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The Effect of Educational Program Based on PRECEDE Model in Promoting Prostate Cancer Screening in a Sample of Iranian Men

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Abstract Prostate cancer is one of the most prevalent diseases among men. This study aimed to assess the effect of educational program based on Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation (PRECEDE) model in promoting prostate cancer screening in a sample of Iranian men. This is a quasi-experimental study carried out on 300 men aged 40 to 70 (the subjects 150 experimental and 150 control groups) in Shiraz City, Fars Province, Iran, in 2016. The participants of the intervention group attended training based on the PRECEDE model. The study compared mean scores of knowledge, attitude, enabling factors, perceived social support, quality of life, general health, self-efficacy, and screening behaviors of the subjects before and 6 months after intervention in experimental and control groups. The mean age of experimental group was 56.45 ± 8.65, and the mean age of the control group was 55.64 ± 8.71 years (P = 0.521). The study showed that there was a significant increase in the mean score of knowledge, attitudes, perceived self-efficacy, enabling factors, perceived social support, quality of life, public health and screening behaviors of the experimental group; however, no significant change was observed in the mean score of knowledge, attitudes, self-efficacy, quality of life, general health, perceived social support, enabling factors, and screening behaviors of the control group. Our findings showed that the health education programs designed based on PRECEDE could positively affect prostate cancer screening behaviors of individuals by improving their knowledge level and attitude, enabling factors, perceived social support, quality of life, general health, and self-efficacy.

Keywords Screening · PRECEDE model · Prostate cancer · Knowledge

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Introduction

Prostate cancer is one of the major health problems in developing countries [1]. It has a large impact on the quality of patients' life and their caregivers and imposes heavy costs on them [2]. The disease is the second most common cancer and the second leading cause of cancer death among the world male population [3, 4]. The peak incidence of the disease is reported to occur in the 60 to 70-year age group [2]. It is estimated that about 233,000 American men will be diagnosed with the disease in 2016, and about 29,480 people lose their lives to the disease [5]. The rate of prostate cancer prevalence in developed countries is as much as six times greater than the case in underdeveloped countries [6]. According to 2010 statistics, prostate cancer is the most common malignancy with the highest incidence (28%) and is only second to lung cancer (29%) as a cause of death (11%). In 2014, about 233,000 Americans had been diagnosed with prostate cancer which is the most common non-skin cancer in American men [7]. The statistics show that prostate cancer makes up 27% of all

cancers and 10% (29,480 cases of death) of all deaths caused by cancer in men [8]. In Iran, hormone-dependent cancers have been increasing in the last 10 years among which prostate cancer is the most common [9]. Prostate cancer is ranked eighth for cancer death in Iran [10]. Compared to other types of cancer in our country, the death rate from prostate cancer is relatively high and, for example, it had been estimated that in 2013, approximately 1309 deaths from prostate cancer would occur in the country [11]. Like all types of cancer, the exact cause of prostate cancer is not easy to determine. Some risk factors are believed to affect one's chances of developing prostate cancer including increasing age, positive family history, and race (African-American, for example) [12]. Moreover, geographical location can also impact the risk of developing prostate cancer. Such other risk factors as educational level, occupation, diet, alcohol consumption, smoking, sexual activity, and diabetes mellitus may have some connection to the pathogenesis of the disease [4]. The nature of prostate cancer is in such a way that as long as progress is not localized or metastasized, it does not cause symptoms [13]. When the symptoms appear, usually it has already run its course. Therefore, the early detection of the disease in early stages can be an effective measure to reduce the mortality rate of the disease which is asymptomatic in men [5, 14] and provides an opportunity to create an effective and inexpensive therapeutic method for people [15]. The stage of prostate cancer diagnosis is an important factor in explaining the survival rate of the cancer. A 5-year survival rate in men with localized prostate cancer when the disease is in localized stage (no metastasis) is almost 100%, while the rate among men whose prostate cancer has metastasized is only 31% [14]. An increase in prostate cancer screening programs will certainly lead to increased diagnosis in the early stages and therefore in its treatment [5]. Thus, performing prostate cancer screening programs and early detection of prostate cancer play a significant role in increasing the survival rate of the patients. The efficacy of prostate cancer screening programs has verified the identification of the disease and the reduction of mortality rate so that various studies have confirmed the reduction of mortality rate of prostate cancer due to performing prostate cancer screening programs [16]. Most prostate cancers are first found during screening with a prostate-specific antigen (PSA) blood test or a digital rectal exam (DRE). PSA is a member of the kallikrein-related peptidase family and is secreted by the epithelial cells of the prostate gland. In digital rectal exam (DRE), which is done to check for the growths in or enlargement of the prostate gland in men, any hyperplasia of the prostate can often be felt as a hard lump [17]. The analysis of data gathered from seven European capitals showed a significant reduction in prostate cancer mortality rate following (PSA) blood test after a period of about 9 years. The study of Hugosson et al. on PSA-based screening in 2010 also indicated the reduction of prostate cancer deaths following prostate cancer screening tests [18, 19]. The time of screening for prostate cancer is controversial. While the American Society of Clinical Oncology recommends screening be encouraged in those who are over 40 and expected to live 10 years, the American Prostate Cancer Society suggests that prostate screening be performed in those men over 50 with a life expectancy of greater than 10 years [14]. The United States Preventive Services Task Force (USPSTF) recommended against PSA screening in men over 75 finding that the potential risks outweigh the potential benefits [20]. A decision should be made by the person in question based on the potential risks and benefits. Therefore, men in the age range 40 to 70 are most appropriate target group for prostate cancer screening. Despite the importance of prostate screening in early detection of prostate cancer and increasing life expectancy, the findings of studies suggest that screening procedures have not been widely welcomed by men. Among such studies are the studies on Philippine men residing in Hawaii, African-American men, and men living in the Caribbean Sea. While prostate cancer is relatively high among these groups of men, the studies indicate their low participation in screening programs [14, 21]. Usually, men with small signs of the disease are reluctant to seek medical advice unless their illness becomes severe or out of control [22]. The reasons of low male participation in screening programs have not yet been clear, but it is likely linked to patients' low socioeconomic status, lack of insurance coverage for screening, men's unawareness of prostate cancer, and the doctors' disrecommendation of screening programs [23–26]. It is noteworthy that many patients do not like or do not want to know they are afflicted with prostate cancer. Having found out they suffer from prostate cancer, they feel concerned and their tranquility is disturbed [27]. In addition to the patient's screening-induced preoccupation, it causes mental distress in the patient's family [28]. Taking the problem into consideration, one can realize how important it is to pay attention to psychological aspects of men's participation in screening prostate cancer. Regarding prostate cancer, many researchers have found out a variety of factors which influence men's participation in screening programs, but in taking a scientific and specialized look at the issue, a conceptual framework for understanding and analyzing health-related behaviors is necessary [27]. In order to design health education interventions, health education specialists make use of appropriate theories and models to help the people in the target group to change [29–31]. Effective health education and health promotion require an advanced analysis of health problems, as well as an evaluation and systematic design. In health education and health promotion programs, it is essential to pay special attention to health problems in terms of behavioral and environmental factors as well as the development, implementation, and evaluation of comprehensive programs [32]. Health promotion also relies on all factors affecting health including health services, genetic

factors, individual health behaviors, as well as socioeconomic and physical environment. To meet the successful development of health education programs, making use of health promotion theory models is necessary [32]. Theories and models present a systematic view of events or achievements and provide a systematic process to analyze the success or failure of a program. As educational process roadmaps, they provide the essential guidelines to check and identify the route of education, the methods of educational planning, and the design of interventions and facilitate the evaluation [33]. One of these models is the PRECEDE-PROCEED model (PPM). The model, as one of the most popular models in health education, is a process for health behavior change and evaluates the possible outcome of a health education program [33]. PRECEDE stands for Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation while PROCEED stands for Policy, Regulatory and Organizational Constructs in Educational and Environmental Development [34]. This model, designed by Lawrence Green and Marshall Crowther (1999), is an approach as a planning, intervention, and evaluation framework. It analyzes the factors affecting health behavior change. It is based on the fundamental assumption that interventions for making change will be sustainable if the participants will take an active part in defining their own problems, establishing their goals, and developing their solutions [35]. In the study carried out by Chiua et al. in 2098 men aged 35 and more in the USA, it was shown that the men over 50 and more, with higher incomes and in better health conditions, tended to participate in prostate cancer screening and followed the procedure. Participating in prostate cancer screening was associated with such factors as age, income, and employment status, good and excellent condition especially in men over 50. Willingness to participate in screening programs in men over 50 was less reported [36]. In a study by Oliver entitling "Prostate Cancer Screening Patterns among African American Men in the Rural South," a quasi-experimental study, which was conducted on 90 African-American men between the ages of 40 and 82 years, the data analysis showed that there was a statistically significant difference between the constructs of health belief model, knowledge, and ages of the men who participated in the prostate cancer screening program and those of the ones who did not participate in the screening. Among the constructs of health belief model and other demographic variables, there was only a significant correlation between participation in prostate cancer screening program and health motivation [37]. The results of a study by Mitchell, using PRECEDE model to evaluate the subjects' behavior in cervical cancer screening, showed that there was a significant correlation between Pap smear test and contraceptive practice, cues for action, and positive attitude, but not between Pap smear test and age and race of the participants. The findings of this study presented three suggestions that it is vital that sex health experts (1) deal with the reduction of the need for Pap smear test among certain populations, (2) advocate planning training courses for the target groups and health care providers, and (3) assert the need for the midwives and gynecologists [30]. By using the theory of planned behavior (TPB), Donna Kenerson also assessed prostate cancer screening intent among African-American men [38]. In a study about the influence of theory-based health education program on promoting preventive behaviors from prostate cancer done by Didarloo et al., it was shown that there was an increase in the performance of participants in the control group following teaching interventions [39]. In the study based on the PRECEDE model conducted by Jeihooni and his colleagues who examined the factors associated with prostate cancer screening behaviors among men over 50 in Fasa, Fars, Iran, the researchers found out that the subjects' awareness and attitudes, self-efficacy, social support, enabling factors, and screening behaviors were low. The mean scores of quality of life and general health were found to be low [40].

Total evidence on prostate cancer screening has been inconsistent and much debated [41, 42]. For example, the European Randomized Study of Screening for Prostate Cancer (ERSPC) presented a decrease in mortality [43, 44] and the European Association of Urology (EAU) and the National Comprehensive Cancer Network (NCCN) emphasized on screening for prostate cancer [45], while the Prostate, Lung, Colorectal, Ovarian Cancer (PLCO) did not find a decrease in mortality [46, 47] and the US Preventive Service Task Force (USPSTF) opposed to performing a prostate cancer screening [48]. Also, researches recommended the high rate of false positives (and related concern), the risk related with prostate biopsy, and the severe consequences of prostate cancer treatment must be considered beside the benefit of reduced cancer-specific mortality [49]. Meanwhile, several organizations mention that doctors should involve men in shared decision-making when debating prostate cancer screening [50–52]. In view of this controversy, there is agreement that men need to be well informed before they undergo a prostate cancer screening test [53]. This can be attained by the use of decision aids. Such decision aids have been shown to increase knowledge about prostate cancer screening [54, 55]. In Iran, prostate cancer continues to be one of the main causes of death [56]. According to the cancer statistical center of Iran, in 2009, prostate cancer had an age-standardized incidence rate (ASR) of 12.59 per 10,000 people, making it the third most prevalent cancer among men in Iran [57]. Also, the results of the studies in Iran suggest that men are not prepared to take screening test procedures and did not have good knowledge about prostate cancer screening methods [58]. According to the aforementioned topics, this study, based on the PRECEDE model, aimed at determining the effect of educational program in promoting

prostate cancer screening in men between 40 and 70 in Shiraz City, Fars Province, Iran.

Materials and Methodology

The present study is a prospective quasi-experimental one carried out on 300 men aged 40 to 70 (the subjects were evenly divided into experimental and control groups) in Shiraz City, Fars Province, Iran, in 2016. Two health centers located in Shiraz were randomly selected (one center for the experimental group and the other for the control group). The criterion for the selection of the subjects was the family file number at the health center. The subjects were then invited to participate in the study. After explaining the purpose of the study to the participants and obtaining their consent form and reassuring them that all the information obtained will be kept confidential, they filled in the pre-test questionnaires. While the inclusion criteria were the age range for men to be 40 to 70 with literacy but without having any type of cancer, the researchers excluded those men who showed unwillingness and those who did not fill out the consent form to participate in the screening program as well as those who did not attend two teaching sessions. Having conducted a pilot study on 30 eligible randomly selected participants, the sample size was calculated by using sample-size formula, P value ($P \leq 0.05$) as the level of significance, 95% as the confidence level for acceptable error(s), 37% as the correlation coefficient, and 10% for the reduction of the number of participants. Altogether, a total of 150 men were selected to participate in the experimental group and 150 men in the control group.

$$n = \left(\frac{\left(Z_{1-\alpha/2} + Z_{1-\beta}\right)}{0.5 \times \ln\left(\frac{1+r}{1-r}\right)} \right)^2 + 3$$

The data-collecting instrument was a questionnaire comprising demographic variables, education level, marital status, tobacco using, the constructs of PRECEDE educational model, and the prostate cancer screening behaviors questionnaire. Data gathering was completed via questionnaires used in various studies, a well-prepared research team [27, 38–40], and interviews with men aged 40 to 70. In order to assess the reliability of the questionnaire, it was given to a team of highly experienced experts (nine health education experts, one urologist, one oncologist, and one specialist in community medicine). The experts were asked to make any comments on the items of the questionnaires in terms of simplicity, clarity, relevance, and necessity. After receiving the experts' feedback and comments, any necessary amendments in the study tools were made and ultimately its validity was confirmed (using Lawshe index table for 12 people (56/0)). Cronbach coefficient alpha was used to measure the reliability of the number of question items ($n = 30$), the results of which were presented in the following table.

Quality of Life Questionnaire For this part, a Farsi version of quality of life questionnaire MOS-SF-20 was used [59, 60]. This 20-item questionnaire has three scales for each functional condition and well-being status as follows: (1) functional status including physical and social functioning, (2) performance of function, and (3) welfare status including mental health, perception of health, and pain. Finally, a score between 0 and 100 was obtained. The validity and reliability of the questionnaire in internal studies among different groups have been reported [61].

General Health Questionnaire Health condition: The instrument applied in this part of the study consisted of a questionnaire called General Health Measurement standard (GHQ-28) to determine the respondents' current health. The questionnaire contains four subscales of physical symptoms, anxiety/insomnia, social activity disruption, and severe depression, each composed of seven questions. At last, the scores obtained for this scale will range between 0 and 84, the latter is indicative of poor health condition, and the former is a sign of excellent health condition. In the pilot study, the obtained Cronbach coefficient alpha was equal to 72% [62].

Prostate Cancer Screening Behaviors Questionnaire Prostate Cancer Screening Questionnaire consisted of six specific question items assessing rectal examination and prostate-specific antigen test.

Predisposing Factors Scale Based on the PRECEDE model [34], such components as knowledge, attitudes, and self-efficacy should be taken into consideration in order to measure predisposing factors. To do so, men's knowledge about prostate cancer, their prostate cancer screening behaviors, their beliefs associated with screening (perceived susceptibility, severity, benefits, and barriers), and their general self-efficacy were measured. In the end, the total score of predisposing factors was calculated out of the sum of the scores of the above factors.

Question Items on Men's Awareness About Prostate Cancer Screening Behaviors The Knowledge about Prostate Cancer Screening Questionnaire was developed by Weinrich (2004) and colleagues [63]. It measures the level of knowledge about prostate cancer and screening behaviors in terms of signs and symptoms, risk factors, treatment side effects, and the current indications for screening. The questionnaire consists of 12 items to be answered with the options of "true," "false," and "I do not know" with a range score of 0 to 10. "True" responses are scored "1," but "false" and "I do not know" responses were scored as incorrect and given zero.

The reliability and validity of the questionnaire have been reported in other studies [37, 63]. In a pilot study conducted on 30 men from 40 to 70 years old, the Cronbach coefficient alpha was reported to be 72%.

Perceived Self-Efficacy Questionnaire This section consisted of 10 questions with a scale of 1 to 4 which measured perceived self-efficacy. The questionnaire is a standardized scale whose reliability and validity have been reported [64].

Attitude Questionnaire Men's attitudes toward prostate cancer screening behaviors [27, 37] included 10 specific items in a 5-point ordinal scale.

Perceived Social Support Questionnaire (as Reinforcing Factors) Social Support Scale with standard tools [61] in two parts assesses overall perceived social support and supportive family behaviors. The overall perceived social support subscale used three items to assess emotional support, instrumental support, and perceived information support from family, peers, and the community. The answers were in a 5-point Likert scale anchored at zero = not at all and 4 = very much. The second part, i.e., supportive family behaviors, consisted of 11 questions and assessed the subjects' perceptions about the extent to which most members of their families took such measures as going to the doctor with them, encouraging them to get the proper exercise, and following up on their self-care and diet. In the second part, the answers ranged from zero = not at all to five = very much on a Likert scale. The obtainable score on this part ranged from zero to 44. Thus, the sum of the scores obtained from both parts provided the social support scores for participants in the study.

Enabling Factors Questionnaire This construct was measured by using six-question items, developed by the researchers. Enabling factors questionnaire assessed the subjects' perceptions of the extent to which they thought their income was sufficient to meet their good health needs, how easy it was to have access to medicine or medical specialists, and how knowledgeable they were about self-care behaviors. The answers ranged from zero = "not at all" to three = "completely" on a four-point Likert scale. The acceptable score for this construct fluctuated between zero and 18. All scores except general health factors were calculated from zero to 100.

The research team conducted the teaching intervention after the preliminary study [40]. The preliminary study, based on the PRECEDE model, was developed and carried out to examine the factors associated with prostate cancer screening behaviors among men over 50 in Fasa, a city in Fars Province, I.R. Iran. Therefore, the teaching program was focused on the constructs, and its educational content was prepared in the form of teaching booklets, presentations, and videos. The teaching program aimed at enhancing the participants' knowledge about prostate cancer, familiarity with potential risk factors, and their complications; understanding the importance of the benefits of adopting preventive behaviors (going on a proper diet, getting exercise, avoidance of tobacco and alcohol, weight control, taking diagnostic and screening tests, refusal of having multiple partners and unsafe sexual intercourse, and avoiding settings contaminated with carcinogens) and screening; identifying the obstacles in the way of adopting preventive behaviors and screening; management of personal and social factors associated with prostate cancer; and providing preventive measures and presenting skills to prevent prostate cancer in individuals. In this study, the educational planning was founded on active learning approach. During the teaching intervention, the subjects were actively involved in the training program and five public health experts helped implement the program. The training program for the experimental group comprised ten sessions. Each 55- to 60-min session was held at the conference hall of Shiraz Health Center once a week in the form of lectures, group discussions, brainstorming and question-and-answer meeting, displaying videos and PowerPoint presentations, enjoying the specialists of community preventive medicine, and health education. In the first session, due to little knowledge of subjects on prostate cancer, the presenter dealt with talking about cancer, causes of cancer, determining factors in reducing the risk of cancer, the impact of cancer on the quality of life, and people's general health along with presentation of teaching slides on the preventive measures associated with prostate cancer. As a part of this session, time was devoted to one of the subjects afflicted by prostate cancer to talk about the severity of the complications of the disease for 20 min. The second and third sessions were spent on questions asked about the disadvantages of unhealthy high-fat foods, alcohol consumption, tobacco use, the effects of sexual promiscuity, overeating, lack of proper weight control, lack of exercise, and diet low in fruit, vegetables, and seafood which make the people susceptible to prostate cancer and the effects it has on quality of life. As the sessions proceeded, the participants began discussing the advantages of taking preventive measures against prostate cancer, the economic and psychological benefits for themselves and their families, and prevention of other cancers. In the fourth session, through brainstorming, the researcher dealt with all of the factors which the subjects considered to be a barrier to the adoption of preventive behaviors and evaluated the benefits of prostate cancer screening. Finally, some approaches were presented. In the fifth and sixth sessions, the presenter reminded the subjects of the perceived benefits. The sessions proceeded with exchanging the ideas about whether the subjects are capable of differentiating the preventive behaviors from predisposing behaviors, whether they can inform others of the factors leading to prostate cancer, and whether they themselves are capable of observing the preventive

behaviors. The seventh session focused on increasing self-efficacy and a change in the attitude of people. Session 8 was held in which a family member of the subjects, the physicians, and staff of the hospitals took part. It stressed their supportive and reinforcing roles in screening behaviors and performing screening tests. The ninth session dealt with introducing the sources of information available at the community, the sites of service provider centers associated with this problem, and the search for valid educational materials presented by the researchers. At the end of the session, the subjects were divided into groups of 5–6 people forming cooperation, consultation and supportive groups. The tenth session focused on the subjects' performance and screening behaviors. The last 5 min of each session was devoted to summarizing the material presented in the same session. After training sessions were finished, an educational message related to the prevention and treatment of prostate cancer screening was sent to the subjects every week; moreover, a follow-up session was held for the subjects every month. Then, the subjects were directed to the laboratory of Nader Kazemi Clinic, situated in Shiraz, to take prostate cancer screening test. Having passed 6 months after the teaching interventions, both the experimental and the control groups completed the questionnaires. This study was first ratified as a research proposal at Shiraz University of Medical Sciences and was given a code of research ethics. In order to comply with ethical considerations, at the end of the study, a training session was held for the control group. The collected data was then analyzed by SPSS (Statistical Package for Social Sciences), independent *t* tests, chi-square, and *t*-pair test. The significance level was set at 0.05%.

Findings

The present study was conducted on 300 men aged 40–70 years old in Shiraz City. The mean age of experimental group was 56.45 ± 8.65, and the mean age of the control group was 55.64 ± 8.71 years ($P = 0.521$). The independent *t* test showed no significant difference between the two groups.

Chi-square test showed that there was no significant difference between the experimental and control groups in terms of education level ($P = 0.315$), jobs ($P = 0.428$), number of children ($P = 0.613$), marital status ($P = 0.115$), and tobacco use ($P = 0.532$) (see Table 1).

The results of the study showed that based on independent *t* test, there was not a significant difference between the mean score of knowledge ($P = 0.215$), attitude ($P = 0.514$), perceived social support ($P = 0.712$), quality of life ($P = 0.06$), public health (09/0 = $P = 0.09$), enabling factors ($P = 0.412$), perceived self-efficacy ($P = 0.213$), and screening behaviors ($P = 0.543$)of the experimental and control groups before the teaching interventions, but there was indeed a significant difference 6 months after the intervention ($P</05$). The *t*-pair test showed that there was a significant increase in the mean score of knowledge, attitudes, perceived self-efficacy, enabling factors, perceived social support, quality of life, public health, and screening behaviors of the experimental group ($P</05$); however, no significant change was observed in the mean score of knowledge, attitudes, self-efficacy, quality of life, general health, perceived social support, enabling factors, and screening behaviors of the control group ($P>/05$) (see Tables 2 and 3).

Discussion

Regarding the high prevalence of prostate cancer in men, it is very important to adopt theory-based teaching interventions to promote preventive and screening behaviors of the patients. The aim of this study was to determine the effect of teaching interventions based on the PRECEDE model on the screening behaviors of men with prostate cancer aged 40–70 years in Shiraz. The results are indicative of the effectiveness of intervention based on the PRECEDE model in promoting prostate cancer screening behaviors in men. In this study, no significant difference was there between the experimental and control groups in terms of demographic data, the mean scores of knowledge, attitude, enabling factors, perceived social support, quality of life, general health, perceived self-efficacy, and screening behavior prior to the intervention. The mean scores were very the same and homogeneous, meaning that they had the least confounding effect on the results of the study. The results showed that the mean scores of knowledge and attitude were at a lower level before the teaching intervention in two groups, but there was a significant increase in the mean scores of the experimental group at 6 months after the intervention. In line with the results of this study, the findings of the studies by Forrester-Anderson IT [65], V. Diane Woods [66], Parker PA [67], Fallahi [68], and Jeihooni [40], the mean scores of knowledge and attitude toward prostate cancer and screening behaviors were at a low level. According to the results of our study, the knowledge and attitudes of participants in both the two groups in relation to such topics as prostate cancer, the anatomy of the prostate gland, genetic risk factors, environmental and lifestyle risk factors, and the early symptoms of prostate cancer and screening tests were not sufficient enough. Lack of knowledge and attitude can be attributed to lack of proper insightful programs released from the mass media, meetings not being held by the health authorities, underestimating the preventive measures, and emphasis on treatment. The findings of Claire's study showed that the Haitian men's health knowledge and beliefs about prostate cancer range from low to moderate [69]. Holding training sessions, handing teaching booklets out, using group discussions for presentation of educational materials, displaying videos, and sending educational messages to the subjects on

Table 1 The reliability of question items in the pilot study (n = 30)

	Variables	Number of items	Cronbach coefficient alpha (%)
1	Quality of life	20	74
2	General health	28	72
3	Question items on men's knowledge about prostate cancer	12	72
4	Question items on men's attitudes toward prostate cancer	10	71
5	Perceived self-efficacy	10	75
6	Perceived social support	14	78
7	Predisposing factors	6	72

The total reliability was measured to be 78%

a weekly basis increased the subjects' knowledge and made a change in subjects' attitude of the experimental group. The study by McCree-Hale R and colleagues showed that the responses to questions on prostate cancer were significantly much more accurate than those before training. In addition, the subjects' knowledge about the risk factors, the symptoms, and prostate cancer screening had increased after they received training [70]. Mazlumi and his colleagues showed that the theory-based training led to an increase in health knowledge and beliefs about prostate cancer in men over 40 years in Yazd after the teaching intervention [71]. The results of other studies based on the PRECEDE model are equally consistent with the results of this study [72–75]. In the PRECEDE model, priority is given to such predisposing factors as knowledge and attitude considered to serve as motivating factors for behavior. In the present study, an increase in subjects' knowledge and a positive change in their attitude facilitated the adoption of screening behaviors for prostate cancer. The findings showed that before carrying out the study, the subjects' perceived self-efficacy or self-confidence was low, but there seems to be a significant increase in the experimental group 6 months after the intervention. Perceived self-efficacy, as a powerful source of motivation, is defined as people's confidence in their capabilities in how they approach goals, tasks, and challenges [76]. The researches show that people with high sense of self-efficacy are more committed to do their tasks while confronting challenges and problems and spend more time and effort in doing the activity [76]. It is more likely that these people cooperate to sustain and retrieve healthy behavior even after they fail. These people are more decisive and empowered, so it will not only lead them to set their goals, but also it will cause them to achieve and pursue the goals. Kenerson [38], Alidust [77], Consedine [78], Kessler [79], and Keshavarz [80] have referred to the role of self-efficacy in the treatment of cancer screening behaviors.

The results of studies conducted by Tavassoli [81], Ghofranipour [82], Luo [83], Tehrani [84], and Khani Jeihooni [85] are consistent with these of the present study. The mean score for perceived social support (reinforcing factors) before the intervention was at a low level; however, it significantly increased in the experimental group after the intervention, but it remained constant in the control group. Regarding the relationship between self-management behaviors and reinforcing factors, it can be said that the higher the levels of social protection, the better the self-care behaviors will be. Chen suggests that social support gives rise to the

Table 2 Demographic data

Variables		Experimental group		Control group		P value
		Number	Percentage	Number	Percentage	
Education level	Elementary school	12	8	18	12	0.315
	Guidance school	56	37.34	50	33.33	
	High school	64	42.66	71	47.33	
	University	18	12	11	7.34	
Job	Working	95	63.33	92	61.33	0.428
	Non-working	55	36.67	58	38.67	
Marital status	Single	8	5.33	6	4	0.115
	Married	142	94.67	144	96	
Number of children	3 children	96	64	91	60.67	0.613
	More than 3 children	54	36	59	39.33	
Tobacco use	Smoker	26	17.33	24	16	0.532
	Non-smoker	124	67	126	84	

Table 3 Comparison of mean scores of knowledge, attitude, enabling factors, perceived social support, quality of life, general health, self-efficacy, and screening behaviors of the subjects before and 6 months after intervention in the experimental and control groups

Variables	Groups	Before intervention	After intervention	*t*-pair test
Knowledge	Experimental	37.31 ± 8.34	65.27 ± 7.93	0.001
	Control	35.25 ± 7.84	36.24 ± 7.79	0.07
	Independent *t* test	0.215	0.001	
Attitude	Experimental	30.2 ± 4.25	59.25 ± 6.24	0.001
	Control	31.45 ± 3.89	32.35 ± 3.29	0.135
	Independent *t* test	0.514	0.001	
Enabling factors	Experimental	28.34 ± 2.25	69.34 ± 5.43	0.001
	Control	27.90 ± 2.64	29.21 ± 2.21	0.08
	Independent *t* test	0.412	0.001	
Perceived social support	Experimental	30.75 ± 9.06	61 ± 10.55	0.001
	Control	31.02 ± 9.66	32.78 ± 9.76	0.311
	Independent *t* test	0.712	0.001	
Quality of life	Experimental	51.15 ± 4.12	71.29 ± 6.36	0.001
	Control	50.18 ± 5.36	52.34 ± 5.20	0.284
	Independent *t* test	0.06	0.284	
Perceived self-efficacy	Experimental	29.15 ± 4.12	69.25 ± 5.32	0.001
	Control	30.26 ± 4.08	32.15 ± 4.11	0.601
	Independent *t* test	0.213	0.001	
General health	Experimental	4.23 ± 4.16	2.12 ± 4.16	0.001
	Control	4.01 ± 4.33	3 ± 3.84	0.361
	Independent *t* test	0.09	0.001	
Screening behaviors	Experimental	21.35 ± 4.22	80.16 ± 4.36	0.001
	Control	20.94 ± 4.30	21.56 ± 4.69	0.721
	Independent *t* test	0.543	0.001	

promotion of self-care behavior, and it affects the participation and self-care behavior through social interaction. Therefore, running multiple treatments from the very early stages of the disease, including educational programs like telephone counseling, participating in social activities, exercise therapy, group therapy, and teaching coping skills with patients to prevent avoidance behaviors during activities related to self-management behaviors, would lead to the betterment of behaviors and thereby improving the patient's health condition. Doctors and health workers are considered to be the most effective factors in determining an individual's lifestyle [86]. In the studies by Woods [66] and Helper [87], physicians and the staff of centers for health care and treatment, and in the study by Randy [88], family and friends were regarded as sources of information and support, respectively. Holding training sessions for physicians and health care staff, involving family members as social supporters, as well as involvement and cooperation of laboratories in doing screening tests and presenting material in the form of group discussion and creation of cooperative groups and friends can make an increase in the score of social support (booster) in the experimental groups.

In a cross-sectional study by Jeihooni, the mean score of enabling factors for prostate cancer screening behaviors was at a low level [40]. In Kenerson's study [38], the cost of undergoing screening test, the time, and access to a doctor, and in Parker PA's study [67], insurance coverage were considered as enabling factors in prostate cancer screening behaviors. Didarloo in his study stated that lack of adoption of prostate cancer-preventive behaviors can be looked for in people's lack of awareness about the time, the place, and the way diagnostic tests were performed as well as having such false beliefs as they felt no sense of urgency to visit the doctor, since they thought they were symptoms free, and they felt some diagnostic tests seemed to be disgraceful to them [89]. Providing the subjects with teaching booklets; establishing communication and holding follow-up sessions after the training sessions; availability of the doctors and holding meetings for the doctors, health staff, and one of the subjects' family member; having access to screening tests; and coordinating with the laboratory to do the tests led to an increase in the men's ability to undergo prostate cancer screening test. The findings of the study by Nadrian H. et al. suggested that enabling factors were seen to be the most powerful predictor of skin cancer-preventive behaviors among the students of Tehran [90]. These findings are consistent with those of Khani Jeihooni [91], Kashfi [92], and Husseini [93]. Based on the results of this study, betterment in general health condition and quality

of life of the subjects in the experimental group were observed 6 months after teaching intervention compared to before the intervention. In chronic diseases like prostate cancer, the subjects' quality of life and their severe weakness in the area of health perception that can be traced in their view to the health condition is very considerable [94]. The subjects' concerns about the chronicity of the disease have probably a negative impact on their health perception [94]. In Jeihooni's study, the scores for quality of life and general health condition were at a desirable level [40], but in the study by Fallahi, the scores for the subjects' quality of life were relatively undesirable [68]. In the present study, the use of recommendations and experiences of the prostatic cancer patients about serious complications of prostate cancer to direct the subjects' attention toward the severity and exacerbation of the complications, loss of mental and physical health condition, and reduced quality of life led the subjects to be seriously watchful about taking care of themselves and an increase in the score for their general health condition and quality of life after teaching intervention. In addition, supporters such as doctors, health staff, and the subjects' family members significantly contributed to a promotion in subjects' general health condition and quality of life. Acquiring wrong habits like alcohol consumption, using a hookah to smoke tobacco, lack of control over the body mass, and not going hiking was noted as risk factors for prostate cancer in Hosseini et al.'s study [95]. In the study by Bynum and his colleagues on prostate cancer, the benefits of preventive behaviors were known as life-saving factors. The findings of Ghodsbin et al. showed the importance and benefits of undergoing prostate cancer screening on the promotion of the people's general health condition [96, 97]. In Whaley's study, lack of access to health care, low socioeconomic status, and painful diagnostic test were mentioned as barriers in taking preventive measures against prostate cancer [98]. Hansson and his colleagues also found that there was an association between the use of certain self-care strategies and subjects' improved quality of life and health promotion [99].

Before the intervention, the subjects of the study had poor performance in prostate cancer screening behaviors, but 6 months after the intervention, a significant increase was observed in the score of prostate screening behavior of the experimental group. The studies by Nnodimele [100], Randy A Jones [88], Daniel Jlee [101], Rezaeian [102], and Jeihooni [40] showed that the subjects had poor performance on prostate cancer screening behaviors. Increased screening behavior score in the experimental group is indicative of the impact of knowledge, attitudes, self-efficacy, and protective and enabling factors on the performance of the people. Given that behavior is a complex phenomenon and programs ignoring the supporting and enabling factors are focusing on improving the health information instead, they do not often succeed in changing the people's behavior. In the present study, the subjects in the experimental group expressed that they paid much more attention to preventive measures like getting exercise, having a proper diet and checkups especially prostate cancer screening tests, and controlling proper weight after the intervention. A large percentage of subjects underwent prostate cancer screening test and with coordination of the laboratory, the test responses were given to them. The study by Mazlumi showed that better taking preventive measures against prostate cancer was achieved through increased knowledge of the subjects aged over 40 years [71]. George Meader's study showed that the health education program based on the PRECEDE model directed the men's more attention to their own health condition [103]. Zare's study showed that theory-based health education program resulted in the promotion of prostate cancer screening in retired men in Shiraz in 2013 [104]. The results of this study are consistent with other studies [77, 105–108].

Conclusion

Given that prostate cancer is a significant health problem in men, it seems vital to properly plan and implement the teaching interventions focusing on desirable behaviors in order to prevent and undergo screening tests. In this regard, making use of health behavior change models like the PRECEDE model can be helpful in needs analyses, appropriate educational designs, and evaluation. The results of this study showed that health education based on the PRECEDE model increased the scores for knowledge, attitude, self-efficacy, enabling factors, general health condition, quality of life, and supporting factors, and eventually contributed to the promotion of prostate cancer screening behaviors. In order to promote the prostate cancer screening behaviors, comprehensive participation of citizens is necessary. Effective steps toward promoting life quality and prostate cancer screening behaviors can be taken through the involvement of the family in designing and holding teaching programs, publication of related books and pamphlets, and taking advantage of educational media, especially radio and television, as well as organizing and holding training sessions for doctors and health and treatment experts. Among the points of strength of this study are providing a group at risk with community-based teaching intervention, as well as a relatively large number of subjects. However, the self-report questionnaires can be considered as a point of weakness.

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