Evidence Based Care Journal
http://ebcj.mums.ac.ir/

Investigating the Relationship between Components of Pender's Health Promotion Model and Self-care Behaviors among Patients with Smear-positive Pulmonary Tuberculosis

Masoud Zare, Zakieh Asadi, Mohammad Vahedian Shahroodi , Hamidreza Bahrami-Taghanaki

The online version of this article can be found at
http://ebcj.mums.ac.ir/article_7983.html

Evidence Based Care Journal 201۷ 06:۰7 originally published online 01 January 2017
DOI: 10.22038/ebcj.2016.7983

Online ISSN: 2008-370X

Address: Mashhad Nursing and Midwifery School, Ebn-e-Sina St., Mashhad, Iran
P.O.Box: 9137913199
Tel.: (098 51) 38591511-294
Fax: (098 51) 38539775
Email: EBCJ@mums.ac.ir

Evidence Based Care Journal

Original Article

OPEN ACCESS JOURNALS

Investigating the Relationship between Components of Pender's Health Promotion Model and Self-care Behaviors among Patients with Smear-positive Pulmonary Tuberculosis

Masoud Zare[1], Zakieh Asadi[2*], Mohammad Vahedian Shahroodi[3], Hamidreza Bahrami-Taghanaki[4]

Received: 19/۰۹/2016
Accepted: 11/12/2016

Evidence Based Care Journal, 6 (4): 7-۱۷

Abstract

Background: Tuberculosis is among the top ten causes of mortality across the world and is highly prevalent in Mashhad, Khorasan Razavi, Iran. The adoption of healthy behaviors by patients can prevent the transmission of this disease to other individuals. The Health Promotion Model is one of the models used in the field of behavior change in this regard.

Aim: The aim of the present study was to investigate the relationship between the components of Pender's Health Promotion Model and self-care behaviors among the smear-positive pulmonary tuberculosis patients in Mashhad.

Method: This correlational study was conducted on 144 smear-positive pulmonary tuberculosis patients, selected from 45 healthcare centers of Mashhad in 2015 using purposive sampling method. The research instruments included Self-Care Behavior Questionnaire, Components of Pender's Health Promotion Model, and Behavior Observation Checklist. The data were analyzed using Spearman's rank-order correlation coefficient through the SPSS software version 16.

Results: According to the results of the study, the mean age of the patients was 51.9±21.1 years. The results also showed that the mean of self-care total score was equal to 63.7±7.3. Additionally, the Spearman's rank-order correlation indicated that self-care behavior was significantly correlated with prior related behavior (P=0.006), perceived barriers (P<0.001), self-efficacy (P<0.001), related affect (P<0.001), interpersonal and situational influences (P<0.001), and competing preferences (P=0.008).

Implications for Practice: As the findings of the present study indicated, there was a significant relationship between the self-care behaviors and self-efficacy, perceived barriers, and interpersonal influences in smear-positive tuberculosis patients. Regarding this, considering these strategies in the health promotion model could be of utmost importance in designing effective interventions for the improvement of self-care behaviors among these patients.

Keywords: Behavior, Health promotion, Self-care, Smear-positive pulmonary tuberculosis

1. Instructor of Nursing, Department of Community Health Nursing, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
2. MSc Student of Nursing Education, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran
3. Assistant Professor, Department of Health Education and Health Promotion, School of Health, Management & Social Determinants of Health Research Center, Mashhad University of Medical Sciences, Mashhad, Iran.
4. Assistant Professor, Department of Chinese and complementary Medicine, Faculty of Persian and Complementary Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

* Corresponding author, Email: asadiz911@mums.ac.ir

Introduction

Tuberculosis (TB) is considered as a chronic bacterial disease caused by *Mycobacterium tuberculosis* and to a lesser extent by *Mycobacterium bovis* and *Mycobacterium* africanum. This disease appears in two forms including pulmonary and extra-pulmonary, the former of which is more prevalent (85%) (1). This disease is one of the top ten causes of decease worldwide. Accordingly, in 2015, 10.4 million people were infected by TB, 1.8 million of whom died because of this disease. More than 95% of the mortality rate associated with TB occurs in low- and middle-income countries. Moreover, in 2015, about one million children were diagnosed with TB and about 170,000 of them died.

TB is the leading killer of the individuals inflicted with HIV-positive. In 2015, 35% of deaths in HIV-infected individuals were due to TB. Nevertheless, the average incidence of TB has decreased since 2000 by 1.5% per year. Therefore, there is a need to accelerate the reduction rate by 4-5% annually in order to reach the milestone of "end-TB strategy" in 2020 (2). Iran ranks seventeenth globally in this regard, which has infection and incidence rates of 17.9% and 26%, per 100,000 people, respectively. Khorasan Razavi province also holds the third place in Iran (most cases reported in Mashhad). The main factors increasing TB in Khorasan Razavi are the vicinity of this province to Afghanistan, the embodiment of large number of Afghan refugees (in Mashhad), and the commutes between the two countries (3).

The policy adopted by the World Health Organization (WHO) is to cut the prevalence and mortality rates of TB reported within 1990-2015 by half, and then uproot this disease (i.e., incidence rate of less than one per one million people) till 2050 (4). To this aim, the WHO embarked on the Directly Observed Treatment, Short-course (DOTS) program (4). Although the implementation of this program has lowered the TB mortality rate, this disease is still the cause of many deceases that are preventable (5).

The transmission of TB via inhalation increases the epidemic risk of this disease. Therefore, obtaining knowledge about its modes of transmission along with adopting healthy behaviors can prevent the transmission of this disease to others (6). It should be noted that about 50% of the TB patients do not continue their treatments seriously; they cut their medications as soon as they feel better, or they do not come to take their medications and even immigrate to other cities (6, 7). Patient adherence to prescriptions is considered as one of the challenges of nursing profession, which is especially important in TB due to its contagious nature. It should be noted that compliance with the treatments and self-care behaviors are similarly affected by the mutual effects of systemic, personal, and social forces (8).

In the literature, self-care has been listed as a factor improving health status in individuals and families (9). Self-care can also refer to the adoption of healthy lifestyle to help prevent diseases and injuries, which can have a significant role in reducing the use of health services (10). According to the definition presented by Orems, self-care is an acquired self-regulation function in humans, which is based on a person's ability to perform self-care procedures on their own (11).

In a study conducted by Shams (2004), 58% of the patients had low levels of knowledge on how to take care of themselves (12). In another investigation carried out by Haj Amiri (2001), 43% and 18% of the participants had low and high levels of knowledge about pulmonary TB, respectively. Furthermore, the adherence to medication regimen was found to be at good, moderate, and poor levels in 62%, 47%, and 11% of the patients, respectively (13).

In a study conducted by Phuong Hoa (2003), a large proportion of the people having a cough for more than three weeks had limited levels of knowledge about the cause, modes of transmission, symptoms, and treatment of TB. In the mentioned study, it was shown that high levels of knowledge were significantly correlated with following the instructions of the healthcare providers or hospital personnel (14).

The correction of wrong behaviors and promotion of self-care in smear-positive pulmonary TB patients require changing the attitudes and behavioral practices among these patients. As a result, various theories and models have been developed including the Pender's Health Promotion Model (HPM) in order to change the non-healthy behaviors and promote health status (15).

Pender defined health not merely as the absence of disease, but as a self-growth toward being healthier. In his view, health-promoting behaviors are operationalized in the form of activities that are based on individuals' lifestyles (16). Self-care plays an undeniable role in managing diseases and increasing health status. The Pender's HPM was developed in 1987 as a framework to describe the health behaviors focusing on people progress towards obtaining a positive state and improved health.

This model highlights the importance of cognitive processes in controlling behaviors (17). The HPM has been recognized as a framework for explaining the health-promoting lifestyle behaviors since 1996. It is also a guide to explore the complex biological-psychological processes that motivate the people to improve their health behaviors and account for decision-making behaviors in this regard (18).
The Pender's model consists of three groups of concepts including individual characteristics and experiences, behavior-specific cognitions and affect, and immediate behaviors. The components of the given model entail: 1) personal factors, 2) perceived benefits, 3) perceived barriers, 4) self-efficacy, 5) prior related behavior, 6) interpersonal influences, 7) situational influences, 8) behavior-related affect, 9) commitment to a plan of action, and 10) immediate competing demands and preferences (19, 20).
This model has been employed in more than 40 studies predicting health-promoting behaviors in different areas. The reason for the emphasis on the use of Pender's HPM components is the comprehensiveness and applicability of this model in recognizing factors determining behaviors. The predictive and explanatory components of healthy behaviors in Pender's model are perceived benefits of action, perceived barriers to action, perceived self-efficacy, behavior-related affect, commitment to action, interpersonal influences, and situational influences (21). The power of the Pender's theory rests in his definition of health that does not limit the nurses or other healthcare team members to interventions, which are oriented towards reducing the risk of diseases (22).
Given the problems caused by TB for these patients such as high costs of treatment, emotional conflicts, Family dysfunction, as well as disabilities, regaining health and promoting optimum health are of utmost importance for these patients (23). Little studies have been conducted particularly in Iran using Pender's model; moreover, to the extent of the researchers' knowledge, no studies have been conducted on TB patients using this model. Regarding this, the aim of this study was to investigate the relationship between the components of Pender's HPM and self-care behaviors in patients with smear-positive pulmonary TB in Mashhad, Iran in 2015.

Methods

This correlational study was conducted on 144 patients suffering from smear-positive pulmonary TB managed with DOTS program administered in the healthcare centers of Mashhad in 2015.
The research instruments consisted of a demographic characteristics form, Self-Care Behavior Questionnaire, Components of Pender's Health Promotion Model, and Behavior Observation Checklist.
The Self-Care Behavior Questionnaire enquired the dimensions of self-care behaviors including knowledge and attitude, which contain 28 (total score of 6-40) and 6 items (total score of 0-6), respectively. Furthermore, 16 items were related to the self-care behaviors. This part of questionnaire was adopted from a study carried out by Jadgal et al. (24), which showed a Cronbach's alpha coefficient of 0.75.
The other questionnaire was associated with the Pender's HPM components including ten dimensions. The first section of this questionnaire entailed the personal factors including 13 items, which were integrated with demographic form, and then examined. The other parts were rated on a three-point Likert scale including prior related behaviors (10 items), interpersonal influences (9 items), situational influences (7 items; always=1, sometimes=0, never=0), perceived benefits (7 items), perceived barriers (8 items), self-efficacy (7 items), and behavior-related affect (5 items; agree=1, neutral=0, disagree=0). Commitment to a plan of action (7 items) was also based on a two-point Likert-type scale (yes=1, no=0) with a total score ranged from 0-7. Immediate competing demands and preferences as a component was comprised of 6 items and scored in a reverse order (always=1, sometimes=2, never=3) with a score range of 6-18. Obtaining higher scores in this questionnaire indicated higher levels of perceiving self-care behaviors.
The checklist was similarly developed in accordance with the questionnaire dimensions and completed through patient interview, observations of patients' behaviors, and recording the frequency of patient's referral to healthcare centers (obtained based on their medical records), and treatment procedures (including regular use of medications or referrals to physicians or scheduled medical tests). This checklist is comprised of 13 items with a score range of 0-1, in which the minimum and maximum scores were 0 and 13, respectively.

The face and content validities of Self-Care Behavior Questionnaire, Components of Pender's Health Promotion Model, and Behavior Observation Checklist were calculated through their submission to seven faculty members of Mashhad University of Medical Sciences. Following the inclusion of the suggestions and revisions, the final research instrument was developed.

Additionally, the reliability of the Self-Care Behavior Questionnaire was measured as it included multiple different dimensions (four dimensions). To this end, 21 patients were evaluated in one session in terms of their self-care behavior scores. Subsequently, the reliability of each dimension as well as the total reliability of the research instrument were calculated, rendering Cronbach's alpha coefficients of 0.36-0.91 and 0.89 for the four sub-scales and total score of self-care behaviors, respectively.

Moreover, the internal consistency of the part extracted from the study of Jadgal et al. (2014) was re-evaluated after the implementation of minor changes in some phrases and statements suggested by the professors and experts in this field (24). The reliability of Pender's HPM model was also calculated using Cronbach's alpha coefficient for each component and the whole model, which was equal to 0.70.

The items related to the model components were likewise adopted from several studies including those of Mehri et al. (2008), Vahedian et al. (2013), and Bahmanpour et al. (2011). In the study of Mehri et al., the validity and reliability of the given questionnaire were approved by a panel of experts (N=30, α=0.81-0.65) (25). Vahedian et al. reported the alpha range of 0.75-0.93 for different components of the questionnaire (26). In the study conducted by Bahmanpour et al., after the assessment and confirmation of the validity of the questionnaire, minor changes were implemented in terms of some phrases and statements via consultation with professors and experts in this field, and then the internal consistency was re-evaluated (27).

In the present study, all codes of ethics approved by the Vice-Chancellor's Office for Research at Mashhad University of Medical Sciences were observed, including obtaining the participants' informed written consents, ensuring the confidentiality of data, and publishing the results in a general form.

The selection of the study population was performed using a purposive sampling method. To this end, sampling was administered in all the healthcare centers located in Mashhad, wherein TB patients were admitted. As a result, the research context of the current study corresponded to a group of 45 healthcare centers including: Imamat center, Najafi center, Nejati center, Lashgar Town center from Healthcare Center No. I, Golshahr center, Bafti center, Amir-al-Moemenin center affiliated with Healthcare Center No. II, Adviehchi center, Ghaem center, Motahari center, Imam Reza center from Healthcare Center No. III, Buildings 1 and 3, Torogh center, and Seyyedi center affiliated with Healthcare Center No. V.

The sample size was estimated using "determination of minimum sample size in correlational studies". Due to the lack of similar investigations in the literature, a pilot study was conducted so that the Components of Pender's HPM and the Self-Care Behavior Questionnaire were administered on 10 TB patients. Subsequently, the correlation coefficient between these two variables was calculated, which rendered the coefficients of 0.26, 0.39, 0.35, and 0.40 for the four investigated dimensions. Accordingly, the sample size was estimated by 115 individuals using the formula for the 0.26 correlation coefficient.

After obtaining the approval of the Ethics Committee and taking formal introduction and permission letters from the School of Nursing and Midwifery authorities and the Vice-Chancellor's Office for Health, respectively, the researchers referred to five healthcare centers (including Healthcare Centers I, II, III, IV, and Samen). Subsequently, they extracted the personal profiles of TB patients from the records in the affiliated healthcare centers, including telephone number and personal information of the eligible patients (i.e., those with smear-positive pulmonary TB receiving treatment in healthcare centers for more than one month with over 15 years of age and having no specific mental and physical illnesses affecting their abilities to complete the questionnaires).

The study participants were invited through phone calls and SMS in groups of 8-10 members to attend to the healthcare centers in which they received treatment or the meeting halls of one of the five healthcare centers on a certain day. The call sessions were held two days a week on Sundays and Wednesdays during 12 consecutive weeks within January, February, and March in 2015.

After explaining the objectives of the study and obtaining the written informed consents from the patients participating in the call sessions, the participants received the demographic form and the two questionnaires. They were asked to complete the research tools provided that they had sufficient

literacy. The questionnaires administered on the illiterate participants were completed by the research assistant and via oral interviews.

Subsequently, the Behavior Observation Checklists were completed for the given patients through interviews and observations. To this aim, the participants were asked to show how they covered their nose and mouth while sneezing and coughing or questions like 'Did you have a tissue or a mask?' Additionally, other items of the checklist were completed through studying the patients' medical records and their performance including regular medication use as well as the schedule of doctor visits and medical tests.

Then, the patients' questions about pulmonary TB were responded and these individuals were provided with educational pamphlets. In the end, the patients were invited to the reception. Data collection procedure was carried out during January, February, and March of 2015. The patients who had not attended on the appointed day were invited to participate in the study a week later through a second call. It was tried to set the call days on the same day the patients typically referred to the healthcare centers to receive medical treatments (including medications or tests).

Upon the completion of sampling and data collection, the data were entered into a computer set. After ensuring the accuracy of data entry, the data analysis was performed using descriptive and inferential statistics through SPSS software version 16. The descriptive statistics indices (i.e., frequency, mean, and standard deviation) were employed to summarize the dispersion of the data. Furthermore, Kolmogorov-Smirnov and Shapiro-Wilk tests were used to check the normality of distribution in the quantitative variables. Since all the scores of the HPM components were normally distributed, the Spearman's rank-order correlation was employed.

Results

According to the results of the study, the mean age of the participants was 51.9±21.19 years. The results also demonstrated that 66 cases (45.8%) were male. Furthermore, whereas 53 individuals (36.8%) had reading and writing literacy and primary education, 12 patients (8.3%) had an academic degree. Considering the employment status of the participants, the majority of the patients were housewives (n=57, 39.6%) and studentship (n=6; 4.2%) had the lowest frequency. In terms of the marital status, married and divorced patients had the highest (90 cases; 62.5%) and lowest frequency rates (8 cases; 5.6%), respectively. Moreover, 15.3% (n=22) and 16.7% (n=24) of the participants were single and widowed, respectively (Table 1).

The rating was performed by dividing the patients' scores of the self-care behavior dimensions into three groups of poor, moderate, and good levels. Accordingly, 43.7% (n=62) and 39.4% (n=56) of the participants obtained good and moderate knowledge scores, respectively. Considering the attitude scores, 59% (n=85) and 32.7% (n=47) of the patients had good and moderate attitude levels,

Table 1. Distribution of absolute and relative frequency of the patients' demographic characteristics

	Variables	Frequency (%)
Gender	Male	66 (45.8)
	Female	78 (54.2)
Marital status	Married	90 (62.5)
	Single	22 (15.3)
	Divorced	8 (5.6)
	Widowed	24 (16.6)
Level of education	Illiterate	38 (26.4)
	Primary education	53 (36.8)
	Secondary high school	16 (11.1)
	Diploma	25 (17.4)
	Academic degree	12 (8.3)
Employment	Student	6 (8.3)
	Employed	7 (4.9)
	Self-employed	25 (17.4)
	Housewife	57 (39.5)
	Unemployed	25 (17.3)
	Worker	9 (6.3)
	Retired	15 (10.4)

respectively. In terms of the scores of the Behavior Observation Checklist, 43.1%, 31.2%, and 13.7% of the patients were at moderate, good, and poor levels, respectively. In total, the majority of the participants (45.3%, n=63) had a moderate level of self-care behavior. Furthermore, 41% and 13.7% of the patients were at good and poor levels in this regard, respectively (Table 2).

Table 2. Absolute and relative frequency of patients' scores in self-care behavior dimensions

Variables	Standard deviation±mean	Poor level (%)	Moderate level (%)	Good level (%)
Knowledge	31.1±6.5	24 (16.9)	56 (39.4)	62 (43.7)
Attitude	4.7±1.2	12 (8.3)	47 (32.7)	85 (59)
Self-care behavior	17.8±2.4	26 (18.4)	74 (52.5)	41 (29.1)
Total score for self-care	53.7±7.3	19 (13.7)	63 (45.3)	57 (41)
Behavior Observation Checklist	10.0±2.2	37 (25.7)	62 (43.1)	45 (31.2)

As illustrated in Table 3, the results of Spearman's rank-order correlation coefficient showed no correlation between the self-care behavior total score (i.e., the sum of scores obtained from the dimensions of knowledge, attitude, behavior, and self-care as well as the scores associated with Behavior Observation Checklist) and the component of perceived benefits and commitment to a plan of action.

However, there was a correlation between the level of total self-care behavior and the components of prior related behavior (P<0.001), perceived barriers (P<0.001), self-efficacy (P<0.001), behavior-related affect (P<0.001), interpersonal influences (P<0.001), situational influences (P<0.001), immediate competing demands and preferences (P<0.001), and Pender's HPM (P<0.001).

The results also demonstrated a strong and direct correlation between the total score of self-care behavior and Pender's HPM. In other words, increased amount of total self-care behavior in individuals could lead to higher scores of HPM. Likewise, the results of the Spearman's rank-order correlation coefficient suggested that the given correlation was statistically significant (P<0.001).

Table 3. Correlation between the components of Pender's Health Promotion Model and self-care behavior scores

Variables	Total self-care	Spearman's rank-order correlation coefficient
Personal factors	P=0.59	r=0.046
Prior related behavior	P=0.006	r=0.23
Perceived benefits	P=0.33	r=0.082
Perceived barriers	P<0.001	r=0.40
Self-efficacy	P<0.001	r=0.50
Behavior-related affect	P<0.001	r=0.32
Interpersonal influences	P<0.001	r=0.46
Situational influences	P<0.001	r=0.30
Commitment to a plan of action	P=0.35	r=0.07
Immediate competing demands and preferences	P=0.008	r=0.23
Pender's HPM	P<0.001	r=0.40

Discussion

Unlike the past decades, it has become clear that behavior can be affected by several factors. Therefore, one of the most important tasks of healthcare service providers is to identify such factors in order to change and modify the inappropriate behaviors. To this end, the purpose of the present study was to investigate the self-care behaviors in patients inflicted with pulmonary TB using the Pender's HPM.

In the studies carried out by Heidari (2011) (28) and Jadgal et al. (2012) (24), the majority of the participants were female, and housekeeping had the highest frequency. Knowledge is considered as one of the main components in establishing a behavior; however, it has become obvious that knowledge might not have the ability to form or modify the behavior without the accompaniment of other factors. Obtaining moderate scores for total self-care behavior and good levels of knowledge and attitude in smear-positive TB patients may be due to the successful implementation of the DOTS program by healthcare centers in which the patient's treatment procedure is followed with direct and continuous supervision until it ends.

Jahani et al. (2010) investigated the relationship of quality of adherence to prescriptions with levels of knowledge and attitude among the TB patients in Ahwaz, Iran. They demonstrated that the majority of the patients (71.25%) had good levels of knowledge, and 62% of them had a positive attitude towards treatment. Moreover, compliance with medication instructions had a significant relationship with knowledge and attitude levels. The findings of the mentioned study revealed that similar investigations and interventions could contribute to TB treatment at the level of society, which would lead to the reduction of the detrimental physical, psychological, familial, social, and economic effects of TB (29).

In the present study, no correlation was observed between the scores of personal factors and self-care behaviors, which is consistent with the findings of the Chenary et al. (2013) (30). However, the findings of this study were not in line with the results of a study by Vahedian et al. (2013) that investigated the physical activities among employed adults and reported that personal factors had a significant predictive power (26). Similarly, our findings are inconsistent with the results of a study conducted by Wilson (1986), which investigated the self-care behaviors and glycemic control in non-insulin dependent diabetic patients (type II) and demonstrated that 25% of self-care behaviors could be explained by demographic and psychological variables (31).

The findings of this study also indicated a correlation between the scores of self-care behavior and prior related behavior, which were in agreement with the findings of Vahedian, showing the significantly predictive power of physical activities in working adults (26). Consistent with the present study, Rahimi et al. (2012) revealed that prior related behavior could predict 69% of changes in breakfast consumption in schoolgirls. In the given study, the researchers concluded that the strategy of considering prior related behaviors in terms of breakfast intake among the schoolgirls could be helpful in designing effective interventions aiming to increase such an intake in students (32).

In addition, the findings of the present study indicated no correlation between the scores of self-care behaviors and perceived benefits. Accordingly, the patients had low levels of perception in terms of the benefits of health-promoting behaviors. These findings were consistent with those of the studies carried out by Khodaveisi (2016) and Kerman Saravi that investigated the nutritional behaviors of overweight women (21) and the use of the HPM to improve the health behaviors of workers (20), respectively.

However, the results obtained in a study conducted by Chenary et al. (2013) indicated that perceived benefits had a direct and positive impact on health-promoting behaviors in chemically disabled veterans (30). Similarly, Karimi el al. (2012) found a significant difference between the mean scores of perceived benefits of the HPM in the case and control groups in terms of the physical activities before and after educational interventions (33). Mohammadi Zaidi et al. (2010) similarly concluded that perceived benefits could significantly predict the stages of changes in sport-related behaviors among students.

Similarly, the perceived health status had an indirect effect on the stages of changes through the status of perceived benefits (34). In this respect, the findings of the present study were not in line with those of Mohammadi Zaidi, Karimi, and Chenary et al. However, most of the participants in this study enjoyed good levels of knowledge and attitude. It should be noted that although having knowledge about the benefits and importance of changes in behavior is essential, it does not suffice by itself.

Therefore, it seems that the differences in perceived benefits could be related to cultural, socioeconomic, familial, and personal factors, which can intervene in terms of changes in health-promoting behaviors. The predicted barriers, which was among the strongest predictors of pursuing health-promoting behaviors, could also affect the intention to perform and implement behaviors.

The investigation of the relationship between the HPM components and self-care behaviors in pulmonary TB patients demonstrated a significant correlation between the self-care behaviors and such components as perceived barriers, behavior-related affect, interpersonal influences, situational influences, self-efficacy, immediate competing demands and preferences, as well as self-care behavior.

The identification and reduction of the perceived barriers to health-promoting behaviors would contribute to the improvement of the patient care quality and facilitate the planning for educational services in order to change behaviors (21). Since the behaviors with a positive affect are likely to be repeated, and those with negative consequences are usually less duplicated, the component of

behavior-related affect in this study was a good predictor for the occurrence of healthy self-care behaviors in patients (35).

Consistent with the findings of Khodaveisi (21), there was a correlation between self-care behaviors and self-efficacy. This was also in line with the findings of a study carried out by Yeni and Pender, which reported the perceived self-efficacy as one of the most important predictors of physical activities in Taiwanese adolescents (36). Mohammadian et al. also concluded that the HPM components and health-promoting lifestyle were significantly correlated with the quality of life in adolescent girls, and the component of self-efficacy was the strongest predictor of quality of life (18).

Self-efficacy is a belief in an individual's ability to overcome challenges, which is also considered as one of the predictive factors in self-management. This concept is also characterized as the main goal in terms of behavior change interventions in the field of health with its own specific focus. High levels of self-efficacy not only leads an individual to adopt and maintain healthy behaviors, but also reduces psychological complaints and provides better compliance with difficult situations (37).

The influence of the attitudes of the immediate family and criteria to perform a task by certain individuals can be employed in this respect to investigate changes in individuals' behaviors. In this study, family members and healthcare employees significantly affected and encouraged the patients towards appropriate behaviors through interpersonal influences.

In the current study, no correlation was observed between the scores of self-care behavior and the component of commitment to a plan of action. This finding was not in line with the results of a study conducted by Bahamanpour (2011) showing a significant and positive correlation between health behaviors and the components of the HPM. In total, the model components could predict 42.2% of the variance in oral health behaviors among the students living in Marivan, Iran. It should be noted that commitment to a plan of action was the strongest predictor among the given factors (27).

Nevertheless, the results of the present study were not in consonance with the findings of Mehri et al. (2009) demonstrating that commitment to a plan of action had a direct effect on oral health behaviors among the students of Islamic Azad University. They also concluded that the situational influences could indirectly predict health behaviors through commitment to a plan of action (25). Such an inconsistency could be due to the implementation of DOTS program in which TB patients were under the direct supervision of healthcare providers wherein all stages of patient treatment were controlled and tracked. It should be noted that one of the limitations of this study was the lack of access to all patients due to their old age, hospitalization, and even the imprisonment of some individuals.

Implications for Practice

According to the findings of the present study, the smear-positive pulmonary TB patients enjoyed good levels of knowledge and attitude towards their disease. Similarly, these patients had moderate levels of self-care behaviors. These findings show the successful implementation of the DOTS program by healthcare centers in which the patient treatment was tracked with direct and continuous supervision until final stages. Given that this infectious disease is contagious and lethal, the healthcare authorities are required to plan and implement related interventions in order to promote the self-care behaviors among these patients.

The findings of this study revealed a relationship between the self-care behaviors in smear-positive pulmonary TB patients and the Pender's HPM. One of the strengths of the HPM was the consideration of prior related behaviors, which are effective in the development of new ones. In this respect, prior behaviors and acquired characteristics could affect beliefs, feelings, and also the lawfulness of performing health-promoting behaviors; however, other theories have paid less attention to these components. As a whole, the results of the present study showed that interventions designed to improve the self-care behaviors in smear-positive TB patients should focus on strategies increasing self-efficacy and reducing perceived barriers and also address interpersonal influences. Furthermore, considering the prior related behaviors, competing demands and preferences along with adherence to treatment regimen can be helpful in terms of designing effective interventions. Consequently, it is recommended to conduct further studies to investigate the Pender's HPM among patients with TB and other contagious diseases.

Acknowledgments

Hereby, we express our gratitude to the staff of the Office for control Diseases affiliated with the Health Department in Khorasan Razavi as well as other healthcare centers in Mashhad for their

collaboration in the present study. It should be also noted that this study was extracted from the findings of a Master's thesis (code number: 931786) approved by the Faculty of Nursing and Midwifery at Mashhad University of Medical Sciences.

Conflict of interest

The authors declare that there is no conflict of interest.

References

1. Harries AD, Maher D, Graham S. TB/HIV: a clinical manual. Geneva: World Health Organization; 2004.
2. World Health Organization. Global tuberculosis report 2016. Geneva: World Health Organization; 2016.
3. Shahinzadh A, Elahi A, Jahani S, Hakim A. Relationship of personal-social and therapeutic factors with medication compliance in TB patients in Ahwaz. J Shahid Sadoughi Univ Med Sci. 2012;19(6):726-35 (Persian).
4. WHO-Stop TB. Partnership. The stop TB strategy: TB strategy: building and enhancing DOTS to meet the TB related millennium development goals. Geneva: World Health Organization; 2006.
5. Harries A, Masher D, Graham S. TB/HIV a clinical manual. Geneva: World Health Organization; 2004.
6. Niknami SH, Taheri Aziz M, Mohraz M. Effectiveness of designed health education package on healthy behaviors of patients with tuberculosis at Pasteur Institute of Iran. Zanjan Univ Med Sci J. 2009;17(66):13-20 (Persian).
7. Miller B, Snider Jr DE. Physician noncompliance with tuberculosis preventive measures. Am Rev Respirat Dis. 1987;135(1):1-2.
8. Erabi A, Changiz T, Darani A, Javadi A, Soleimani B. Quality of patient adherence in tuberculosis and its relationship with some factors. Isfahan J Nurs Midwifery. 1998;10(3):4-9 (Persian).
9. Repetti RL, Taylor SE, Seeman TE. Risky families: family social environments and the mental and physical health of offspring. Psychol Bull. 2002;128(2):330-6.
10. Wellness Councils of America. Self-care managing your healthcare and living well. New York: CDC & NCHC; 2003.
11. Dehghannayeri N, Salehi T. Nursing management principles. 1st ed. Tehran: Boshra Publication; 2004. P. 74 (Persian).
12. Shams S. Study of educational needs in Tuberculosis patients and their family and self-care in Uremia. J Uremia Nurs Midwifery Facul. 2004;2(2):55-62 (Persian).
13. Hajamiri P, Monjamed Z, Tabari F, Bahrani N. Assessment of TB patients, relation between their knowledge of disease and therapeutic regimers in TB/Control center, Tehran, 1998. J Hayat. 2001;6(2):31-40 (Persian).
14. Hoa NP, Thorson AE, Long NH, Diwan VK. Knowledge of tuberculosis and associated health-seeking behavior among rural Vietnamese adults with a cough for at least three weeks. Scand J Public Health Suppl. 2003;62:59-65.
15. hKeating XD, Guan J, Pinero JC, Bridges DM. A meta-analysis of college students' physical activity behaviors. J Am Coll Health. 2005;54(2):116-25.
16. Corbin CB, Lindsey R, Welk G. Concepts of physical fitness: active lifestyles for wellness. 4th ed. Boston: McGraw-Hill; 2003.
17. Pender NJ, Barkauskas V, Hayman L, Rice VH, Anderson ET. Health promotion and disease prevention: toward excellence in nursing practice and education. Nurs Outlook. 1992;40(3):106-12.
18. Mohamadian H, Eftekhar Ardebili H, Rahimi Foroushani A, Taghdisi MH, Shojaiezade D. Evaluation of Pender's health promotion model for predicting

adolescent girls' quality of life. J Sch Public Health Instit Public Health Res. 2011;8(4):1-3 (Persian).
19. Taymoori P, Niknami S, Berry T, Ghofranipour F, Kazemnejad A. Application of the health promotion model to predict stages of exercise behavior in Iranian adolescents. East Mediterr Health J. 2009;15(5):1215-25 (Persian).
20. Kermansaravi F, Rakhahani F, Shahrokhipour M. Applying pender's educational model in promotion of health behavior of workers. J Guilan Univ Med Sci. 2006;15(58):54-60 (Persian).
21. Khodaveisi M, Omidi A, Farokhi S, Soltanian AR. Dietary behavior status and its predictors based on the penders health promotion model constructs among overweight women referred to Fatemieh hospital clinics in Hamedan, 2014. J Nurs Educ. 2016;5(2):31-9 (Persian).
22. Radmehr M, Ashktorab T, Neisi L. Effectiveness of educational programs based on Pender's theory on the health and symptoms in patients with obsessive-compulsive disorder. Life Sci J. 2012;9(4):2174-80 (Persian).
23. Wood D, Valdez R, Hayashi T, Shen A. Homeless and housed families in Los Angeles: a study comparing demographic, economic, and family function characteristics. Am J Public Health. 1990;80(9):1049-52.
24. Jadgal Kh ZI, Alizadeh-Siuki H, Izadirad H. The impact of educational intervention based on health belief model on promoting self-care behaviors in patients with smear-positive pulmonary TB. Iran J Health Educ Health Promot. 2014;2(2):143-52 (Persian).
25. Mehri A, Morowatisharifabad M. Utilizing the health promotion model to predict oral health behaviors in the students of Islamic Azad University of Sabzevar (2008). J Dental Med. 2009;22(1):81-7 (Persian).
26. Vahedian-Shahroodi M, Amin-Shokravi F, Haidarnia A, Jabbari Nooghabi H. A survey on the effects of the Pender's health promotion model on prediction of the employees' physical activity. Health Educ Health Promot. 2013;1(1):51-66 (Persian).
27. Bahmanpour K, Nori R, Nadrian H, Salehi B. Pender's Health promotion model structures on oral health in high school students in Marivan. J Public Health Instit Health Res. 2011;9(2):93-106 (Persian).
28. Heydari A, Ramezankhani A, Hatami H, Soori H. The effect of health belief model (HBM) based health education on promotion of self-care behaviors of patients with smear-positive pulmonary TB in Sistan Regionin 2011. J Zabol Univ Med Sci Health Serv. 2012;14(1):69-83 (Persian).
29. Jahani S, Elahi N, Shahinzade A, Hakim A, Latifi M. Related of knowledge and attitude with medication control of tuberculosis patients referring to Ahwaz anti TB center. Iran J Nurs Res. 2011;5(19):52-7 (Persian).
30. Chenary R, Noroozi A, Tahmasebi R. Effective factors of health promotion behaviors based on Health Promotion Model in chemical veterans of Ilam province in 2012-13. J Ilam Univ Med Sci. 2013;21(6):257-67 (Persian).
31. Wilson W, Ary DV, Biglan A, Glasgow RE, Toobert DJ, Campbell DR. Psychosocial predictors of self-care behaviors (compliance) and glycemic control in non-insulin-dependent diabetes mellitus. Diabetes Care. 1986;9(6):614-22.
32. Rahimi T, Dehdari T, Ariaeian N, Gohari M. Survey of breakfast consumption status and its predictors among Qom students based on the Pender`s health promotion model constructs. Iran J Nutr Sci Food Technol. 2012;7(2):75-84 (Persian).
33. Karimi M, Eshrati B. The effect of health promotion model-based training on promoting students' physical activity. J Kermanshah Univ Med Sci. 2012;16(3):192-200 (Persian).

34. Zeidi I, Ziaeiha M, Variani AS, Khalaj M, Zeidi B, Tonekaboni H. Predicting the stages of change in physical activity behavior of QUMS students with Pender's model. J Qazvin Univ Med Sci. 2010;14:58-66 (Persian).
35. Pender NJ, Murdaugh CL, Parsons MA. Health promotion in nursing practice. 3rd ed. London: Salud Publica, Enfermeria; 2011.
36. Wu TY, Pender N. Determinants of physical activity among Taiwanese adolescents: an application of the health promotion model. Res Nurs Health. 2002;25(1):25-36.
37. Mohebbi S, Azadbakht L, Feyzi A, Sharifirad G, Hozoori M. An assessment of the correlation between self-management nutritional and health promotion model constructs in women with metabolic syndrome, 2012. Qom Univ Med Sci J. 2013;7(5):42-52 (Persian).