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Community-based Interventions and willingness for screen prostate cancer 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. Considering the lack of similar studies, this study was performed to determine the effect of community-based intention to perform screening behaviors on prostate cancer screening in the elderly based on the Health Belief Model. Methods: This study was a randomized field trial. The statistical population included all older 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, training based on the health belief model was performed. The data collection tool was a standard questionnaire, which consisted of two sections: demographic information and intention to perform screening behaviors for cancer prostate-based 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. Results: Data analysis showed no significant difference in the frequency distribution of 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 comparing 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 ($P < 0.001$). Conclusion: Educational interventions based on Health Belief Model can encourage the elderly to prostate cancer screening. It is suggested that the educational program designed in this study be implemented in the country'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

The prevalence of cancer-related diseases is on the rise throughout the globe [1, 2]. In 2020, the International Agency for Research on Cancer (IARC) reported an estimated 19.3 million cases of cancer worldwide and 10 million fatalities therein [3]. The total number of cancer patients in 2018 in Iran was 110,115, of which 55,785 people died in the same year. The population of Iran was estimated to be approximately 83 million people in the year above, effectively translating to 1.4 cases of cancer per 1000 people [4]. Cancer patients typically experience a range of symptoms, including a variety of physical and mental disorders. Patients diagnosed with cancers are almost immediately affected by anxiety and other mood-related disorders, which gradually affect the patient's recurrence and recovery in response to the diagnosis [5].

Among the various types of cancers, the respective share of each from the total number of cancers diagnosed in 2020 is as follows: Lung cancer (18%), colorectal cancer (9.4%), breast cancer (9%), liver cancer (8.3%) and gastric cancer (7.7%) [3]. Prostate cancer is one of the most common malignancies among males worldwide. According to the Global Burden of Disease Study, 1.4 million new cases of prostate cancer were reported in 2016, hence the most prevalent cancer among men. Moreover, it was reported that this disease led to 381,000 in 2016 [6]. The incidence of prostate cancer varies among different communities and ethnicities, often attributable to the quality of health services provided, prevalence of screening procedures, and genetic backgrounds [4]. Although the incidence of prostate cancer is declining in the United States and other Western countries, the incidence of prostate cancer is increasing in the so-called developing countries [7], yet the figures are still lower in Asian countries than those in Western countries [8].

Prostate cancer is the third most common cancer (9.4%) among Iranian men after skin and stomach cancer [9]. Geographically speaking, Prostate cancer is not uniformly distributed in Iran [10-12]. The lowest prevalence of prostate cancer in Iran pertains to the Kerman province, where the incidence is reported to be about 3.2 cases per ten thousand people [13]. Despite the significant differences in the incidence of the disease, prostate cancer can be considered mainly a men-over-65-years-of-age disease, as more than three-fourths of new cases are reported in men over 65 years of age [10, 14]. In Iran, men aged 70-79 are more likely to develop prostate cancer than other age groups [10]. Various factors such as age and diet are perceived to affect the progression of the disease [10]. However, the root causes of prostate cancer are still unknown [15]. Among the various types of cancer in terms of morphology, carcinoma, adenocarcinoma, and sarcoma are more evident in men over 65 years [10].

Among the ways to mitigate the morbidity and mortality of prostate cancer is screening, used to diagnose the disease in asymptomatic individuals [16]. 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, frequently leading to a shorter and more effective treatment process and, in turn, increased survival rates [17]. 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 [18]. Urodynamic studies (UDS), sonography, laboratory tests, and physical examination of the patient are various screening and diagnostic methods established to diagnose people with prostate cancer [19]. One way to early detection of prostate cancer is testing for prostate-specific antigen (PSA) [9], which is currently one of the best markers for diagnosing prostate cancer [20]. Age and race can affect PSA levels [21]. According to the simulated models, 45% to 70% of the reduction in mortalities of prostate cancer can be attributed to the early diagnosis of the disease using PSA tests [22, 23]. However, the findings of various studies have indicated that a major portion of the elderly evade prostate cancer screening and are not willing to undergo prostate cancer screening [24, 25].

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 have grown in volume during recent decades due to improved public health services and epidemiological research. Community-based education includes activities that target people of all geographical and demographical statuses as an educational environment. It involves activities performed at the community level and at the very site the people live, the goal of which would be to improve the community's overall health with specific attention to first- and second-level prevention [26]. The ensuing models focus on how individuals' perception regarding the phenomenon leads to internal contemplation and motivation, ultimately providing the basis for behavior changes therein. Overall, one can argue that the models rely on changes in attitudes as drivers to changes in behaviors [27]. Various studies using the Health Belief Model have sought to examine the knowledge and attitudes of men to perform prostate cancer screening. In this regard, the findings of studies have

shown that a high percentage of the elderly do not have prostate cancer screening exams on their agenda [24, 25].

Research Background

Shariat et al. (2015) examine the effectiveness of the community-based intervention on changes in attitudes regarding pregnancy and childbirth in District 4 of Tehran Municipality, the findings of which revealed that out of 274 mothers in the pre-intervention group, 193 (70.44%) underwent C-section, while out of 250 mothers in the post-intervention group, 169 (67.6%) employed C-section. The results indicated that although the initial inclination towards cesarean delivery was reduced, the actual rate was not significantly lower. The rate of episiotomy, induction and maternal morbidity was lower in the post-intervention group. Moreover, significant differences in terms of gestational age were observed in the two groups. Based on these results, the mother's desire for natural childbirth increased, and the incidence decreased following the intervention, yet, the rate of cesarean section relies on some other important factors [28].

Robert and Smith (2019) conducted a study in the USA to determine individuals' willingness to participate in screening for various cancers. It revealed that the participation of individuals in the recommended screening tests is significantly lower than the set goals and the most significant differences are attributable to race, ethnicity, socioeconomic status, and other indicators of access to health care. The findings indicated that consistent inequality in access to screening is involved in the prognosis and inferior outcomes of the more susceptible groups. The findings also show that only 42% of women have recently undertaken breast and cervical screening. Evaluations also revealed that national reports overstate the cancer screening rates [19].

Bai et al. (2020) performed a cross-sectional study to examine the effect of the Health Belief Model on the attitude towards colonoscopy screening. In this study, the level of participation of individuals in performing colonoscopy was low, and hence coronavirus-related screening for the Chinese population at risk should be prompted to include components for reducing existing barriers [31]. Zare et al. (2016) reported that holding educational programs in a workshop method based on the Health Belief Model increases the sensitivity, severity, barriers, and benefits of understanding prostate screening in men [30]. Nevertheless, the rate of prostate cancer screening in Iran is much lower than that of the developed countries [31-33], and given the high incidence of prostate cancer in Iran, raising the level of public awareness and providing the necessary infrastructure to provide the necessary conditions for cancer screening is of paramount significance [24, 34]. The purpose of this study was to examine the effect of community-based interventions on attitude towards prostate cancer screening in the elderly based on the Health Belief Model.

Materials and Methods

Methodology

This study was a randomized control trial (RCT), in which Eligible elderly who had health records in public health service centers 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.

Research population

The statistical population included all older men over 60 years of age with health records in public health service centers in Malayer in 2019-2020.

Inclusion criteria

The following criteria were considered to include participants in the study: men over 60 who were willing to participate in the study, physical health of a participant, being married, ability to answer questions, no prostate cancer, no malignant and advanced disease, and complete independence in self-care.

Exclusion criteria

The participants with the following conditions were excluded from the experiment: suffering from any acute illness, returning incomplete questionnaires, lack of ability to respond to questions, and inaccessibility for any reason during the study process.

Sampling

Systematic random sampling was employed for this study, according to which the urban area Malayer was divided into three classes, namely north, center and south. Two public health centers from north and south areas and three public health centers from the city's central area 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.

Sample size

The sample size required for each group was determined to be 113 based on the perceived obstacle score and using the formula $S \cong \frac{R}{6}$. Moreover, PASS v. 15. However, considering the 10% probability of sample loss, the final sample size in both groups was determined to be 125 people.

Research environment

The research sample was selected from the public health centers of Malayer city.

Data collection tools

For 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 about 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. This questionnaire was designed based on Kapik et al. (2006) and Oliver et al. (2006), the validity and reliability for which was confirmed by Barati et al. [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. The same questionnaire was distributed among the participants for analysis during the follow-up period (i.e., three months after the intervention). The intervention in this study was based on the constructs of the health belief model.

Research procedure

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 a 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, halting the research process for a month. With the decreasing trend of the 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. All health protocols, including masks, face shields, and social distancing, were fully observed during the study and in-house visits. 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, the selected centers were first outlined in a list, and then, by attending these centers and explaining the purpose of the research, a list of older 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 participants' residences. The training was 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.

Table 1: Timeline and description of the intervention for the participant and his family

Session	Session goal	Estimated duration	Site	Activities performed during the session
1	Increasing the awareness of the elderly about prostate cancer	20-30 min	Residence of the participant	Assessing the current awareness of the participants regarding prostate cancer, as well as barriers and facilities for prostate cancer screening. Then, based on the level of knowledge and understanding of the elderly and family, training on the anatomy and physiology of the urinary tract, functions and risk factors, way of getting prostate cancer, the definition of screening, and its benefits were given to the participants and their families.
2	Further raising the awareness of the participant and his/her family - creating perceived sensitivity and intensity for screening	20-30 min	Residence of the participant	Offering a review of the offered material - Providing information about the problems that the disease causes for the individual and family and the complications and severity of the disease.
3	A review of the past content - Explaining perceived benefits as well as barriers and facilities in the health system	20-30 min	Residence of the participant	Outlining items related to the benefits of using prostate screening for the participant and his family and facilitating the barriers that the elderly and their families cite for screening.
4	A review of the past content - giving practical	20-30 min	Residence of the participant	Explaining the methods of performing prostate cancer screening and its

Session	Session goal	Estimated duration	Site	Activities performed during the session
	suggestions for cancer screening			procedures
5	A review of past content - giving practical suggestions for cancer screening	20-30 min	Residence of the participant	Explaining the process of prostate cancer screening through public health centers as well as university centers.
6	A review of the past content - Pursue facilitation of screening	20-30 min	Remote session	Alleviating barriers to screening
7	A review of the past content - Pursue facilitation of screening	20-30 min	Remote session	Alleviating barriers to screening
8	Review of past content - Follow up to facilitate screening	20-30 min	Remote session	Alleviating barriers to screening

Data analysis

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 analyzed 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.

Ethical considerations

All the established ethical considerations were observed in this study. The research plan for this study was presented in the university's ethics committee 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 2. Fisher's exact chi-square test revealed no significant difference in the frequency distribution of the two groups regarding age group variables, body mass index, education, physical activity during the week, smoking, insurance status, and economic status ($0.05 < P$). The Chi-square test showed that the two groups had significant differences in job variable ($P = 0.016$), based on which the effect of job variable was adjusted in all multivariate models used for data analysis.

Table 2: Demographic variables of the studied samples between 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 visit	Yes	101	88.6	102	89.5	> 0.999
	No	13	11.4	12	10.5	
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 data analysis of variables of prostate screening intention and practice guides for the control and intervention groups, before and after the intervention, are provided in Table 3. Based on the marginal effect model (using the Logit link function), it can be stated that by adjusting the effect of initial behavioral intention and occupation, the effect of the intervention on the intention to undergo prostate screening was not significant ($P = 0.862$). Nevertheless, performing the intervention increased the number of participants willing to undergo screening tests by 6.3%, which was not statistically significant ($P = 0.862$, 95% CI = 0.2-535.110, OR = 1.063).

Table 3: willingness to undergo prostate screening in the experimental and control groups, before and after the intervention

Willingness to undergo screening		Control group		Intervention group		p-value
		Frequency	%	Frequency	%	
Before the intervention	Yes	97	85.1	95	83.3	0.862
	No	17	14.9	19	16.7	

Findings from the frequency distribution of various forms of practice guides before and after the intervention between the experimental and control groups are

given in Table 4. The 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, $B=0.974$). The change in the frequency distribution of different practice guides in the control group was more pronounced than in the intervention group.

Table 4: of the frequency distribution of various forms of practice guides between 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			

Discussion and Conclusion

This study aimed to determine the effect of community-based interventions on the attitude towards prostate cancer screening in the elderly based on the health belief model. A review of the relevant literature reveals that this research is an early effort in employing a 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 encouraging the elderly to undergo prostate cancer screening tests. Prostate cancer has a latent nature, often with prolonged latencies, and hence patients assume that they are less likely to develop prostate cancer. As such, informing the risk groups, using various ways and continuously over time, about the dangers and consequences of the disease is of utmost importance.

The present study's findings revealed that education programs based on the health belief model could positively influence the attitude of individuals in exhibiting preventive behaviors for prostate cancer by improving the level of knowledge and positive effects on sensitivity and severity and considering barriers, benefits, and health motivations. In line with the findings of this study, Zarei et al. (2009) showed that education based on the health belief model could improve the attitude of the elderly in undergoing prostate cancer testing [36].

Among the issues that can influence the willingness of individuals towards prostate cancer screening is the use of educational videos and images depicting the complications and consequences of the disease. Also, exhibiting the complications of the patients to the elderly population can further encourage them to undergo prostate screening. Television is a national media that, according to studies, can be used as a potential to encourage people in the community to undergo screening tests. Janorf et al. (2007) reported that the success of interventions in persuading people at the community level to undergo prostate screening led them to move to new hosting locations, such as public health centers and community-based locations, such as churches [37]. Moreover, Zarei et al. (2009) revealed that holding workshops based on the health belief model for the elderly resulted in 36% of the samples visiting health centers for prostate cancer screening following one month of the workshop. Therefore, all health care providers must regularly offer consultation for older men about the risk of developing prostate cancer and the benefits of early screening. Elderly people should also talk about the fears and barriers that prevent them from participating in screening programs, increasing their responsibility for self-care.

As such, the findings of this study indicated that community-based interventions based on the health belief model could 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, according to which purposeful measures tailored to the prostate cancer patient's needs can be devised 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.

The findings of this study can contribute to health policymakers in providing the infrastructure for prostate screening tests, which would be to mitigate the high incidence of prostate cancer in the community and prevent the progression of this disease. Moreover, the unique challenges and pitfalls of dealing with the elderly can be alleviated by employing specialized nurses in the field of the elderly in public health service centers. Educational programs based on face-to-face interaction with the elderly and family members by competent nurses with the prerequisite expertise and experience can effectively encourage the elderly to undergo prostate cancer screening. Therefore, due to Iran's aging population and the high prevalence of prostate cancer in this corresponding age group, preventive measures for and early diagnosis of prostate cancer should be the main focus of scholars and academics of medicine, nursing, health, and paramedics disciplines. Moreover, the findings of this study were able to partially explain the community-based interventions to encourage the elderly to undergo prostate cancer screening tests based on the health belief model.

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