years. The questionnaire comprised the International Prostate Symptom Score (IPSS), barriers, and intention to screen scales. The participants were recruited from barbershops located in two cities of Oman. **Results:** The mean IPSS score was 8.31 ± 3.34 and the majority of participants had mild prostate cancer symptoms (60.4%). The others had moderate (28.7%) or severe symptoms (10.9%). Most men had low-to-moderate intention to screen using the method of digital rectal examination (DRE) (76%) and prostate-specific antigen test (PSA) (69.8%). The most common barriers to screening were fear of finding out something wrong (48.1%), not knowing what will be done during screening (54.3%),

belief that PCa is not a serious disease (55.8%), and belief that DRE is embarrassing (56.6%). The significant determinants of intention to screen using DRE were perceived threat of the disease ($P = 0.006$) and past information from doctors that one has any prostate disease ($P = 0.017$). The determinants of intention to screen using PSA were perceived threat of the disease ($P = 0.025$), perceived general health ($P = 0.047$), and past information from doctors that one has any prostate disease ($P = 0.017$). **Conclusions:** The participants had diminutive intention to undergo PCa screening. Interventions aimed at enhancing PCa disease and risk awareness may help to reduce the barriers and increase PCa screening uptake.

Key words: Cancer screening, early diagnosis, men, Oman, prevention, prostate cancer

Introduction

Prostate cancer (PCa) is increasingly affecting men around the world.[1] Worldwide, PCa is the 2nd most common cancer among men accounting for 15% of all cancers diagnosed in men.[2,3] An estimated 307,000 deaths were attributed to PCa in 2012, making it the 5th leading cause of cancer death in men.[3] The highest incidence rates of PCa are found in Western countries.[4] The regions with the highest

incidence rates of PCa include Australia/New Zealand (111.6/100,000) and North America (97.2/100,000). The high rates in Western countries have been attributed to the widespread use of prostate-specific antigen test (PSA) screening.[3] For instance, in the USA, the age-adjusted incidence and mortality rate of PCa in men of all races are 156/100,000 and 24.7/100,000, respectively.[5] The incidence (233.8/100,000) and mortality rates (54.2/100,000) are higher among African-American men.[5]

In the Middle East, the estimated age-standardized incidence and mortality rate of PCa are 9.7/100,000 and 6.2/100,000, respectively.[3] In this region, countries such as Lebanon (27.6/100,000), Turkey (19.1/100,000), Bahrain (13.3/100,000), and Kuwait (12.6/100,000) have the highest incidence rates for PCa.[6] While countries such as Oman (5.8/100,000), Egypt (6.6/100,000), and Saudi Arabia (6.1/100,000) have moderate incidence rates, mainly due to the limited number of asymptomatic men undergoing PCa screening.[6] In the Middle East, PSA screening is not routine and the other methods of screening such as transrectal sonography are only available in regional hospitals, leading patients to present with more advanced disease.[7]

Among the countries in the Gulf Cooperation Counties, Oman has the 2nd highest incidence of newly diagnosed cancers (11%) after Saudi Arabia (71.8%).[8] In Oman, the incidence of PCa has increased from 5.1/100,000 in 2000 to 7/100,000 in 2010, and is now the 3rd most frequent cancer among men.[8] Omani men affected by PCa are diagnosed late and present with higher grade tumors according to the Gleason's scale.[8,9] A study of prostate biopsies in Oman ($n = 1163$) showed that these men had nodular hyperplasia (88.5%), intraepithelial neoplasia (60.6%), and nodular hyperplasia (88.5%).[9]

The risk factors for PCa are present in Oman and will continue to rise as the number of older adults increase. The life expectancy of Omanis has increased from 50 years in 1970 to 73.9 years in 2010 and today 5% of the population is above the age of 60 years.[10] This change is consistent with the risk profile of PCa which includes age above 50 years, family history of the disease (having a brother or father with the disease), and ethnicity.[5] One of the essential steps toward reducing late diagnosis, morbidity, and mortality of PCa is increased uptake of screening. The findings from the European randomized study of screening for PCa show that screening reduces the risk of developing metastatic PCa by 3.1/1000 men.[11] The findings of an earlier randomized study show that PSA-based screening reduces the rate of death from PCa by 20%.[12] However, in order for men to benefit from these outcomes of PCa screening, they have to be able to access it.

Various studies have confirmed that men face several barriers which curtail their intention to attain PCa screening. The intention and actual attendance of PSA test and prostate biopsy is affected by factors such as men's perceived threat of the disease, perceived benefits, external influences, and general health.[13] A study of multi-ethnic men ($n = 308$) conducted in New York showed that ethnicity, level of income, and fear are key predictors of screening using PSA and digital rectal examination (DRE).[14] The other factors include fear of invasion of privacy, embarrassment, fear of screening procedures and religiosity,[15,16] lack of knowledge, lack of motivation or encouragement by others, lack of health-care provider involvement, and limited screening clinic hours.[17]

A study conducted in Sweden showed that physicians' opinions about the PSA test, request for screening, and physical symptoms affected the physician's decision of ordering PSA testing.[18] The studies cited above inform us that the barriers to PCa screening are still a common burden even in countries with high screening rates. There are no studies done in the Middle East region about men's PCa screening intention and barriers that can be used to compare with. The aim of this study was to explore the barriers to PCa screening and the level of intention to screen in Omani men to delineate the needed interventions to enhance PCa screening and reduce PCa morbidity and mortality.

Current status of recommendations for prostate cancer screening

Currently, there is no universal consensus recommendation for population-wide PCa screening. However, some PCa cases are very aggressive, lead to mortality at a young age, and only have a good prognosis if diagnosed early.[19] Therefore, it is important to encourage men of age 40 years and above to have discussions with their health-care providers to make informed decisions about initiating PCa screening. Screening for PCa means that a medical or diagnostic test is performed in the absence of any symptoms.[20] The main goal of screening is to identify cancer at an early stage, to increase the chances of successful treatment, and to improve the patients' quality of life.

The methods commonly used for PCa screening include the PSA and DRE. If an elevated PSA level (in general ≥ 3.0 ng/mL) and/or the DRE show abnormalities, a prostate biopsy is indicated.[13] Rarely, transrectal ultrasound-guided biopsy is used for PCa screening.[21] Reports from the USA and Europe show that PCa screening using PSA induced over-diagnosis, over-treatment, and this triggered the retraction of recommendations for a population-wide screening. Despite the retraction, available evidence strongly shows that screening reduces PCa-related mortality.[11,12]

The European Association of Urology recommends that early detection of PCa should be offered to well-informed men starting with a baseline PSA at the age of 40 years.[21] Subsequent screening intervals of 8 years are then encouraged if the initial PSA level is <1 ng/mL and no further testing after the age of 75 years.[21]

The American Cancer Society (ACS) recommends that men should have a chance to make an informed decision with their health-care provider about whether to be screened for PCa.[22] The decision should be made after getting information about the uncertainties, risks, and potential benefits of PCa screening. The discussion should take place at age 50 for men who are at average risk and expected to live at least 10 or more years; at age 45 for men at high risk such as African-Americans, or who have a first-degree relative diagnosed with PCa at age younger than 65 years; at age 40 for men at even higher risk. Men with a PSA level <2.5 ng/mL only need to be tested every 2 years and those with higher levels should be tested every year.[22]

The American Urological Association (AUA) also strongly recommends shared decision-making for men aged 55–69 years that are considering PSA screening, and proceeding based on men's values and preferences.[23] The AUA does not recommend routine screening in men under the age of 40 years and men above the age of 75 years or with a <10–15 years' life expectancy. A screening interval of 2 years is preferred because it preserves the majority of the benefits and reduces over-diagnosis and false positives.[23]

Methods

A descriptive design was used to collect data from Community dwelling Omani men. The study focused on men of age 40 years and above. The ACS recommends initiation of discussions to assist high-risk men with decisions related to PCa screening starting at the age of 40 years. The participants were recruited in men's barbershops located in two cities of Oman (Muscat and Sohar). A total of twenty barbershops were purposefully selected in each city and these constituted the study setting. The barbershops represent an accessible setting for most Omani men and are a good setting where customized information for men can be disseminated in a structured and culturally appropriate environment. Barbershops are commonly recommended as a culturally relevant, feasible, and appropriate venue for community-based PCa education.[24]

The participants were recruited based on the following inclusion criteria: nationality (Omani), age (40 years and above regardless of PCa history), and not being a health-care professional. The health-care professionals were excluded from the study because their professional knowledge about health issues and PCa could skew the results. A total of 400 men were approached to participate in the study and 129 (32.3%) agreed to consent to participate in the data collection interview. The reason given by those who refused to participate were lack of time and discomfort talking about diseases related to sexual organs. This study recruited a convenient sample of 129 Omani men.

Data collection instrument

Data were collected using a survey questionnaire (SQ). The SQ comprised a section to elicit data about men's experiences with PCa (7 items) and these were used to determine the history of prostate disease, immediate family members with PCa, and past experience with DRE or PSA. Intention to screen for PCa was measured with the intention-to-screen scale. Intention to screen is a measure of a person's readiness to be screened for PCa and is considered to be the immediate antecedent of behavior. Intention to screen is frequently used as a proximal measure of actual behavior when actual behavior is not readily apparent.[25] Intention to screen was measured with 5 items of "How likely is it that you will have a DRE or blood test to screen for PCa in the next 12 months?," "How likely is it that you will take a DRE or blood test to screen for PCa when recommended by a doctor?," and the three items with the following stem: "I expect to...," "I want to...," and "I intend to..."[25] The participants responded to each item on a 5-point Likert scale as 1 "Definitely will not" to 5 "Definitely will." A total score was calculated by adding the level of intent (each item) for each procedure (DRE or blood test). The total scores ranged from 5 to 25 with higher scores indicating high intention for the respective procedure. The 5-item intention scale has a Cronbach's alpha reliability of 0.94.[26]

The International Prostate Symptom Score (IPSS) was used to measure the presence of prostate symptoms. The IPSS measures the presence and severity of symptoms (7 items) related to prostate disease such as incomplete bladder emptying, urinary frequency, intermittency, urgency, weak stream, straining, and nocturia. The participants responded to each item on a 6-point Likert scale as "not at all = 0," "<1 in 5 times = 1," "less than half of the time = 2," "about half the time = 3," "more than half the time = 4," and "almost always = 5." A total score was computed by adding the level for each item. The total scores were categorized as mild (1–7), moderate (8–19), and severe (20–35). The IPSS has an extra item that measures the quality of life associated with the urinary symptoms on a scale of "0" to "6" ("delighted" to "terrible"). The IPSS has been widely used and has Cronbach's alpha ranging from 0.71 to 0.80.[27]

The barriers to PCa screening were measured using 14 items which have been used by other studies.[13,15] The

participants responded to each barrier statement on a 4-point Likert scale of "strongly disagree" to "strongly agree." The other barriers to screening were measured using the Prostate Cancer Testing Behavior Questionnaire (PCTBQ) developed in 2012. The PCTBQ comprises subscales of perceived general health, perceived threat of PCa, and external influences of screening decision-making.[13] The participants responded to each item on a 5-point Likert scale of "strongly disagree (1)" to "strongly agree (5)." The ratings of each item were added to get the total score for the domain. Higher scores on each scale indicate high levels of the respective factor. The scales of the PCTBQ all have a Cronbach's alpha above 0.79.[13]

All the components of the SQ were translated from English into Arabic by a professional translator. A second professional translator was used to translate the Arabic version back into English. Discrepancies between the back translation and original English version were identified and clarified. The items in the Arabic version were closely reviewed before generating the final SQ. The final Arabic SQ was pilot tested using a sample of ten Arabic-speaking men. The participants' responses during the pilot test were reviewed to determine understanding, interpretation, and relevance of items.

Ethics

The study was reviewed and approved by the Research and Ethics Committee of the College of Nursing at the University of the investigators. The participants were required to complete a consent form written in Arabic. Participants were also provided with an opportunity to ask questions before data collection and were informed of their right to stop their participation at any time without any penalty.

Data collection procedure

Previsits were made to the study sites to identify and meet with the owners of barbershops to get permission for the study activities. The information gained during previsits was used to develop a schedule for data collection and to determine the availability of a private space for data collection. On data collection days, any Omani man who came to the barbershop and who met the inclusion criteria was approached to obtain permission to participate in the study. After providing consent, the participants were taken to a private space to complete the questionnaire.

Statistical analysis

The Statistical Package for Social Sciences version 17 (SPSS Inc. Released 2008. SPSS Statistics for Windows, Version 17.0. Chicago) software program was used for data management and analysis. The participants' characteristics, prostate symptoms, intention to screen, and

perceived barriers to PCa screening were summarized using descriptive statistics. Chi-square test, Pearson's correlation, and multivariate regression analysis were used to establish determinants of intention to screen for PCa. The significance level for all statistical tests was set at $P \leq 0.05$ (two sided).

Results

Characteristics of the participants

The participants' characteristics ($n = 129$) are summarized in Table 1. The mean age of participants was 55.6 ± 11.8 years. The majority were married (82.2%), educated at a diploma or higher levels (55%), and had regular access to a physician (66%). The majority of the participants reported having mild prostate symptoms (60.4%), high levels of general

Table 1: Characteristics of the participants ($n=129$)		
Characteristics	**Category**	**Frequency (%)**
Age in years (mean±SD: 55.60±11.76)	40-50	100 (77.5)
	51-60	18 (14.0)
	≥61	11 (8.5)
Marital status	Never married	13 (10.1)
	Married	106 (82.2)
	Separated/widowed	10 (7.8)
Highest level of education attained	Primary school or less	20 (15.5)
	High school	38 (29.5)
	Diploma	27 (20.9)
	Bachelor's degree and above	44 (33.1)
Monthly income (US $)	<500	13 (10.1)
	501-1500	41 (31.8)
	≥1501	75 (58.1)
Employment status	Not employed or retired	25 (19.4)
	Part time	18 (14.0)
	Full time	86 (66.7)
Access to regular physician	No	44 (34.1)
	Yes	85 (65.9)
Main source of health care	Government facility	100 (77.5)
	Private facility	29 (22.5)
Perceived general health on a scale of 1-10 (mean±SD: 8.35±2.08)	1-5	11 (8.5)
	6-10	118 (91.5)
Perceived threat of PCa on a scale of 1-10 (mean±SD: 8.35±2.08)	1-5	38 (29.5)
	6-10	91 (70.5)
External influences on a scale of 1-15 (mean±SD: 10.02±3.13)	1-7	23 (17.8)
	8-15	106 (82.2)
IPSS (mean±SD: 8.31±8.34)	Mild to moderate	115 (89.1)
	Severe	14 (10.9)
Quality of life associated with IPSS	Delighted	34 (26.4)
	Pleased	33 (25.6)
	Mostly satisfied	2 (1.6)
	Mixed	36 (27.9)
	Mostly dissatisfied or unhappy	24 (18.7)
SD: Standard deviation, PCa: Prostate cancer, IPSS: International prostate symptom score		

health (91.5%), external influences (82.2%), and perceived threat of PCa (70.5%). A large number of men (46.6%) had mixed feelings and were dissatisfied or unhappy with the quality of life associated with their prostate symptoms.

Participants' experiences with prostate cancer and prostate cancer screening

The majority of participants did not have any prior personal experiences with PCa [Table 2]. The results summarized in Table 2 show that only a few participants had ever been diagnosed with PCa (4.7%), informed by a doctor that they had any disease of the prostate (8.5%), and had ever a DRE (10%) or PSA (11.6%) in the past 12 months.

Perceived barriers to prostate cancer screening

Table 3 shows the perceived barriers to PCa screening. The top five most common barriers to PCa screening were belief that DRE will be harmful (45.7%), fear of finding out something wrong as a result of PCA screening (48.1%), not knowing what will be done during PCA screening (54.3%), belief that PCA is not a serious disease (55.8%), and belief that DRE is embarrassing (56.6%).

Intention to screen for prostate cancer

Table 4 indicates that, despite the number of participants with moderate-to-severe prostate symptoms, the majority had low-to-moderate intention to screen using DRE (76%) and PSA (69.8%). The average level of intention to screen using both DRE and PSA was 15.4 and 16.4, respectively, and these are within the moderate range. Bivariate correlation analysis showed that intention to screen for PCa using DRE was significantly associated with being informed by a doctor that one has any disease of the prostate gland ($r = 0.258$; $P = 0.003$), working hours ($r = -0.176$; $P = 0.046$), belief that DRE is embarrassing ($r = -0.187$; $P = 0.034$), convenience of clinic or health center hours ($r = -0.197$; $P = 0.025$), not knowing where to go for screening ($r = -0.239$; $P = 0.006$), perceived general health ($r = 0.245$; $P = 0.005$), perceived threat of PCa ($r = 0.397$; $P = 0.000$), and level of external influences ($r = 0.278$; $P = 0.001$). Intention to screen for PCa using PSA was significantly associated with being informed by a doctor that one has any disease of the prostate gland ($r = 0.235$; $P = 0.007$), perceived general health ($r = 0.282$; $P = 0.001$), perceived threat of PCa ($r = 0.385$; $P = 0.000$), and external influences ($r = 0.331$; $P = 0.000$).

Participants' characteristics associated with intention to screen for prostate cancer

Table 5 shows that the participants' characteristics that were significantly associated with intention to screen

Table 2: Personal experiences related to prostate cancer and prostate cancer screening (n=129)

Reported experience	Response	Frequency (%)
Was informed by doctor that he has any disease of the prostate	No	118 (91.5)
	Yes	11 (8.5)
Had a rectal examination for PCa	No	119 (92.2)
	Yes	10 (7.8)
Had a digital rectal examination for PCa in the past 12 months	No	116 (89.9)
	Yes	13 (10.1)
Had a blood test for PCa	No	113 (87.6)
	Yes	16 (12.4)
Had a blood test for PCa in the past 12 months	No	114 (88.4)
	Yes	15 (11.6)
Has been diagnosed with PCa	No	123 (95.3)
	Yes	6 (4.7)
Has an immediate family member who had PCa	No	119 (92.2)
	Yes	10 (7.8)

PCa: Prostate cancer

Table 3: Barriers to prostate cancer screening (n=129)

Perceived major barriers	Response	Frequency (%)
Lack of transportation to reach the health-care facility	Agree/strongly agree	30 (23.3)
I believe that I am at high risk for PCa than other men	Agree/strongly agree	33 (25.6)
Working hours prevent me from getting PCa screening	Agree/strongly agree	45 (34.9)
There is nothing I can do to prevent me from getting PCa	Agree/strongly agree	46 (35.7)
PCa will threaten the relationship with my partner	Agree/strongly agree	49 (38.0)
I fear that I might become impotent	Agree/strongly agree	51 (39.5)
PCa screening will take a lot of time	Agree/strongly agree	53 (41.1)
Procedures for PCa screening will be painful	Agree/strongly agree	54 (41.9)
I do not know where to go for screening	Agree/strongly agree	57 (44.2)
Clinic or health center hours are not convenient	Agree/strongly agree	59 (45.7)
Digital rectal examination will be harmful to me	Agree/strongly agree	59 (45.7)
I fear that they might find something wrong during PCa screening	Agree/strongly agree	62 (48.1)
I do not understand what will be done during PCa screening	Agree/strongly agree	70 (54.3)
PCa is not a serious disease	Agree/strongly agree	72 (55.8)
Digital rectal examination is embarrassing	Agree/strongly agree	73 (56.6)

PCa: Prostate cancer

using DRE were prior receipt of a DRE ($P = 0.006$), having had a DRE in the past 12 months ($P = 0.000$), prior receipt of a PSA test ($P = 0.000$), having had a PSA in the past 12 months ($P = 0.005$), and a past medical history of PCa ($P = 0.000$). The characteristics which were significantly associated with intention to screen using PSA were prior receipt of a DRE ($P = 0.033$) and past medical history of PCa ($P = 0.004$).

Determinants of intention to screen for prostate cancer

Multivariate regression analysis results [Table 6] show that the significant determinants of intention to screen for PCa by DRE are perceived threat of the disease ($\beta = 0.27$, $P = 0.006$) and having been informed by a doctor that one has any disease of the prostate ($\beta = 0.20$, $P = 0.017$). The model of prediction of intention to screen using DRE explained 26% of the variance. The significant determinants

of intention to screen PCa by PSA were perceived threat of the disease ($\beta = 0.22$, $P = 0.025$), having been informed by a doctor that one has any disease of the prostate ($\beta = 0.20$, $P = 0.017$), and perceived general health ($\beta = 0.16$, $P = 0.047$). The model of prediction of intention to screen using PSA explained 26.9% of the variance.

Discussion

There is no study which has specifically explored PCa screening behaviors in Omani men. To our knowledge, this is the first study to report about men's behaviors related to PCa screening in Oman. The findings show that the majority of men did not have personal experiences with PCa, but had mild (60.5%), moderate (28.7%), or severe (10.9%) prostate symptoms that deserved reporting to a health-care provider for potential screening and health care. A large number of men (46.6%) were dissatisfied or unhappy with

Table 4: Participants' intention to screen for prostate cancer (*n*=129)

Variable	Category	Frequency (%)	Mean±SD
Intention to screen using DRE	Low-to-moderate intention	98 (76.0)	15.36±5.50
	High intention	31 (24.0)	
Intention to screen using PSA	Low-to-moderate intention	90 (69.8)	16.44±5.12
	High intention	39 (30.2)	

PSA: Prostate-specific antigen, DRE: Digital rectal examination, SD: Standard deviation

Table 5: Distribution of intention to screen and selected participants' characteristics

Characteristics	Response	Intention to screen with DRE (*n*=129)			Intention to screen with PSA (*n*=129)		
		Low to moderate	High	χ^2 and *P*	Low to moderate	High	χ^2 and *P*
International Prostate Symptom Score	Mild	59	19	χ^2=1.58 P=0.454	54	24	χ^2=0.03 P=0.983
	Moderate	30	7		26	11	
	Severe	9	5		10	4	
Had a DRE for a PCa	No	94	25	χ^2=7.68 P=0.006	86	33	χ^2=4.55 P=0.033
	Yes	4	6		4	6	
Had a DRE for PCa in the past 12 months	No	94	22	FET=16.18 P=0.000	83	33	χ^2=1.74 P=0.187
	Yes	4	9		7	6	
Had ever had a PSA for PCa	No	92	21	χ^2=14.81 P=0.000	82	31	χ^2=3.38 P=0.066
	Yes	6	10		8	8	
Had a PSA for PCa in the past 12 months	No	91	23	χ^2=7.98 P=0.005	82	32	χ^2=2.17 P=0.140
	Yes	7	8		8	7	
Past medical history of PCa	No	97	26	χ^2=12.12 P=0.000	89	34	χ^2=8.41 P=0.004
	Yes	1	5		1	5	

FET: Fisher's exact test, PSA: Prostate-specific antigen test, DRE: Digital rectal examination, PCa: Prostate cancer

Table 6: Determinants of intention to screen for prostate cancer

Screening procedure	Variables	Unstandardized coefficients		β	*t*	*P*	95% CI
		B	SE				
DRE	Constant	17.67	8.55		2.07	0.041	0.75-34.59
	Been informed by a doctor that he has any disease of the prostate gland	3.97	1.64	0.20	2.42	0.017	0.72-7.22
	Perceived threat of PCa	0.68	0.24	0.27	2.81	0.006	0.20-1.16
	Perceived general health	0.35	0.22	0.13	1.60	0.113	−0.08-0.79
	Do not know where to go for screening	−0.74	0.99	−0.07	−0.75	0.457	−2.70-1.22
	Digital rectal examination is embarrassing	−0.87	0.96	−0.08	−0.91	0.365	−2.76-1.02
PSA	Constant	1.452	8.080		0.18	0.858	−14.55-17.45
	Been informed by a doctor that he has any disease of the prostate gland	3.714	1.530	0.20	2.43	0.017	0.69-6.74
	Perceived threat of PCa	0.513	0.226	0.22	2.27	0.025	0.07-0.96
	Perceived general health	0.405	0.211	0.16	1.92	0.047	−0.01-0.82
	Do not know where to go for screening	0.251	0.927	0.02	0.27	0.787	−1.58-2.09

PSA: Prostate-specific antigen test, DRE: Digital rectal examination, CI: Confidence interval, SE: Standard error, PCa: Prostate cancer

the quality of life associated with the reported symptoms, and this highlights a gap in their health. It is possible that men did not know that the prostate symptoms could be potential indicators of underlying prostate disease. These findings are consistent with the findings of a recent study conducted in Oman which showed that the majority of the population has limited cancer awareness.[28] Therefore, our study supports the call for more strategies to educate the public about cancer risk, manifestations, and screening.

The findings of this study show that the main barriers to PCa screening were those related to health-care facility, knowledge about PCa, and personal beliefs. The most highly rated barriers were clinic or health center hours not being convenient, belief that DRE will be harmful, fear of finding out something wrong after PCA screening, not knowing what will be done during PCa screening, belief that PCa is not a serious disease, and belief that DRE is embarrassing. Closely similar barriers have been reported by studies conducted in the USA and Europe.[13,15,16,29] The good news is that there are interventions which can be used to reduce some of these barriers to PCa screening. An intervention study which was conducted in Turkey showed that web-based education and reminders can effectively and significantly reduce barrier perception, increase susceptibility perception, and screening using PSA.[30]

The intention to screen for PCa was generally low and this could be attributed to the various barriers discussed above or lack of knowledge about PCa. The majority of men had low to moderate intention to screen using DRE and PSA. These findings are not surprising because available literature about cancer screening in the Middle East shows that misconceptions about cancer are high, and screening programs have low uptake because of social and health beliefs.[31] The findings indicating a diminutive intention to undergo PCa screening are important because they may be a glimpse into the story behind the increasing PCa late diagnosis, morbidity and mortality among Omani men.

The determinants of intention to screen for PCa established by this study such as perceived threat of the disease, perceived general health, and having been informed by a doctor about disease of the prostate gland show that, when health-care providers provide eligible men with information about their health, prostate disease, and risk factors for PCa, their intention to undergo PCa screening increases. The results about determinants of intention to screen are similar to those of other studies. For instance, it has been reported by earlier studies that 47% of the variance in men's intention to screen for PCa depends on a doctor's recommendation of the screening and men's positive attitude toward screening.[32] The intention to screen for PCa also increases with prior experience and good knowledge about the disease.[33] It seems that some of the interventions that are needed to address the upsurge in PCa morbidity and mortality are those focusing on men's knowledge and attitudes toward PCa screening. Such effort can help to enhance intention, actual uptake of PCa screening, and subsequent early diagnosis and treatment.

Conclusion

This study has showed diminutive intention to undergo PCa screening by the participants. This inclination may be due to the various personal beliefs, experiences, and health-care system factors which act as barriers to PCa screening. The findings provide a good baseline that can be used by future studies to test interventions to enhance PCa awareness. Interventions aimed at enhancing PCa disease and risk awareness may help reduce the perceived barriers, increased screening uptake, and subsequent early diagnosis and treatment.

Conflicts of interest

There are no conflicts of interest.

References

1. Haas GP, Delongchamps N, Brawley OW, Wang CY, de la Roza G. The worldwide epidemiology of prostate cancer: Perspectives from autopsy studies. Can J Urol 2008;15:3866-71.

2. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA Cancer J Clin 2011;61:69-90.

3. International Agency for Research on Cancer and World Health Organization. Available from: http://www.globocan. iarc.fr/Pages/fact_sheets_cancer.aspx. [Last accessed on 2017 Dec 09].

4. Center MM, Jemal A, Lortet-Tieulent J, Ward E, Ferlay J, Brawley O, *et al.* International variation in prostate cancer incidence and mortality rates. Eur Urol 2012;61:1079-92.

5. Brawley OW. Prostate cancer epidemiology in the United States. World J Urol 2012;30:195-200.

6. Bazarbashi S, Bachour M, Bulbul M, Alotaibi M, Jaloudi M, Jaafar H, *et al.* Metastatic castration resistant prostate cancer: Current strategies of management in the Middle East. Crit Rev Oncol Hematol 2014;90:36-48.

7. Hassen WA, Karsan FA, Abbas F, Beduk Y, El-Khodary A, Ghosn M, *et al.* Modification and implementation of NCCN guidelines on prostate cancer in the Middle East and North

Africa region. J Natl Compr Canc Netw 2010;8 Suppl 3:S26-8.

8. Mahfudh SS. Historical perspectives and trends in the management of pain for cancer patients in Oman. Asian Pac J Cancer Prev 2010;11 Suppl 1:93-6.

9. George E, Thomas S. A histopathologic survey of prostate disease in the sultanate of Oman. Internet J Pathol 2004;3:1-4. Available from: http://www.ispub.com/IJPA/3/2/5566. [Last accessed on 2014 Mar 26].

10. Hajjar RR, Atli T, Al-Mandhari Z, Oudrhiri M, Balducci L, Silbermann M. Prevalence of aging population in the Middle East and its implications on cancer incidence and care. Ann Oncol 2013;24 Suppl 7:vii11-24.

11. Schröder FH, Hugosson J, Carlsson S, Tammela T, Määttänen L, Auvinen A, *et al.* Screening for prostate cancer decreases the risk of developing metastatic disease: Findings from the European Randomized Study of Screening for Prostate Cancer (ERSPC). Eur Urol 2012;62:745-52.

12. Schröder FH, Hugosson J, Roobol MJ, Tammela TL, Ciatto S, Nelen V, *et al.* Screening and prostate-cancer mortality in a randomized European study. N Engl J Med 2009;360:1320-8.

13. Avery KN, Metcalfe C, Vedhara K, Lane JA, Davis M, Neal DE, *et al.* Predictors of attendance for prostate-specific antigen screening tests and prostate biopsy. Eur Urol 2012;62:649-55.

14. Consedine NS, Morgenstern AH, Kudadjie-Gyamfi E, Magai C, Neugut AI. Prostate cancer screening behavior in men from seven ethnic groups: The fear factor. Cancer Epidemiol Biomarkers Prev 2006;15:228-37.

15. Blocker DE, Romocki LS, Thomas KB, Jones BL, Jackson EJ, Reid L, *et al.* Knowledge, beliefs and barriers associated with prostate cancer prevention and screening behaviors among African-American men. J Natl Med Assoc 2006;98:1286-95.

16. Ukoli FA, Patel K, Hargreaves M, Beard K, Moton PJ, Bragg R, *et al.* A tailored prostate cancer education intervention for low-income African Americans: Impact on knowledge and screening. J Health Care Poor Underserved 2013;24:311-31.

17. Ford ME, Vernon SW, Havstad SL, Thomas SA, Davis SD. Factors influencing behavioral intention regarding prostate cancer screening among older African-American men. J Natl Med Assoc 2006;98:505-14.

18. Hayat Roshanai A, Nordin K, Berglund G. Factors influencing primary care physicians' decision to order prostate-specific antigen (PSA) test for men without prostate cancer. Acta Oncol 2013;52:1602-8.

19. Moyer VA; U.S. Preventive Services Task Force. Screening for prostate cancer: U.S. Preventive Services Task Force recommendation statement. Ann Intern Med 2012;157:120-34.

20. Ilic D, Neuberger MM, Djulbegovic M, Dahm P. Screening for prostate cancer. Cochrane Database Syst Rev 2013;Issue 1. Art. No.:CD004720. DOI: 10.1002/14651858.CD004720. pub3.

21. Heidenreich A, Bastian PJ, Bellmunt J, Bolla M, Joniau S, van der Kwast T, *et al.* EAU guidelines on prostate cancer. part 1: Screening, diagnosis, and local treatment with curative intent-update 2013. Eur Urol 2014;65:124-37.

22. Wolf AM, Wender RC, Etzioni RB, Thompson IM, D'Amico AV, Volk RJ, *et al.* American Cancer Society guideline for the early detection of prostate cancer: Update 2010. CA Cancer J Clin 2010;60:70-98.

23. Carter HB, Albertsen PC, Barry MJ, Etzioni R, Freedland SJ, Greene KL, *et al.* Early detection of prostate cancer: AUA Guideline. J Urol 2013;190:419-26.

24. Releford BJ, Frencher SK Jr., Yancey AK. Health promotion in barbershops: Balancing outreach and research in African American communities. Ethn Dis 2010;20:185-8.

25. Frank D, Swedmark J, Grubbs L. Colon cancer screening in African American women. ABNF J 2004;15:67-70.

26. Griffin MJ. Health Belief Model, Social Support, and Intent to Screen for Colorectal Cancer in Older African American Men. Doctoral Dissertation 2011; University of North Carolina at Greensboro; 2011.

27. Choi EP, Lam CL, Chin WY. Validation of the International Prostate Symptom Score in Chinese males and females with lower urinary tract symptoms. Health Qual Life Outcomes 2014;12:1.

28. Al-Azri M, Al-Rasbi K, Al-Hinai M, Davidson R, Al-Maniri A. Awareness of risk factors for cancer among Omani adults – A community based study. Asian Pac J Cancer Prev 2014;15:5401-6.

29. Oliver JS, Grindel CG, DeCoster J, Ford CD, Martin MY. Benefits, barriers, sources of influence, and prostate cancer screening among rural men. Public Health Nurs 2011;28:515-22.

30. Capik C, Gözüm S. The effect of web-assisted education and reminders on health belief, level of knowledge and early diagnosis behaviors regarding prostate cancer screening. Eur J Oncol Nurs 2012;16:71-7.

31. Brown R, Kerr K, Haoudi A, Darzi A. Tackling cancer burden in the Middle East: Qatar as an example. Lancet Oncol 2012;13:e501-8.

32. Berglund G, Nilsson S, Nordin K. Intention to test for prostate cancer. Eur J Cancer 2005;41:990-7.

33. Hevey D, Pertl M, Thomas K, Maher L, Chuinneagáin SN, Craig A. The relationship between prostate cancer knowledge and beliefs and intentions to attend PSA screening among at-risk men. Patient Educ Couns 2009;74:244-9.