

## RESEARCH ARTICLE

# Predictors of Participation in Prostate Cancer Screening among Older Men in Jordan

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### Abstract

**Background:** Participation is one of the major factors affecting the long-term success of population-based prostate cancer screening programs. The aim of this study was to explore strong factors linked to participation in prostate cancer screening among older Jordanian adults using the Health Belief Model (HBM). **Materials and Methods:** Data were obtained from Jordanian older adults, aged 40 years and over, who visited a comprehensive health care center within the Ministry of Health. A pilot test was conducted to investigate the internal consistency of the the Champion Health Belief Model Scale for prostate cancer screening and the clarity of survey questions. Sample characteristics and rates of participation in prostate cancer screening were examined using means and frequencies. Important factors associated with participation in prostate cancer screening were examined using bivariate correlation and multivariate logistic regression analysis. **Results:** About 13% of the respondents had adhered to prostate cancer screening guidelines over the previous decade. Four out of the seven HBM-driven factors (perceived susceptibility, benefits and barriers to PSA test, and health motivation) were statistically significant. Those with greater levels of susceptibility, benefits of PSA test and health motivation and lower levels of barriers to PSA testing were more likely to participate in prostate cancer screening. Family history, presence of urinary symptoms, age, and knowledge about prostate cancer significantly predicted the participation in prostate cancer screening. **Conclusions:** Health professionals should focus more on the four modifiable HBM-related factors to encourage older adults to participate in prostate cancer screening. Intervention programs, which lower perceived barriers to PSA testing and increase susceptibility, benefits of PSA testing and health motivation, should be developed and implemented.

**Keywords:** Prostate cancer - screening - predictors - health beliefs - health belief model

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### Introduction

Prostate cancer has emerged as a major health problem in industrialized nations, as well as in developing countries (Stewart and Wild, 2014). It was the fifth leading cause of cancer deaths worldwide in 2012, accounting for 6.6% (307,000 cases) of all cancer deaths in males (Ferlay et al., 2012). Prostate cancer incidence rates in industrial countries are higher than rates in developing countries (Stewart and Wild, 2014). However, mortality rates for prostate cancer in industrial countries are less than those in developing countries; this could be attributed to widespread prostate cancer screening in industrial countries, late stage diagnosis of cancer in developing countries, and variations in male life expectancies across countries (Ferlay et al., 2012).

In the United States in 2013, prostate cancer was the most commonly diagnosed cancer, with about 239,000 new cases and about 30,000 deaths, making it the second leading cause of death due to cancer among men in the US (Siegel et al., 2013).

Recent statistics have shown a significant increase in prostate cancer incidence and mortality in Arab countries. According to the International Agency for Research on Cancer (IARC), the highest age-standardized incidence rates were in Lebanon (37.2 per 100,000), South Sudan (25.5 per 100,000), and Morocco (18.5 per 100,000), while the highest mortality rates were in South Sudan (21.5 per 100,000), Lebanon (17 per 100,000), and Morocco (12.9 per 100,000) (Ferlay et al., 2012).

According to the National Cancer Registry of Jordan, CaP ranked the third highest among males (9.4%) for cancer incidence and fourth highest (7.0%) for cancer mortality (Jordan Cancer Registry [JCR], 2010). Prostate cancer incidence has dramatically increased in the last few decades in Jordan; the number of new cancer cases diagnosed among Jordanian males increased from 123 in 2000 to 218 in 2010 (JCR, 2010). Moreover, it is estimated that the cancer incidence and mortality rate has increased by 9.4% (284 cases) and 7.8% (164 cases) respectively in 2012 (Ferlay et al., 2012).

With regard to the stage of prostate cancer among men

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in the US, according to the Surveillance, Epidemiology, and End Results (SEER) program, 81% of prostate cancer cases were discovered at a localized stage and 4% were discovered at an advanced stage in 2010. In contrast, the SEER program indicated that among Jordanian men in 2010, 48.6% of prostate cancer cases were discovered at a localized stage and 28% at an advanced stage (Siegel et al., 2013). Based on this comparison, Jordanian men are more likely to be diagnosed at an advanced stage, when compared to men of the US.

**Screening and early detection of prostate cancer:** A diagnosis of prostate cancer can only be confirmed through a biopsy, which refers to the removal of small pieces of the prostate for microscopic examination (ACS, 2012). However, prior to a biopsy, several less invasive tests can be used to detect PC, such as a prostate specific antigen (PSA) blood test and digital rectal exam (DRE) (ACS, 2012). Recently, these have been the most commonly used screening measures for PC (American Cancer Society [ACS], 2012).

Prostate cancer survival is closely related to the clinical and pathological stage of the disease at diagnosis. Available empirical evidence suggests that surviving prostate cancer depends on early-stage detection and immediate treatment. When the cancer was identified in its early stages and treated immediately, survival rates of 100%, 98%, and 91% were found for 5-, 10-, and 15-year periods, respectively (Schroder et al., 2012). However, the five-year relative survival for men with metastatic prostate cancer dropped to 31% (Schroder et al., 2012). As a result, prostate screening measures are essential in reducing prostate cancer diagnosed at an advanced stage.

Prostate cancer screening can aid in the identification of the disease at an early stage, and permit more effective treatment, all of which will increase survival rates, reduce risk of death, and reduce the cost of care (Loeb et al., 2011; Schroder, 2012). It is believed that more than 69% of prostate cancer deaths could be prevented during the first five years through proper screening (Schroder, 2012).

Prostate cancer screening on a routine basis using PSA testing and DRE has been the issue of intense investigation and controversy in the medical community (Schroder, 2012). Recent studies have emphasized the importance of routine PSA testing and DRE in increasing reported incidence rates of prostate cancer, discovering early-stage disease, and declining death rates from prostate (Schroder, 2012; Schroder et al., 2012). However, other studies have found that routine PSA testing and DRE did not reduce deaths from PC (Ilic et al., 2011).

**Perceived factors related to prostate cancer screening:** Several studies have demonstrated low screening rates for prostate cancer (Odedina et al., 2011a; Arafa et al., 2012; Avery et al., 2012; Nakandi et al., 2013), which could potentially affect the long-term success of population-based screening programs. Given the efficacy of screening measures and the importance of adherence to screening, it is urgent to enhance rates of participation in prostate cancer screening (Odedina et al., 2011a; Arafa et al., 2012; Avery et al., 2012; Nakandi et al., 2013).

To enhance participation rates, significant factors associated with participation in prostate cancer screening

must be understood. Currently, little is known about the relationship between these factors and participation in screening (Odedina et al., 2011b; Oliver et al., 2011; Arafa et al., 2012; Avery et al., 2012). Knowledge, health beliefs, and socio-demographic factors have been shown to be significant factors that affect participation in prostate cancer screening (Odedina et al., 2011b; Arafa et al., 2012; Avery et al., 2012). It is believed that the level of knowledge about cancer and screening measures affects men's utilization of screening tests (Ajape et al., 2010; Ahmad, 2014). Ahmad (2014) highlighted that correcting the knowledge gap in a sample of Jordanian population could facilitate prevention and early detection of cancer. Increased knowledge about cancer and screening tests encourages individuals to commit to screening regimens, whereas lack of knowledge discourages individuals from participating in screening for this type of cancer. Moreover, individuals' beliefs about cancer and screening measures are vital determinants in performance of screening, such that misconceptions and erroneous beliefs could result in poor participation (Ahmad et al., 2011; Odedina et al., 2011b; Avery et al., 2012).

In Jordan, few studies have examined the effect of factors influencing Jordanian men's screening behaviors regarding prostate cancer and prostate cancer screening (Arafa et al., 2012; Ahmad, 2014). Arafa et al. (2012) examined the knowledge and attitudes of men aged forty years and older towards prostate cancer screening in Egypt, Jordan, and Saudi Arabia, and found poor knowledge and fair attitudes towards cancer, which contributed to poor participation in screening activities. Furthermore, Ahmad (2014) conducted a national survey to assess knowledge, attitudes, and practice with respect to cancer prevention and care in Jordan. Only 11% of the study sample reported participating in cancer screening, and the most stated reasons for not participating were being free from health problems or illnesses and not knowing that screening was needed. In addition, only 5% of the sample reported that they had been told to participate in screening for prostate screening (Ahmad, 2014).

Thus, this study aims to assess the predictors of prostate cancer screening behaviors among older men in Jordan; more specifically, it focuses on factors derived from the Health Belief Model (HBM). The results of this study can be used by health care providers to increase their understanding of the influence of Jordanian men's knowledge, and health beliefs on prostate cancer screening behaviors. Moreover, this study adds further to the breadth of understanding of the perception in the international literature from the Jordanian population perspective as part from the Arab world.

**Theoretical Framework:** The health belief model was first developed in the 1950s by Rosenstock, Hochbaum, and Kegels to explain the causes of tuberculosis screening programs failure (Sharma and Romas, 2011). According to HBM, personal beliefs about a disease determine the individual's health behavior (Sharma and Romas, 2011). The original model is composed of four main constructs perceived susceptibility to illness, perceived severity of illness, perceived benefits of the intended action, and perceived barriers of the intended action

(Sharma and Romas, 2011). Over time, confidence and health motivation constructs were integrated to the model (Sharma and Romas, 2011). The constructs of perceived susceptibility and perceived severity refer to a person's belief regarding, respectively, the chances of getting and severe consequences of a disease (Sharma and Romas, 2011). The construct of perceived barriers refers to the beliefs about adverse psychological costs that work as obstacles to take a health-related action, while the construct of perceived benefits implies the positive consequences of taking an action (Sharma and Romas, 2011). In order to enable the change of old behavior to the new desired behavior, a person should believe that benefits of adopting a new behavior should outweigh the consequences of continuing the old behavior (Sharma and Romas, 2011). Perceived barriers are the most significant construct among all the constructs of HBM in determining behavior change (Sharma and Romas, 2011). The concept of health motivation is the person's beliefs and degree of interest in his/her general health. Health motivation is considered individual characteristic that acts as a modifying factor that influence person's perceptions (Sharma and Romas, 2011).

## Materials and Methods

### *Sample and data collection*

The sample of the study was obtained from three major governorates in Jordan. A convenience sampling technique was followed in the study. The total sample size in this study was 432 participants. The data collection was conducted through self-administered questionnaires. The study population was all Jordanian men who are 40-75 years old attending the public health centers of the ministry of health in Amman, Irbid, and Zarqa cities. Given these centers provide health care to client from all over the country, results of the study can be better generalized to the society. The inclusion criteria were being Jordanian male between the ages of 40 to 75 years old, able to read and write Arabic, and consenting to take part in the study. While the exclusion criteria were being previously diagnosed with prostate cancer, mentally ill, lack the ability to communicate with the researcher, and illiterate.

### *Instruments*

A combination of researcher-designed and existing instruments was used for data collection in this study, including socio-demographic scale, the Knowledge of Prostate Cancer Screening Scale (KPCS), and the Champion Revised Health Belief Model Scale (CHBMS) (Champion, 1993) which was translated to Arabic and modified to fit with Prostate Cancer Screening (CHBMS-PCS).

The socio-demographic scale was developed by the authors based on the literature. It contains questions about demographic variables and performance of prostate cancer screening during the last decades including both PSA testing and DRE.

The Knowledge of Prostate Cancer Screening Scale (KPCS) contains 12 items and is used to assess the level of knowledge about prostate cancer and prostate cancer

screening. Responses are scored as "True (Yes)," "False (No)," and "Don't know," with "Don't know" responses being coded as incorrect (Weinrich et al., 2004). According to Weinrich et al. (2004), the KPCS has a Cronbach's alpha of 0.76. The maximum score for knowledge was 12 (100%) and the minimum score was 0 (0%). Knowledge levels were categorized as "low" for scores from 0 to 49%, "moderate" for scores from 50 to 79%, and "high" for scores from 80 to 100% (Weinrich et al., 2004). In this study, the Cronbach's alpha coefficient (internal consistency reliability) of the KPCS was 0.72 for the total scale.

Minimal modifications were made to CHBMS for applicability to prostate cancer screening. All subscales were included in the modified scale, except for the confidence subscale, because individuals cannot perform PCS on their own. While the benefits and barriers subscales for CHBMS referred to mammogram and BSE, these subscales referred to PSA testing and DRE for the modified CHBMS-PCS. The modified CHBMS-PCS is composed of 42 items and 7 subscales (susceptibility, severity, motivation, barriers (PSA), benefits (PSA), barriers (DRE), and benefits (DRE)). A 5-point Likert response format was used for each statement. The CHBMS-PCS was then translated from English to Arabic, and the translated version was checked if they were equivalent to the originals according to Brislin's model (Brislin, 1986). In this study, the CHBMS-PCS has established content validity by a panel of 8 experts from various health disciplines. The reliability of CHBMS-PCS in this study has Cronbach's alpha coefficients for each subscale as follows: perceived susceptibility (0.90), perceived severity (0.89), perceived benefits of PSA testing (0.83), perceived barriers to PSA testing (0.92), perceived benefits of DRE (0.91), perceived barriers to DRE (0.87), and health motivation (0.90). Finally, Cronbach's alpha coefficient for the total scale was 0.87.

### *Data Processing*

The Statistical Package for Social Sciences (SPSS) was used to run descriptive and inferential statistical analyses for the study variables (IBM Corporation, 2012). Descriptive statistics were calculated to describe the characteristics of the sample. The relationships between individual predictors and participation in prostate cancer screening were examined using both bivariate correlation analysis and multivariate logistic regression analysis. Bivariate correlation analysis was used to identify the relationships between each individual predictor and participation in prostate cancer screening. In addition, multivariate logistic regression analysis was used to identify a predictive model regarding participation in prostate cancer screening. There were no missing values in the data.

### *Ethical considerations*

Once the approvals from the Research Ethics Committee (IRB) at the University of Jordan and the Ministry of Health were obtained, the Health Ministries in Amman, Zarqa, and Irbid cities were approached to obtain a permission to recruit subjects from the comprehensive

public health centers. The authors collected the data by themselves from the period of May 17<sup>th</sup> 2014 to August 31<sup>st</sup> 2014. The authors approached the potential participants and screened them for eligibility to participate and assured confidentiality of the data obtained. These participants were approached in the reception area of the center, where they were waiting to be escorted to physician room or waiting to take their medications. Participants who met the inclusion criteria and agreed to participate were given more information about the purpose of the study and were asked to sign an informed consent form. The participants were informed that their participation in the study was voluntary, that they could withdraw from the study at any time, and that their refusal to participate in the study would have no negative impact on the medical care they receive. The completion of the scale took about 25 to 30 min.

When participants were asked if they ever have been screened for prostate cancer using PSA testing, only 59 (13.6%) of participants had participated in PSA blood tests during last decades. Moreover, 45 (10.4%) of participants had received a DRE to screen for prostate cancer during the last decades.

Almost 49 (11.3%) of participants had a family history of prostate cancer and about 181 (41.9%) had one or more of the lower urinary signs and symptoms (LUTS). Of those, 74.6% had difficulty maintaining a steady stream, 34.8% had dysuria, 14.4% had hematuria, and 5.5% had erectile dysfunction.

Regarding knowledge about prostate cancer, the mean knowledge score was 4.29 (SD=2.8), which meant that correct answers were given to less than half of the questions. Moreover, 67.1% of participants had a low level of knowledge, 29.2% had a moderate level of knowledge, and 3.7% had a high level of knowledge.

## Results

### Participants

The mean age of participants was 52.5 years (SD=8.5; range=40-75). A total of 36.6% were living in Amman, 35.2% in Zarqa, and 28.2 % in Irbid. In addition, 42.1% had a primary educational level, 29.9% had a secondary educational level, and 28% had a university education. Regarding marital status, the majority (91.4%) was married, followed by 5.6% who were single and 3% who were divorced or widowed. Furthermore, 49.5% had an intermediate income, 41.7% had a low income, and 8.8% had a high income. In total, 89.4% of participants were covered by a health insurance plan. Of those (multiple answers were allowed), 56% were covered by the governmental sector, 22.6% by the private sector, and 21.8% by the military sector.

### Predictors of participation in prostate cancer screening

Table 1 shows that the bivariate Pearson correlation analysis of HBM constructs, socio-demographics, and cues to actions variables with the participation in prostate cancer screening. The analysis revealed a moderate significant relationship between all HBM constructs and participation in screening. Benefits of PSA testing had the strongest correlation ( $r=0.41$ ,  $p<0.01$ ) with participation

in screening, followed by susceptibility ( $r=0.38$ ,  $p<0.01$ ), health motivation ( $r=0.35$ ,  $p<0.01$ ), benefits of DRE ( $r=0.32$ ,  $p<0.01$ ), barriers to PSA testing ( $r=-0.31$ ,  $p<0.01$ ), severity ( $r=0.25$ ,  $p<0.01$ ), and barriers to DRE ( $r=-0.17$ ,  $p<0.01$ ). Barriers to PSA testing and DRE were negatively correlated with participation in screening, indicating that as perceived barriers increased, participation in screening decreased. Moreover, knowledge variable had the strongest positive correlation ( $r=0.19$ ,  $p<0.001$ ), followed by Family history ( $r=0.18$ ,  $p<0.001$ ), LUTS ( $r=0.14$ ,  $p<0.001$ ), and age ( $r=0.11$ ,  $p<0.01$ ). Income, education, marital status, and insurance were not significantly correlated with participation in screening.

Table 2 summarizes the raw scores of the multivariate logistic regression coefficients, Wald statistics, and the estimated c ties. Fur hange in odds along with a 95% CI. Three of the predictors were significantly predictive of participation in PCS scores; these included family history,  $B=0.90$ ,  $\chi^2(1)=4.58$ ,  $p=0.03$ , having LUTS,  $B=0.71$ ,  $\chi^2(1)=4.94$ ,  $p=0.03$ , and knowledge of PC and PCS,  $B=0.13$ ,  $\chi^2(1)=5.73$ ,  $p=0.02$ . The odds ratio of the family history variable was 2.47, with a 95% confidence interval ranging from 1.08 to 5.64. Thus, the odds of performing screening were approximately 2.5 times higher for men with a family history than for men with no family history. The odds ratio of having LUTS was 2.04 with a 95% confidence interval ranging from 1.09 to 3.81. Thus, the odds of performing screening were approximately 2 times higher for men with LUTS than for men without LUTS. The odds ratio of the knowledge variable was 1.14, with a 95% confidence interval ranging from 1.02 to 1.26. The odds ratio showed that an increase in knowledge scores would result in a 1.14 times increase in the participation in cancer screening.

Table 3 summarizes the raw score multivariate logistic regression coefficients, Wald statistics, and estimated change in odds along with 95% CIs. Four of the variables were significantly predictive of participation in PCS; these included perceived susceptibility,  $B=0.18$ ,  $\chi^2(1)=15.09$ ,  $p<0.001$ , perceived benefits of PSA testing,  $B=0.13$ ,  $\chi^2(1)=4.45$ ,  $p=0.04$ , perceived barriers of PSA testing,  $B=-0.14$ ,  $\chi^2(1)=9.73$ ,  $p=0.002$ , and health motivation,  $B=0.10$ ,  $\chi^2(1)=4.94$ ,  $p=0.026$ . The odds ratio of the perceived susceptibility variable was 1.19, with a 95% confidence interval ranging from 1.09 to 1.30. Thus, the odds ratio showed that an increase in perceived susceptibility scores would result in a 1.19 times increase in the participation in screening. The odds ratio of the perceived benefits of PSA testing variable was 1.14, with a 95% confidence interval ranging from 1.01 to 1.29. Thus, the odds ratio showed that an increase in perceived benefits of PSA testing scores would result in a 1.14 times increase in the participation in screening. The odds ratio of the perceived barriers to PSA testing variable was 0.87, with a 95% confidence interval ranging from 0.79 to 0.95. Since the odds ratio was less than 1, an increase in perceived barriers to PSA testing would decrease the odds of participation in screening. The odds ratio of the health motivation variable was 1.10, with a 95% confidence interval ranging from 1.01 to 1.20. Thus, the odds ratio showed that an increase in health motivation scores would result in a 1.10 times increase in participation in screening.



**Table 1. Bivariate Correlations of HBM Constructs, Socio-demographics, and Cues to Actions with Prostate Cancer Screening Participation (N=432)**

Variables	PCS participation
Susceptibility	0.38**
Severity	0.25*
Benefits (PSA)	0.41**
Barriers (PSA)	- 0.31**
Benefits (DRE)	0.32**
Barriers (DRE)	- 0.17**
Health motivation	0.35**
Age	0.11*
Income	-0.005
Education	0.02
Knowledge of PC & PCS	0.19 **
Marital status	0.06
Insurance	0.006
Family history	0.18**
LUTS	0.14**

\*p&lt;0.05; \*\* p&lt;0.01 (two-tailed)

**Table 2. Results of Multivariate Logistic Regression to Predict Participation in Prostate Cancer Screening from Demographic Characteristics and Cues to Action Variables (N=432)**

Predictor variables	$\beta$	Wald chi-square test	p	Odds Ratio	95% CI	
					Lower	Upper
Age	0	0	0.99	1	0.96	1.04
Income	-0.06	0.07	0.8	0.94	0.58	1.52
Marital status	0.49	1.21	0.27	1.63	0.68	3.89
Insurance	-0.25	0.27	0.6	0.78	0.3	2
Education	0.22	1.32	0.25	1.24	0.86	1.8
Knowledge of PC & PCS	0.13	5.73	0.02	1.14	1.02	1.26
Family history	0.9	4.58	0.03	2.47	1.08	5.64
LUTS	0.71	4.94	0.03	2.04	1.09	3.81
Constant	-3.09	7.92	0.005	0.05		

\*Overall model (Cox & Snell's  $R^2=0.06$ ; Nagelkerke's  $R^2=0.11$ ,  $p<0.001$ )**Table 3. Results of Multivariate Logistic Regression to Predict Participation in Prostate Cancer Screening From the HBM constructs (N=432)**

Predictor variables	$\beta$	Wald chi-square test	p	Odds Ratio	95% CI	
					Lower	Upper
Susceptibility	0.18	15.1	<0.001	1.19	1.09	1.3
Severity	0.02	0.2	0.65	1.02	0.94	1.1
Benefits of PSA	0.13	4.45	0.04	1.14	1.01	1.29
Barriers of PSA	-0.14	9.73	<0.001	0.87	0.79	0.95
Benefits of DRE	0.02	0.24	0.63	1.02	0.94	1.11
Barriers of DRE	0.07	3.07	0.08	1.07	0.99	1.15
Health motivation	0.1	4.94	0.03	1.1	1.01	1.2
Constant	-9.93	23.5	<0.001	0		

\*Overall model (Cox & Snell's  $R^2=0.25$ ; Nagelkerke's  $R^2=0.45$ ,  $p<0.001$ )

## Discussion

The main purpose of the current study was to examine the influence of Jordanian men's demographics, cues to action, knowledge, and beliefs on prostate cancer

screening behaviors among Jordanian older men. The demographic findings in the current study were consistent with Jordanian participant's demographic characteristics of Arafa et al. (2012) study in which the average age was 53.7 years and the majority of Jordanian participants was married (85%) and covered by health insurance (85%). However, Arafa et al. (2012) study reported that the majority of the participants (70%) had a university education level and a smaller percentage of the participants (8%) had a family history of PC. Moreover, Alhelih et al. (2010) reported similar demographic characteristics for Saudi population in terms of participants' mean age, marital status, insurance. In contrast, international studies reported higher mean age, educational qualifications, and income level (Kleier, 2010; Avery et al., 2012).

The literature supports the argument that regular PCS leads to early detection and influences treatment, prognosis, and survival rates (Schroder, 2012a; 2012b). Nevertheless, only 13.6% of participants in this sample reported undergoing PSA testing, while 10.4% reported undergoing DRE in the last decades. Similarly, Arafa et al. (2012) reported percentages of participation in screening that ranged from 8% to 30% in KSA, Jordan, and Egypt. Surprisingly, Jordan had the highest percentage of screening activities, despite having the lowest attitude towards prostate cancer screening (Arafa et al., 2012). A study by Odedina et al. (2011c) also indicated a higher rate of early-detection behavior by participants; 31% of men had received PSA testing, and 27% had received a DRE. Moreover, the current study findings regarding levels of prostate cancer screening are much lower than the results of Kleier (2010), who reported that 44% of Haitian-American men had undergone prostate cancer screening at some point. Furthermore, Oliver et al. (2011) reported high early-detection behaviors for PSA testing by 83% of participants and for DRE by 66% of participants. In contrast, Ajape et al. (2010) indicated a lack of participation in screening behavior among Nigerian native African men. However, the majority of Nigerian men (94%) had an intention to undergo PSA testing (Nakandi et al., 2013). From a researcher's point of view, the majority of Jordanian men who underwent PSA testing were mostly referred from urologist's clinics because of their urinary symptoms. Many urologists recommend performing PSA test for patients with mild to severe urinary signs and symptoms.

The findings of the current study indicated that Jordanian men were not well informed about prostate cancer and cancer screening since the majority (67%) of participants had a low level of knowledge about prostate cancer and cancer screening.

The effects of demographic variables, knowledge variable, and cues to action on the participation in PCS were examined simultaneously using multivariate logistic regression analysis. The analysis findings are consistent with those of previous research that found family history (Bloom et al., 2006; Seo and Lee, 2010), urinary signs and symptoms (Anderson, 2013), and knowledge of PC and PCS (Ajape et al., 2010; Nakandi et al., 2013) to be significantly associated with participation in prostate cancer screening. In contrast, these findings

are inconsistent with previous research that found age, education, income, and health insurance to be significantly associated with participation in prostate cancer screening (Seo and Lee, 2010; Drazer et al., 2011; Anderson, 2013).

An interesting finding from this study was the significant predictive effect of knowledge, LUTS, and family history for screening behavior. Therefore, it is also of vital importance to educate Jordanian men about prostate cancer and cancer screening; particularly those with family history. Public campaigns to educate men in Jordan on these topics are lacking and that which men have heard or read may not be adequate to educate them sufficiently and motivate them to screen for prostate cancer. Furthermore, knowledge about cancer and screening options will allow men to understand the potential benefits to their health and the importance of making the decision to screen.

With respect to HBM constructs, the findings are consistent with those of previous research that found susceptibility constructs (Atulomah et al., 2010; Kleier, 2010; Odedina et al., 2011b), benefits and barriers constructs (Oliver et al., 2011), and the health motivation construct (Oliver et al., 2011) to be significantly correlated and predictive of the participation in cancer screening. These findings emphasize the need to provide correct information about factors related to susceptibility, as well as benefits of and barriers to PSA testing. Although it has been widely documented that when prostate cancer screening is performed regularly, it can be an effective means of early detection, only a small proportion of men undergo it regularly. Therefore, men must be shown that the benefits of screening outweigh the benefits of continuing with their old behavior.

Finally, this study adds to the wealth of studies that support the use of HBM to examine health behavior related to cancer screening, in order to offer an evidence-based foundation for health promotion activities. Furthermore, the current study findings converges with Carpenter (2010) meta-analyses that concludes that perceived barriers and perceived benefits constructs were consistently the strongest predictors of screening behaviors. In contrast, the current study findings diverges with Carpenter (2010) meta-analyses that concludes that perceived susceptibility construct was not predictive of screening behaviors.

In conclusion, overall, this study contributes to the understanding of factors linked to participation in prostate cancer screening among Jordanian older men. Educative-counseling programs that focus on the enhancement of knowledge and health beliefs regarding cancer and screening options are required to encourage participation in prostate cancer screening activities. Thus, the findings from this study can guide health professionals to better understand the extent to which different factors influence screening behaviors among adult Jordanian men, and may direct future research. Health professionals should focus more on the four modifiable HBM-related factors to encourage older adults to adhere to prostate cancer screening. Intervention programs, which lower perceived barriers to PSA testing and increase susceptibility, benefits of PSA testing and health motivation, should be developed and implemented. National campaigns toward increasing

the awareness about prostate cancer and screening options, should be launched frequently.

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## References

- Ahmad M, Al Gamal E, Othman A, et al (2011). Knowledge, attitudes and practices towards cancer prevention and care in Jordan. Report. Amman, Jordan: King Hussein Institute for Biotechnology and Cancer (KHIBC).
- Ahmad MM (2014). Jordanians knowledge and beliefs about cancer. *Global J Advances Pure Applied Sci*, 4.
- Ajape AA, Babata A, Abiola OO (2010). Knowledge of prostate cancer screening among native African urban population in Nigeria. *Public Health*, 1, 2.
- Alhelih EM, Rabah DM, Arafa MA (2010). Analysis of perceived benefits and risks for prostate cancer screening in Saudi Arabia. *J Medicine Medical Sci*, 1, 302-8.
- Anderson MM (2013). Testing the health belief model using prostate cancer screening intention: comparing four statistical approaches applied to data from the 2008-09 Nashville Men's Preventive Health Survey.
- Arafa MA, Rabah DM, Wahdan IH (2012). Awareness of general public towards cancer prostate and screening practice in arabic communities: a comparative multi-center study. *Asian Pac J Cancer Prev*, 13, 4321-6.
- Atulomah NO, Olanrewaju MF, Amosu AM, et al (2010). Level of awareness, perception and screening behavior regarding prostate cancer among men in a rural community of ikenne local government area, Nigeria. *Primary Prevention Insights*.
- Avery KN, Metcalfe C, Vedhara K, et al (2012). Predictors of attendance for prostate-specific antigen screening tests and prostate biopsy. *European Urol*, 62, 649-55.
- Bloom JR, Stewart SL, Oakley-Girvans I, et al (2006). Family history, perceived risk, and prostate cancer screening among African American men. *Cancer Epidemiol Biomarkers Prev*, 15, 2167-73.
- Brislin RW (1986). The wording and translation of research instruments. *J Cross Cultural Psychol*, 16, 340-59.
- Carpenter CJ (2010). A meta-analysis of the effectiveness of health belief model variables in predicting behavior. *Health Communicat*, 25, 661-9.
- Champion VL (1993). Instrument refinement for breast cancer screening behaviors. *Nurs Res*, 42, 139-43.
- Drazer MW, Huo D, Schonberg MA, et al (2011). Population-based patterns and predictors of prostate-specific antigen screening among older men in the United States. *J Clin Oncol*, 29, 1736-43.
- Ferlay J, Soerjomataram I, Ervik M (2012). GLOBOCAN 2012 v1. 0, Cancer Incidence and Mortality Worldwide: IARC Cancer Base No. 10 [Internet], *Int Agency Res Cancer*, 2013.
- IBM Corporation (2012). IBM SPSS Statistics for Windows, Version 21.0. NY: IBM Corp.
- Ilic D, O'Connor D, Green S, et al (2011). Screening for prostate cancer: an updated Cochrane systematic review. *BJU Int*, 107, 882-91.
- Kleier J (2010). Fear of and susceptibility to prostate cancer as predictors of prostate cancer screening among Haitian-American men. *Urologic Nursing*, 30, 179.
- Loeb S, Vonesh EF, Metter EJ, et al (2011). What is the true

- number needed to screen and treat to save a life with prostate-specific antigen testing? *J Clin Oncol*, **29**, 464-7.
- Nakandi H, Kirabo M, Semugabo C, et al (2013). Knowledge, attitudes and practices of Ugandan men regarding prostate cancer. *African J Urol*, **19**, 165-70.
- Odedina FT, Dagne G, LaRose-Pierre M, et al (2011a). Within-group differences between native-born and foreign-born Black men on prostate cancer risk reduction and early detection practices. *J Imm Minority Health*, **13**, 996-1004.
- Odedina FT, Dagne G, Pressey S, et al (2011b). Prostate cancer health and cultural beliefs of black men: The Florida Prostate Cancer Disparity Project. *Infectious Agents Cancer*, **6**, 10-7.
- Odedina FT, Scrivens J, John J, et al (2011c). Modifiable Prostate Cancer Risk Reduction and Early Detection Behaviors in Black Men. *Am J Health Behavior*, **35**, 470-84.
- Oliver JS, Grindel CG, DeCoster J, et al (2011). Benefits, barriers, sources of influence, and prostate cancer screening among rural men. *Pub Health Nursing*, **28**, 515-22.
- Schroder FH (2012). Landmarks in prostate cancer screening. *BJU Int*, **110**, 3-7.
- Schroder FH, Hugosson J, Roobol MJ, et al (2012). Prostate-cancer mortality at 11 years of follow-up. *New England J Med*, **366**, 981-90.
- Seo HS, Lee NK (2010). Predictors of PSA screening among men over 40 years of age who had ever heard about PSA. *Korean J Urol*, **51**, 391-7.
- Sharma M, Romas JA (2011). Theoretical foundations of health education and health promotion, Jones & Bartlett Publishers.
- Siegel R, Naishadham D, Jemal A (2013). Cancer statistics, 2013. *CA: Cancer J Clin*, **63**, 11-30.
- Stewart B, Wild C (2014). World cancer report 2014, IARC Press, *Int Agency Res Cancer* [Epub ahead of print].
- Weinrich SP, Seger R, Miller BL, et al (2004). Knowledge of the limitations associated with prostate cancer screening among low-income men. *Cancer Nursing*, **27**, 442-51.