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Community-based interventions and the attitude towards prostate cancer screening in the elderly based on the health belief model: Examination and analysis

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Abstract---Introduction: Prostate cancer is one of the most common malignant cancers among men worldwide. One way to control this disease is screening. One of the models that can be used to identify and change the beliefs and attitudes of the elderly and their families is the health belief model. Due to lack of similar studies, this study was performed to determine the effect of community-based interventions on subjects' perception of screening behaviors prostate cancer based on the Health Belief Model in the elderly. Methods: This study was a randomized field trial. The statistical population included all elderly men over 60 years of age with electronic files in comprehensive health service centers in Malayer in 2020-2021. The samples were 250 eligible elderlies who were divided into control and intervention groups by stratified random sampling. For the intervention group, trainings based on the health belief model were performed. The data collection tool was a standard questionnaire, which consisted of two sections: demographic information and subjects' perception of screening behaviors for prostate cancer based on health belief model. Questionnaires were given to both groups before and after the

intervention. Data were analyzed using SPSS software version 22 and statistical tests, MANOVA, chi-square and Fisher's exact test. People's understanding of screening behaviors. Results: Data analysis showed that there was no significant difference between the experimental and control groups in terms of demographic variables except for the job variable ($P > 0.05$). The results showed that the intervention had an increased relative chance of screening test in the experimental group by 6.3%, but this difference was not significant statistically ($P = 0.862$). Data analysis showed that the comparison of the mean total score of health belief model constructs at the beginning and end of the study was different in the experimental and control groups, which was significant statistically ($P < 0.001$). Marginal model showed that after adjusting the effect of confounding variables, there was a statistically significant difference between the two groups of intervention and control in terms of the mean change in structures of perceived intensity, perceived benefits, perceived self-efficacy and awareness ($P < 0/05$). Conclusion: Educational interventions based on Health Belief Model can encourage the elderly to prostate cancer screening. It is suggested to implement the educational program designed in this study in Iran's health care system for early diagnosis, treatment and control of prostate in the elderly.

Keywords---community-based care elderly, prostate screening, health belief model.

Introduction

WHO (2018) reported that cancer is the second leading cause of death worldwide [1] [2, 3]. The burden of cancer is projected to reach 28.4 million cases in the world by 2040, that is, 47% more than that of 2020, with largest share in increase attributed to the so-called developing countries [4]. Cancer is second to none in terms of the panic and hopelessness it develops among the patients diagnosed therewith. It goes without saying that the diagnosis of life-threatening diseases, none more terrifying as cancer, will oftentimes hinder the quality of life the patient. Cancer is not just an occurrence with a certain closure, but an obtruse permanent situation characterized by late onset of psychological system stemming from the illness, treatment, and other psychological issues [5].

In terms of type of cancer, breast, lung, colorectal, prostate and stomach cancers had respective shares of 11.7%, 11.4%, 10%, 7.3% and 5.6% of all cancers globally diagnosed in 2020 [4]. Prostate cancer is the second leading cause of malignancy and the fifth leading cause of death in men [7, 6]. The incidence of prostate cancer and its mortality is expected to reach 1.7 million and 499,000 in the world by 2030, respectively [8]. Its malignancy is the second leading cause of death in the United States, with 33,000 deaths from prostate cancer reported each year. The risk of being deceased from prostate cancer for American men is clocked at 2.4% [10]. The incidence of prostate cancer in developing countries is projected to increase by 2025, amassing up to 45% of all prostate cancers diagnosed worldwide [11]. In Iran, the prevalence of cancer is increasing with time

and is determined to be the second leading cause of death in the country [12]. Mortality rates stemming for prostate cancer in Iran is higher than that of other malignancies [13]. The incidence and standardized incidence in Iranian men has respectively increased to 3.7 and 1.7 times in recent years [14]. The incidence of this cancer is reported to be 9.6 per 100,000 people [15].

Aging is one of the most significant risk factors involved in this type of cancer. Approximately 60% of cancerous complications occur in people over the age of 65, and about 70% of cancer deaths are attributed to very same age group [16]. Causes of prostate cancer include race and ethnicity-related differences [17], genetic and environmental factors, family history [18], hormonal changes related to aging [19], infection, malnutrition, especially the consumption of saturated fats, [20], smoking, and consumption of alcohol [21] among others. Adenocarcinoma is the most common pathological outbreak in prostate cancer [22], which is more witnessed Iranian men over 50 years, hence the term “the disease of the elderly” [13].

The incidence of prostate cancer varies among different communities and ethnicities, often attributable to the quality of health services provided, prevalence of screening procedures as well as genetic backgrounds [23]. Among the ways to mitigate the morbidity and mortality of prostate cancer is screening, used to diagnose the disease in asymptomatic individuals [24]. Cancer screening is a test that looks for cancer-related complications before symptoms appear, contributing to the early diagnosis of the disease, and distinguishing, as a result, healthy people from outwardly healthy people. The main purpose of screening is to detect cancer in the early stages, when there are no signs and symptoms, oftentimes leading to a shorter and more effective treatment process and, in turn, increased survival rates [25]. Given the significance of the issue, the American Cancer Society has called for the screening and awareness of prostate cancer for all men over the age of 50 [26]. Urodynamic studies (UDS), sonography, laboratory tests, and physical examination of the patient are among the various screening and diagnostic methods established to diagnose people with prostate cancer [27]. One way to early detection of prostate cancer is testing for prostate-specific antigen (PSA) [28] which is currently one of the best markers for diagnosing prostate cancer [17, 19]. This screening test can be best employed in detecting malignancy, the benefits of which would be reduced metastasis owing to early detection [28].

Findings from research indicated that that PSA testing has reduced mortality rate of prostate cancer in the United States compared to that of the United Kingdom [29]. Regarding prostate cancer, researchers have suggested a plethora of factors affecting the participation of individuals in screening programs. One of these approaches is community-based hygiene interventions that has grown in volume during recent decades as a result of improved public health services and epidemiological research [30]. The high prevalence of this disease increasingly calls for comprehensive community-based educational programs and the close participation of the beneficia of these services. This model considers behavior as a function of knowledge and attitude of the individual and leads to varying perception regarding threats to health based on its components, hence promoting healthier lifestyles within the individuals [31].

community based education involves activities that are performed at the community level and at the very site the people live, the goal of which would be to improve the overall health of the community with a specific attention to first- and second-level prevention [32]. One of the models extensively employed to promote health and predict health-seeking behaviors is the health belief model. It examines the inherent features of preventive behavior or diagnosis in the asymptomatic phase using six constructs, namely perceived sensitivity, perceived severity, perceived benefits, perceived barriers, practical guidelines, and self-efficacy. This model seeks to exhibit the multidimensional nature of personal behaviors (as being a combination of interpersonal relationships and physical environment) [33]. The findings of Barati et al. revealed that the most significant predictors of prostate screening behavior are constructs of perceived sensitivity and perceived barriers [34].

Barati et al. (2017) examined the behaviors and attitudes of individuals towards prostate cancer screening and related psychological factors among men over 50 years old using the health belief model, the findings of which revealed that 12% and 9% of the participants in the study, respectively, had a history of digital rectal examination (DRE) and prostate specific antigen (PSA) test. Constructs of perceived benefit and barriers were reported to be predictors of prostate cancer screening behaviors. Moreover, attitude towards prostate cancer screening was strongly correlated with variables of age and history of prostate-related complications [35].

Rezaian et al. (2020) sought to determine the effect of educational interventions based on planned behavior model on prostate screening in 68 men aged 30-59 years, using a randomized clinical trial. The results showed that educational interventions based on planned behavior model is capable of improving the willingness of individuals for prostate cancer screening [36]. Brozowska et al. (2020) conducted a study to determine the impact of community-based interventions on cervical cancer screening. The study population was immigrant and non-immigrant women from the EU and non-EU. The findings of this study showed that compared to non-immigrant women, immigrant women had fewer visits to health centers for cervical cancer screening. The findings further indicated that younger age group had higher visits for screening [37].

Educational interventions based on the health belief model in the residence of the elderly is a promising avenue for raising their awareness and promoting prostate cancer screening. As such, the purpose of this study was to determine the impact of community-based interventions on attitude towards prostate cancer screening in the elderly based on the health belief model, the implications of which can determine the efficacy of interventions performed to promote prostate cancer screening within the target population of the elderly.

Materials and Methods

This study was a randomized control trial (RCT), in which all elderly men over 60 years of age with health records in public health service centers in Malayer in 2019-2020 were divided into two groups of control and experiment using stratified random sampling. The stratification was based on age group (60-69 and

≥70) and level of education (undergraduate, Diploma and above). Within each stratification, the participants were divided into two groups using permuted block randomization.

The following criteria were considered for the inclusion of participants in the study: (1) men over 60 who were willing to participate in the study, (2) physical health of participant, (3) being married, (4) ability to answer questions, (5) lack of prostate cancer, (6) no malignant and advanced disease, and (7) complete independence in self-care. Furthermore, participants with the following criteria were excluded from the study: (1) inability to answer questions, (2) Inaccessibility of individuals for any reason during the study process. Systematic random sampling was employed for the purposes of this study, according to which, the urban area Malayer was divided into three classes, namely north, center and south. Two public health centers from each of the north and south area and three public health centers from the central area of the city were selected using systematic random sampling and according to map. Finally, samples from the eligible population of each health center were selected through quota sampling. The sample size required for each group was determined to be 113 based on the perceived obstacle score and using the formula $S \cong \frac{R}{6}$ and PASS v. 15. However, considering the 10% probability of sample loss, the final sample size in both groups was determined to be 125 people.

For the purposes of the research, a standard questionnaire previously developed and administered by Barati et al. (2006) during a study in Hamadan was employed for data collection. Its validity and reliability were confirmed in the same study. This inventory is divided into two parts, namely (1) the section addressing demographic information and (2) the section for screening behaviors [35]. The demographic information section included items pertaining to age, marital status, number of children, level of education, occupation, economic status, previous history of prostate cancer, family history of cancer, type of insurance coverage, daily activity levels, history of smoking, family support and history of prostate screening tests. The section on the perception of prostate screening behaviors consisted of six sub-scale, each based on a component of the Health Belief Model, the first five of which were scored on a 5-point Likert scale (strongly disagree = 1, strongly agree = 5). The perceived sensitivity section consisted of 8 items with a score range of 7-35, of which a score of 7-16 indicated low sensitivity, 16-26 indicated moderate sensitivity, and 26-35 indicated high sensitivity. The subscale of perceived severity consisted of 16 items, with scores ranging from 16 to 80, in which a score of 16-37 indicated low perceived severity, 37-58 reflected moderate perceived severity, and high perceived severity was attributed for scores of 58-80. Perceived barriers included 20 items with a possible score range of 20-100, with a score of 20-47 indicating low perceived barriers, score of 46-72 indicating moderate perceived barriers, while 72-100 indicating high perceived barriers. Perceived benefits consisted of 10 items with a score range of 10-50, for which a score of 10-23 indicated weak perceived benefits, a score of 23-36 indicated moderate perceived benefits, and a score of 36-50 reflected high perceived benefits. The sub-scale of perceived self-efficacy consisted of 7 items, with a score range of 7-35, with a score of 7-16 indicating poor self-efficacy, 16-26 reflecting moderate self-efficacy and 26-35 indicating

good self-efficacy. On the contrary, the awareness level section consisted of 14 items scored on 3-point Likert scale (True, False, N/A).

This questionnaire was designed based on Kapik et al. (2006) and Oliver et al. (2006), for which the validity and reliability was confirmed by Barati et al. [35] Cronbach's alpha for the subscales of perceived sensitivity, sensitivity, barriers, benefits and self-efficacy was calculated to be 0.71, 0.82, 0.84, 0.70, 0.74 and 0.71, respectively [35]. The questionnaire was administered to the research samples (both experimental and control groups) before the intervention, and for the illiterate, the items were read by the researcher. During the follow-up period (i.e., 3 months after the intervention), the same questionnaire was distributed among the participants for analysis. The intervention in this study was based on the constructs of the health belief model.

At the beginning of the study and while obtaining the necessary permits, that is, when the researcher was planning a timeline for intervention measures, the country was plagued with COVID-19 pandemic. As such, Malayer Health Center did not cooperate in issuing a referral letter, and it was hence declared that referring to public health service centers and homes must wait until the situation stabilizes, in turn halting the research process for a month. With the decreasing trend of COVID-19 pandemic in mid-April 2020, the health center issued a permit for studies to commence. During the study, training sessions and follow-up examination, the country was struck with the second wave of the pandemic, and hence the research process was again halted until early August, when the studies were allowed to resume and the necessary interventions and measures were taken to conduct the study. During the study and in-house visits, all health protocols including the use of masks, face shields and also social distancing were fully observed. Before conducting the study, the authors visited the Pars Laboratory Center of Malayer city to explain and outline the purpose of the study, after which the laboratory was asked for PSA tests on introduced individuals at a lower cost than the usual fees, to the approval of the respected management of the center. During the sampling process, first the selected centers were outlined in a list and then, by attending these centers and explaining the purpose of the research, a list of elderly men over 60 years of age was provided from each center. The samples were randomly assigned to two groups of experimental and control groups using random stratified sampling. For the experimental group, a list of contact numbers of these people was prepared and attempts were made to call and establish a time frame for visiting the residences of the participants

In the first session, the researcher first introduced himself and explained the purpose of conducting research and reassuring the participants and their families that participating in the study would be optional and that the confidentiality and anonymity principles are observed, following which he assessed the level of awareness and perception of the participants and their families regarding prostate cancer and related complications. Moreover, a questionnaire was distributed among the subjects. In the second session, various materials on the anatomy and physiology of the urinary tract, functions and risk factors, complications and symptoms of urinary tract disorders were handed out. In the third session, a plethora of issues was discussed, including the definition of prostate disease, its phase, its risk factors and precursors and ways to prevent it. During the fourth

session, the definition of screening, different screening methods, locations of prostate cancer screening tests, as well as the benefits of using screening tests were completely described in detail. The fifth session was dedicated to clearing up the ambiguities of the elderly and their families regarding this disease and answering their questions in this regard. Sixth to eighth sessions were dedicated to alleviating the barriers to screening through frequent visits to the laboratory to examine the procedures, offering their own contact number and reminding the participants that they can call the researcher all the time in case of problems in screening tests, as well as questions and ambiguities in the field of prostate cancer and the corresponding follow-up screening tests.

To form a certain sense of apprehension within the participant (perceived sensitivity), its rate of global incidence, prevalence, mortality and the complications it causes for the individuals and their families were discussed. Moreover, issues like the financial burden on the families, incapacity, and treatment options, among others, were addressed. For perceived severity, the figure on mortality, metastasis, disease progression, and lethality were provided, and instances of prostate cancer in friends, acquaintances, and family members who had experienced the disease were disclosed. For perceived benefits, the benefits of healthy living were linked to the benefits of prostate screening, early detection, and the possibility of complete elimination or control of the disease in many cases, after which the treatment options and their costs, issues involved screening, and the benefits of prostate screening was explained to the participants and their families. Obstacles and facilities for prostate screening were explained to the participants and their families, and the necessary information on mechanisms of the health system and steps prior to undergoing prostate screening tests in public health centers, public hospitals and the University of Medical Sciences were outlined. The trainings were conducted in the form of questions and answers. Moreover, pamphlets, brochures, and CDs were handed out in direct physical contact to help them have increased awareness. Training programs were planned once every two weeks according to Table 1. No intervention was devised for the control group, whose selection conditions were similar to the intervention group, as they were administered the usual health system programs.

Following the conclusion of data collection, the data were analyzed in SPSS v. 22 using the relevant statistical tests. Fisher's exact test and Chi-square test were used to compare the demographic characteristics of the samples in the control and experimental groups, the findings of which revealed that there was a significant difference in the job variable between the two groups in all multivariate models used for data analysis, and hence the effect of the job variable was adjusted. A marginal effect model with a logit or polynomial link function was used to analyze behavioral intent and practice guidelines. In all models, the effect of job type and values of all structures were adjusted at the beginning of the study. Multivariate analysis of covariance (MANCOVA) was used to analyze the constructs of the health belief model (perceived sensitivity, perceived severity, perceived barriers, perceived benefits, perceived self-efficacy, and awareness). All the established ethical considerations were observed in this study. The research plan for this study was presented to the ethics committee of the university and

received the code of ethics. Also, before the intervention, the design was registered in the Iranian Registry of Clinical Trials (IRCT) and the IRCT code was obtained.

RCT Code: IRCT20180721040540N3

Ethical Cod: IR.LUMS.REC.1398.260

Research Findings

In this study, the data were analyzed in SPSS v. 22 using the relevant statistical tests. Fisher's exact test and Chi-square test were used to compare the demographic characteristics of the samples in the control and experimental groups. Statistical findings on demographic information of the samples in the control and experimental groups are listed in Table 1. Fisher's exact chi-square test revealed that there was no significant difference in the frequency distribution of the two groups in terms of age group variables, body mass index, education, physical activity during the week, smoking, insurance status and economic status ($0.05 < P$). Chi-square test showed that the two groups had significant differences in terms of job variable ($P = 0.016$), based on which the effect of job variable was adjusted in all multivariate models used for data analysis.

Table 1: Demographic variables of the studied samples for the intervention and control groups

Demographic variables		Control		Experimental group		p-value
		Frequency	%	Frequency	%	
Age group	Less than 70	73	64	73	64	> 0.999
	More than 70	41	36	41	36	
Body mass index (BMI)	Normal	56	49.1	56	49.1	> 0.999
	Overweight/obese	58	50.9	58	50.9	
Marital status	Single/widow	3	2.6	3	2.6	> 0.999
	Married	111	97.4	111	97.4	
Number of children	1	32	28.1	33	28.9	> 0.999
	2 or more	82	71.9	81	71.1	
Educational level	Illiterate, elementary	80	70.2	80	70.2	> 0.999
	High school, academic level	34	29.8	34	29.8	
Occupation	Self-employed	39	34.2	47	41.2	0.016**
	Retired	14	12.3	28	24.6	
	Worker	24	21.1	15	13.2	
	Farmer	37	32.5	24	21.1	
Economic status	Weak	30	26.3	29	25.4	0.964
	Moderate	68	59.6	65	57	
	Good	16	14	20	17.5	
History of doctor's	Yes	101	88.6	102	89.5	> 0.999
	No	13	11.4	12	10.5	

visit						
History of familial cancer	None	107	93.3	106	93	> 0.999
	Siblings	0	0.00	0	0.00	
	Parent	4	3.5	3	2.6	
	Aunts, uncles, grandparents	3	2.6	5	4.4	
	Others	0	0.00	0	0.00	
Insurance coverage	None	7	6.1	12	10.5	> 0.999
	Social Security (Tamin)	64	56.1	63	55.3	
	Iranian Health Insurance	39	34.2	35	30.7	
	Others	4	3.5	4	3.5	
Physical activity	Sedentary	28	24.6	32	28.1	> 0.999
	Less than 150 min per week	80	70.2	76	66.7	
	150 min per week or more	6	5.3	6	5.3	
Smoking	None	63	55.3	62	54.4	0.995
	Infrequent smoker (1-9 cigarettes per day)	13	11.4	16	14	
	Moderate smoker (10- 19 cigarettes per day)	33	28.9	31	27.2	
	Heavy smoker (more than 20 cigarettes per day)	5	4.4	5	4.4	
Blood test in the previous year	Yes	102	89.5	102	89.5	> 0.999
	No	12	10.5	12	10.5	

Findings from frequency distribution of various forms of practice guides before and after the intervention between the experimental and control groups is given in Table 2. Marginal effect model (using polynomial link function) indicated that there was a statistically significant difference between the intervention and control groups in terms of changes in the frequency distribution of various forms of practice guides ($P < 0.001$, 95% CI: 0.1-660.288, $B=0.974$). That is, the change in the frequency distribution of different types of practice guides in the control group was evidently more pronounced than that of the intervention group.

Table 2: The frequency distribution of various forms of practice guides for the intervention and control groups, before and after the intervention

	Form of educational resource	Control group		Intervention group	
		Frequency	%	Frequency	%
Before the intervention	Health personnel	20	17.5	19	16.7
	Magazine, newspaper	5	4.4	2	1.8
	Book	0	0	1	0.9
	Family	0	0	1	0.9
	Lack of information	68	59.6	5	4.4
	Other sources	21	18.4	86	75.4
After the intervention	Health personnel	24	21.1	19	16.7
	Magazine, newspaper	3	2.6	2	1.8
	Book	0	0	1	0.9
	Family	0	0	1	0.9
	Lack of information	33	28.9	5	4.4
	Other sources	54	47.4	86	75.4
p-value		<0.001			

Tables 3 presents the statistical findings on components of health belief model including perceived sensitivity, severity, barriers, self-efficacy and the current awareness of the studied samples in the intervention and control groups, before and after the intervention, using multivariate analysis of covariance. After adjusting the effect of job type and values of all structures at the beginning of the study, as per required, the results indicated that the effect of intervention on the mean change in sensitivity score was not statistically significant ($P = 0.104$). However, the adjusted mean change in sensitivity scores was -0.283 in the control group and 1.001 in the experimental group. Moreover, the results also indicated that the effect of intervention on the mean change in perceived severity score was statistically significant ($P = 0.049$), that is, the adjusted mean change in the perceived severity score was -20.617 for the control group and -27.085 for the experimental group.

Also, the result of MANCOVA further revealed that the effect of intervention on the mean score change of perceived barriers was statistically insignificant yet notable ($P=0.067$), that is, the adjusted mean change in the score of perceived barriers was -36.151 in the control group and -43.904 in the experimental group. The findings from the same analysis also revealed that the effect of the intervention on the mean score change of perceived benefits was statistically significant ($P < 0.001$). as such, the adjusted mean change in the score of perceived benefits was -1.126 for the control group and 6.910 for the experimental group.

Also, after adjusting the effect of job type and values of all structures at the beginning of the study, the findings indicated that the intervention had a statistically significant effect on the mean change in perceived self-efficacy ($P = 0.002$). In detail, the adjusted mean change in perceived self-efficacy score was 9.331 for the control group and 13.821 for the experimental group. The findings from the same analysis also revealed that that the intervention had a statistically

significant effect on the mean change in awareness score of the samples ($P < 0.001$). That is, the adjusted average was 14.387 for the control group and 21.787 for the experimental group.

Table 3: Comparison of the mean changes in the components of the health belief model for the intervention and control groups, before and after the intervention

Components	Interval	Control		Experiment		F	p-value
		Mean	SD	Mean	SD		
Perceived sensitivity	Before intervention	25.61	8.31	16.15	4.38	2.668	0.104
	After intervention	21.86	6.32	20.63	2.85		
	Adjusted mean changes	-0.283	0.0462	1.001	.450		
Perceived severity	Before intervention	62.04	19.32	60.05	15.25	0.872	0.049
	After intervention	39.48	20.09	34.85	7.7.		
	Adjusted mean changes	-20.617	1.932	-27.085	1.885		
Perceived barriers	Before intervention	73.76	25.74	86.90	22.98	3.399	0.067
	After intervention	41.95	25.70	38.28	9.87		
	Adjusted mean changes	-36.151	2.472	-43.903	2.411		
Perceived benefits	Before intervention	36.27	10.65	69.39	6.42	14.429	<0.001
	After intervention	37.79	11.42	43.13	5.60		
	Adjusted mean changes	1.126	0.865	6.910	0.873		
Perceived self-efficacy	Before intervention	15.20	8.62	15.59	6.62	9.987	0.002
	After intervention	25.47	9.338	28.52	3.87		
	Adjusted mean changes	9.331	0.835	13.821	0.815		
Awareness	Before intervention	23.39	1.75	15.34	3.92	17.469	<0.001
	After intervention	34.93	10.27	40.11	5.15		

	Adjusted mean changes	14.387	1.041	21.787	1.015		
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Discussion and Conclusion

The purpose of current study was to determine the effect of community-based interventions on an individual's attitude towards prostate cancer screening in the elderly men based on the Health Belief Model. A review of the relevant literature reveals that this research is an early effort in employing health belief model for promoting prostate cancer screening in the elderly. The findings of this study indicated that community-based interventions could be effective in motivating the elder population to undergo prostate cancer screening tests, as the intervention proved to improve all the components of the health belief model, namely perceived sensitivity, severity, barriers, benefits, self-efficacy, and last but not least, awareness and knowledge of the research subjects.

The findings further revealed that health education plans based on health belief model can promote behaviors aimed at prostate cancer prevention by enhancing knowledge on perceived sensitivity and severity, and to a lesser extent, on barriers, benefits and health-related motivations. In line with the findings of this study, Zarei et al. (2009) reported that education based on the health belief model can improve the attitude of the elderly to perform prostate cancer testing. Further, the findings of the same study indicated that, while gaining proper awareness regarding the significance of screening for prostate cancer, the samples may also establish a clear understanding of the constructs of the health belief model such as perceived barriers, benefits and sensitivity and their ensuing effects on the development of cancer prevention behaviors [38].

The findings of this study showed that there was no significant difference between the variations in the mean perceived sensitivity score of the intervention and control groups. The corresponding data revealed that although the perceived sensitivity was low in both experimental and control groups, the intervention led to higher sensitivity in the experimental group, albeit not statistically significant. Consistent with the findings of this study, Karimi et al. (2008) reported that the perceived sensitivity of the elderly for prostate cancer screening was low. Higher scores in mean perceived sensitivity are associated with a higher awareness of cancer sensitivity and indicates that community-based interventions may improve the sensitivity of individuals regarding prostate cancer, in turn leading to improved preventive behaviors and possible early diagnoses of the disease using screening. The popular belief among the elderly is that prostate cancer can occur without any symptoms and begin to progress, and this can lead to the onset of screening behaviors [39].

Offering educational content on the serious complications and chronic nature of prostate cancer and discussing the rate of fatalities and morbidities caused by such a disease, along with the high cost of treatment, are important factors that can print about improved levels of perceived severity in older men for prostate cancer screening [39]. The findings of the present study showed that the perceived severity regarding prostate cancer screening was moderate for both the control

and experimental groups, and before the intervention and after the intervention. The results also displayed that the perception of the research participants regarding prostate cancer screening improved significantly after the intervention compared to the control group, effectively meaning higher levels of awareness regarding the risk of prostate cancer, its complications and consequences in the participants. In this regard, Barati et al. reported that the perceived severity of prostate cancer and its related complications within their research sample was moderate-level. Their findings also revealed that the perceived severity of the intervention group increased compared to the control group following community-based interventions, which is consistent with the findings of Zarei et al. [38].

Given the frequently proven efficacy of community-based education, establishing similar programs consistently through various institutions providing health services as well as the national media is pivotal to the improved awareness of the elderly regarding the matter, the ultimate purpose of which would be to offer educational contents regarding the significance of prostate cancer, its possible complications, and the potential negative effects it may have on the family economy.

Findings of the current research revealed that perceived barriers are among the most potent components of the health belief model in predicting preventive behaviors for prostate cancer [39]. As such, the elder men of the research population generally felt that there is a plethora of barriers to prostate cancer testing. Consistent with the results of the current study, Barati et al. also reported that the elderly felt various obstacles to prostate cancer screening test, ultimately discouraging them for undergoing the test. The implications of such a scenario would be that, over time, the prevalence of the aforementioned diseases may increase, to the extent that it runs amok throughout the society. This must ring alarms for the authorities of the health-care systems, as they should actively seek to remove any barrier, whether perceived or actual, to prostate cancer screening tests, providing in the aftermath cost-effective and continent screening solutions for the elderly

Furthermore, findings of the study showed that educational interventions based on the health belief model are capable of alleviating the perceived barriers, as reflected by the differences in the corresponding score for the aforementioned components in the intervention group compared to that of the control group. In line with the findings of this study, other studies have also reported that performing interventions based on the health belief model can facilitate perceived barriers to screening tests [38, 40]. Perceived barriers are assumed to directly hinder preventive behaviors and hence discourage participation in prostate cancer screening [40]. As such, education and counseling can facilitate barriers and early detection of the disease in men.

The findings of the current study illustrated that the participants were mostly uniformed of the perceived benefits of prostate cancer screening. In agreement with the findings of the current study, Barati et al. (2006) reported that research sample tested poorly on perceived benefits of prostate cancer and its complications, signifying their lack of information regarding prostate cancer testing. In addition, statistical tests indicated a significant difference between the

intervention and control groups in terms of the mean score of perceived benefits after the intervention, which is in accordance with the findings of Zarei et al. [38]. Other studies have also reported similar results in examining the effect of educational programs based on health belief model on urinary tract infections and acquired immunodeficiency syndrome (AIDS) [40, 42]. The higher the mean score of perceived benefits, the more practical the perception of the participants about the recommendations offered for the prevention of prostate cancer. This improvement is one of the desired consequences, as the significant increase of this component in the experimental group compared to that of the control group should be interpreted the positive effect of the training program on the intervention group compared to the control group. Therefore, authorities of the public health system must actively pursue and implement policies on community-based interventions.

The findings of the present study showed that perceived self-efficacy for prostate cancer screening was moderate for both the experimental and control groups before the intervention. The results also showed that the post-intervention perceived self-efficacy of the experimental group increased significantly compared to that of the experimental group. In agreement with the findings the present study, Khosravi et al. reported an increase in self-efficacy of participant for prostate cancer screening test following interventions based on protection motivation theory [45].

Self-efficacy is one of the most significant variables predicting behavioral changes, the improvement of which would result in positive understanding of the ability, competency and capacity to perform. Therefore, it is widely evidenced that people with better self-efficacy are more likely to actively seek constructive behavior. As such, Alidosti et al. reported that the self-efficacy of their research sample regarding nutritional behaviors related to gastric cancer can be improved using educational interventions [44]. Also, Kessler et al. found that willingness to undergo in individuals can be enhanced by increasing self-efficacy [45]. Similarly, Barati et al. verified that the self-efficacy of men in undergoing prostate cancer screening is perceivably low. However, the results of previous research have established that self-efficacy can have a positive effect on the promotion of cancer prevention behaviors [46]. Even though major efforts have been recently implemented to enhance the health of individuals in the community in general, and to facilitate perform prostate cancer testing in particular, these guidelines are oftentimes not elaborative and practical enough, and hence may confuse people in public health centers. Assisting the elderly and their families in undergoing prostate cancer screening by holding educational classes as well as designing appropriate instructions and guides is of utmost importance.

It should be borne in mind that awareness is heavily involved in the willingness to undergo prostate cancer screening [47] as one of the causes of the relative high prevalence of this disease is a reportedly lack of awareness therein [48]. Awareness regarding the inherent features of the disease and lifestyle—induced alterations may have positive effects on procedures aimed at preventing complications [49], as poor awareness perceivably affects the attitude and practice of patients [50]. Findings from the current study indicated that the subjects suffer from low levels of knowledge about prostate cancer screening. In

the present study, the mean score of knowledge increased following the educational interventions, indicating the efficacy of the interventions on proposing the recommendations for the prevention of prostate cancer. This improvement can be traced back to the desired educational intervention, as a significant increase in the scores of the intervention group compared to those of the control group reflects the favorable effect of the educational program on the research population.

In line with the findings of this study, Zarei et al. reported that the level of knowledge of the participants regarding prostate cancer screening is low, as the majority of the participants cited that they did lack the slightest of information about this type of screening, and furthermore, those who were aware of the necessity of periodically undergoing this type of screening were mostly receiving their information from various forms media such as television, magazines, newspapers, radio, and last but not least, doctors, friends and family members. The findings of this study also indicated that holding educational classes based on the health belief model can promote the benefits of the prostate cancer screening in men [38], as other studies have shown that educational interventions can improve men's awareness of the importance of prostate cancer screening. [45, 51]. Another web-based study found that there was no change in the level of awareness of older men about prostate cancer screening. Therefore, previous literature reveals that face-to-face training are better suited to teaching the elderly [40]. Another study showed that handwritten contents are more effective in altering attitudes than web-based contents [52].

Also, in line with the findings of this study, the results of a study conducted in North Florida showed that 86% of African-American men had little knowledge about prostate cancer screening. Considering the importance of sufficient knowledge about prostate cancer as the pivotal element in decisions to undergo screening test, and considering that its academic realms is greatly understudied compared to developed countries, employing face-to-face interventions at the community level, along with various forms of published contents, namely, pamphlets and illustrated posters, can promote public awareness regarding the significance of prostate cancer screening.

The findings of the current study revealed that the effect of intervention on the frequency distribution of different types of practice guides has been statistically significant. The results of this study implied that the elderly received information about prostate screening tests from various sources, one the more meagre of which was the health system itself. Moreover, the share of the national media, including radio and television, was low therein. In line with the findings of this study, Jandorf et al. (2007) reported that community-based interventions can be fruitful in stimulating individuals to undergo prostate cancer screening. The corresponding data further indicated that people received their knowledge about prostate cancer mostly through newspapers, posters distributed throughout the community, friends and family, and finally, through local agoras [53]. Given that the health system is perceivably heavily involved in the prevention and treatment of diseases, employing various methods to outline the significance of prostate cancer testing among men, especially the elderly can be highly fruitful. Barati et al. showed that the guides for prostate cancer testing are

highly ineffective [34], indicating that devising and developing the appropriate guidelines for prostate cancer testing in the community must be highly prioritized.

Barati et al. showed that among the various components of the health belief method, the perceived barriers were predictors of prostate-specific antigen testing, while other studies have that perceived severity and benefits [54] and sensitivity [55]. A review on the literature also revealed that perceived sensitivity is the most significant component of the health belief model in predicting behavioral alterations [56]. As such, scrutinizing the role of each of the components of the health belief model when designing and formulating educational programs and interventions can encourage the elderly to perform prostate cancer screening, and all interventions are suggested to be conducted evidence-based and in line with the components of the health belief model.

Ultimately, the findings of this study indicated that community-based interventions based on the health belief model can be effective in encouraging senior men to undergo prostate cancer screening. Therefore, it is suggested that, before pursuing any community-level intervention, the dimensions of the phenomenon be determined based on the structures of the health belief model, pursuant to which purposeful measures tailored to the needs of the prostate cancer patient can be devised and implemented. Since this type of cancer is perceived to be highly curable in case of early diagnosis, and on the other hand, older men are at higher risk of severe complications from this disease, performing interventions for promoting awareness within the elderly and their families regarding the significance and procedures of prostate cancer screening, and making prostate cancer screening accessible for people of various physical, financial and cultural conditions are the key to higher rates of prostate screening tests with optimal results.

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