

# Factors related to adopting healthy behaviors by patients with tuberculosis in Isfahan: Application of health belief model

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## ABSTRACT

**Introduction:** Tuberculosis is an infectious disease caused by *Mycobacterium Tuberculosis* complex. It is one of the most common infectious diseases largely resulting from the patient's lifestyle. The purpose of the present study is to investigate factors related with adopting health behaviors by patients with tuberculosis based on the health belief model. **Materials and Methods:** The present cross-sectional study was performed on 196 patients with tuberculosis. Data was collected using a 47-item, self-designed, questionnaire. Cronbach's alpha was calculated as 73.9. The Pearson test was used to study the correlation between independent variables and adopting a healthy behavior. **Results:** The mean score for adopting healthy behaviors by patients was  $87.52 \pm 13.8$ . The Pearson correlation test indicated a statistically significant relation between adopting healthy behaviors and scores of knowledge ( $P < 0.001$ ,  $r = 0.536$ ), perceived susceptibility ( $P < 0.001$ ,  $r = 0.36$ ), perceived benefits ( $P < 0.001$ ,  $r = 0.347$ ), and perceived barriers ( $P = 0.046$ ,  $r = 0.143$ ). **Conclusion:** Direct relationship was found between adopting a healthy behavior and scores of knowledge, perceived susceptibility, and perceived benefit. Although the results of this study can be the basis of educational interventions, any generalizations should be performed cautiously.

**Key words:** Healthy behavior, health belief model, tuberculosis patients

## INTRODUCTION

Tuberculosis is a chronic infectious disease which is still a global health problem. In humans it is caused by the *Mycobacterium Tuberculosis* complex and in most cases

is caused by *Mycobacterium Tuberculosis*.<sup>[1,2]</sup> Tuberculosis attacks the lungs, and in one-third of the cases, other organs of the body are involved.<sup>[3]</sup> Approximately one-third of the population of the world is infected with *Mycobacterium Tuberculosis*.<sup>[4]</sup> Tuberculosis is the leading cause of mortality in the world, with two million death reports in developing countries.<sup>[5,6]</sup> The geographical location of Iran and its neighborhood, with some countries having a high prevalence of tuberculosis, require our considerable attention to this disease.<sup>[7]</sup> Epidemiological data, in 2010, showed that about 13.7 million people in the world were infected with tuberculosis, of whom more than 80% belonged to 22 developing countries. Each year, about 1.8 million people die of tuberculosis.<sup>[8,9]</sup> The above-mentioned report stated that the number of people infected with tuberculosis in 2009, in Iran, was 10099. Tuberculosis is the deadliest infectious disease among women of reproductive age. As most affected women in the reproductive age are almost always young, the highest number of orphans resulting

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from a disease is associated with tuberculosis. Tuberculosis, more than any other disease, leads to loss of income and disruption of family.<sup>[10]</sup> In terms of frequency of the global burden of disease and the rank among diseases, tuberculosis ranks 10, and it is predicted that in 2020, it will reach rank 7 of the global burden of disease, based on Disability Adjusted Life Years (DALY). This occurs when most of the infectious diseases decrease to lower ranks in this frequency and priority.<sup>[9,11]</sup> The increase of acquired immune deficiency syndrome (AIDS) and tuberculosis, resistant to treatment, has increased the occurrence of tuberculosis disease in recent years, in different countries. Due to this fact, in 1993, tuberculosis was introduced by the World Health Organization (WHO) as a global emergency disease.<sup>[12]</sup> Directly Observed Treatment Short-course (DOTS) is the strategy recommended by the WHO for controlling tuberculosis.<sup>[13]</sup> Although this strategy reduces the mortality rate of tuberculosis, this disease is the reason for deaths that can be prevented.<sup>[14]</sup> Successful performance of DOTS in fighting against tuberculosis requires the collaboration of all sections giving health-clinical services including clinical health networks, hospitals, university centers, and private physicians.<sup>[15]</sup> The lack of compliance in using drugs by patients is one of the problems and its investigation in some diseases such as tuberculosis is of great importance, due to its contagious nature.<sup>[16]</sup> Tuberculosis can be treated, but as it requires long treatment despite other infectious diseases, completion of the treatment period by the patient is of great importance.<sup>[17]</sup> The studies showed that the behavior condition of tuberculosis patients is one of the most important factors in controlling tuberculosis. For example, Taqizadeh *et al.*, in their study on the status and attitude of patients with pulmonary tuberculosis to treatment, susceptibility, and perceived benefits, in a group that did not follow the treatment were low.<sup>[18]</sup> In a study conducted by Rahbar *et al.*, in the Taleqani Hospital of Orumieh city, it was defined that diet was directly associated with the education level, self-confidence, living in the city, and receiving previous education.<sup>[17]</sup> The study conducted by Janakan *et al.* on smear-positive patients, in Sri Lanka, indicated that susceptibility and benefit scores in the group that did not observe the treatment, were low.<sup>[19]</sup> Generally, the researches, including Jahani *et al.*, Pishkar *et al.*, and Clark *et al.*, emphasized on the relationship between an individual attitude to treatment and adherence to treatment.<sup>[20-22]</sup>

Behavior change is a complex process.<sup>[23]</sup> As human behavior is a reflection of different factors, recognizing this causative network is important to influence the effective factors of behavior; for many years, behavior specialists have been pursuing it. Thus, true identification of the factors related to tuberculosis, based on the theory, can be useful in improving the conditions for treatment of patients with tuberculosis. Various approaches and theories are considered to investigate this phenomenon and one of these approaches is the health belief model. This model is one of the social psychological

models that are used to understand health behavior. The health belief model is the first behavior change model and is accepted widely in empirical applications.<sup>[24]</sup>

## MATERIALS AND METHODS

The present cross-sectional study was performed on 196 patients with pulmonary tuberculosis in Isfahan, for a period of six months. Data was collected using a 47-item and nine-section, self-designed questionnaire, which included personal data, knowledge (six items) (e.g. drug use duration in patients with tuberculosis), perceived susceptibility (four items) (e.g., Family members of patients with tuberculosis are susceptible to the disease), perceived severity (five items) (e.g. in case of lack of a good treatment, tuberculosis can kill a person), perceived benefits (six items) (e.g. Free drugs in clinical centers), perceived barriers (four items) (e.g., yellow color of the eyes due to drug use), self-efficacy (four items) (e.g. assurance by the patient of doing experiments in the second, fourth, and sixth month), guidance of action (three items) (e.g. Getting information from health staff), and functional questions (nine items) (e.g., using drugs regularly). Scoring in knowledge questions were marked thus: In case of a correct response, they got one point, and in case of incorrect answers a zero was given to them. Responding to perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and guidance for action questions, which were in multi-choice form, was by some choices, such as, completely agree (score 3), agree (score 2), disagree (score 1), and strongly disagree (zero score). The subjects would select one of the choices that was close to their personal idea. The score that the patients received for perceived susceptibility, perceived barriers, and self-efficacy questions was between 0 and 12. The received score of perceived severity was (0-15), perceived benefits (0-18), and guidance for actions questions score (0-9). Responding function questions were Yes (score 1) and No (score 0) and the received score for this part was (0-9). The reliability of the questionnaire in a 30-person sample was 73.9, with Cronbach's alpha of 62.7 for guidance of action and 80.4 for perceived benefit structure. For easy comparison, the structure scores were calculated out of 100. After data collection, the data were entered in an SPSS 18 software and were analyzed by statistical tests.

## RESULTS

In this study, 196 patients with pulmonary tuberculosis, under the supervision of the Clinical Health Centers of Isfahan, were investigated. The patients were with an age average of 52.23 (SD of 23.62), 48% of the patients were women and 52% of the patients were men; 19.9% of the patients were under the supervision of the clinical rural centers of Isfahan province and 80.1% of the patients were under the supervision of the clinical urban centers of the Isfahan province [Table 1].

The findings of Table 1 show that 11.75% of the Iranian patients are under the supervision of health-clinical centers of the village and 51.55% are under the supervision of health-clinical centers of the city. Among Afghani people, 11.75% were under the supervision of the health-clinical center of the village and 8.15% were under the supervision of the urban clinical-health centers.

The average score received by the patients of the health belief model variables is shown in Table 2.

As shown in Table 2, the outcome variable in the current study is adopting a healthy behavior, and perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and guidance for action are predictive variables to take behavior.

The results of the Pearson test in Table 3 show that there is a significant association between all variables of the health belief model, except perceived severity and guidance for action,

**Table 1: Frequency distribution of patients with pulmonary tuberculosis based on nationality and clinical center under the supervision of Isfahan province**

| Clinical center | Iranian |       | Afghani |       | Total  |      |
|-----------------|---------|-------|---------|-------|--------|------|
|                 | Number  | %     | Number  | %     | Number | %    |
| Rural           | 23      | 11.75 | 16      | 8.15  | 39     | 19.9 |
| Urban           | 101     | 51.55 | 56      | 28.55 | 157    | 80.1 |
| Total           | 124     | 63.3  | 72      | 36.7  | 196    | 100  |

**Table 2: Average and standard deviation scores of patients with pulmonary tuberculosis based on predictive and outcome variables-Isfahan province**

| Variables                | Score average | Standard deviation |
|--------------------------|---------------|--------------------|
| <b>Predictor</b>         |               |                    |
| Knowledge                | 76.20         | 20.3               |
| Perceived susceptibility | 70.36         | 20.4               |
| Perceived severity       | 72.51         | 18.1               |
| <b>Outcome</b>           |               |                    |
| Perceived benefits       | 91.72         | 12.1               |
| Perceived barriers       | 50.97         | 21.5               |
| Self-efficacy            | 92.17         | 13.1               |
| Guidance for action      | 46.25         | 17.8               |
| Healthy behavior         | 87.52         | 13.8               |

**Table 3: Correlation scores between predictor variables and considering healthy behavior**

| Predictor variables      | Healthy behavior |         |
|--------------------------|------------------|---------|
|                          | R                | P value |
| Knowledge                | 0.536            | <0.001  |
| Perceived susceptibility | 0.36             | <0.001  |
| Perceived severity       | -0.008           | 0.917   |
| Perceived benefits       | 0.347            | <0.001  |
| Perceived barriers       | -0.143           | 0.046   |
| Self-efficacy            | 0.363            | <0.001  |
| Guidance for action      | 0.126            | 0.078   |

with adopting healthy behaviors. The results of the analysis show that the highest direct relation between knowledge and adopting healthy behaviors, with the correlation coefficient of 0.536, and the lowest relation, is between the perceived benefits and adopting healthy behaviors with a correlation coefficient of 0.347.

## DISCUSSION

The problems in tuberculosis management are protecting patients during the treatment cycle and completion of the treatment period. Negative outcomes of not adhering to the treatment are extensive. Thus, recognizing the factors related to the treatment-adherence behavior of the patients is an important issue in the reduction of some outcomes, such as, drug resistance and reduction of re-treatment costs.

The purpose of the current study was to determine the factors related to adopting healthy behaviors by tuberculosis patients, based on the health belief model (healthy behavior in this study is patient adherence to treatment for a period of six months). It is with reference to the knowledge of the patient to tuberculosis and illness treatment, and according to the current study findings, the average and standard deviation of the score of the patients' knowledge was  $76.20 \pm 20.3$ . In the current study, most of the patients had a low knowledge of the disease symptoms. Also, the results of the study showed that there was a significant difference between the knowledge score that patients attained and healthy behavior ( $r = 0.536$ ,  $P < 0.001$ ), and the above results were expected. Niknami *et al.* stated that the patients' education and their knowledge of the nature of disease and tuberculosis treatment increased their understanding and intake of their treatment diet.<sup>[15]</sup> The study conducted by Tornee *et al.*, in Bangkok, proved the results of the current study; in their study, there was a significant association between knowledge and screening test, as healthy behavior in tuberculosis patients was less than 1/1000.<sup>[25]</sup> Also, another study that was carried out by Jankan *et al.*, in Sri Lanka, found a direct significant association between knowledge and treatment adherence in the patients.<sup>[19]</sup> In a study conducted by Clark *et al.*, in Turkey, and in the study conducted by Jahani *et al.*, in Ahvaz city, the patients with a better knowledge or adequate education about the disease and treatment, showed better adherence.<sup>[20,21]</sup> However, the study conducted by Mweemba *et al.*, did not show any significant association between knowledge and treatment adherence.<sup>[26]</sup>

Perceived susceptibility is a structure that is called mental perception of the patient, with regard to the danger that is caused in case of not completing the six-month treatment. The average and standard deviation of the received score of the patients was  $74.36 \pm 20.4$ , which had direct correlation with the adopting healthy behavior outcome, at a level less than 1/1000, which was in line with the results of Tornee *et al.*'s study.<sup>[25]</sup> However, the study of Jankan *et al.*, in Sri Lanka, did not show a significant association between the perceived susceptibility and healthy behavior (19). Also, the

study conducted by Taqizadeh *et al.*, was not in line with the results of our study.<sup>[18]</sup> The perceived severity variable included some feelings that were about considering the seriousness of the outcomes in case of not completing the treatment by the patient, which included evaluation of the medical and clinical outcomes. The mean and standard deviation of the perceived severity was  $72.51 \pm 81$ . The results of the test did not report a significant association between the perceived severity score and healthy behavior ( $r = -0.008$ ). The result was not in line with the assumptions of the study.

Probably it was due to the immediate outcome of the treatment that the patients felt better and the symptoms were reduced considerably after a short time of treatment. The results of the other studies were not in line with the results of the current study. As per the study conducted by Taqizadeh *et al.*, it reported the above-mentioned relationship as being significant.<sup>[18]</sup> Also, the studies carried out by Tornee *et al.* and Jankan *et al.* reported an association between the perceived severity variable and adopting healthy behavior.<sup>[19,25]</sup> The observed differences in the results of the studies could be due to the type of study (that is based on cross-section results) and the data collection method.

The exact determination of the prediction of perceived severity of objective behavior requires long-term studies. The perceived benefits variable refers to the reality that human beings are inclined to carry out behaviors that have the maximum benefits for them. In the current study, the mentioned benefits are mostly emphasizing on receiving free drugs and experiments, and the mean and standard deviation of the score of patients of perceived benefits variable was  $91.72 \pm 12.1$ . Correlation analysis results showed that there was a significant association between the perceived benefits of the patients and adopting healthy behaviors ( $r = 0.347$ ,  $P < 0.001$ ) and the above-mentioned results were in line with the results of Taqizadeh *et al.* studies.<sup>[18]</sup> Also, Jankan *et al.* and Tornee *et al.* reported similar results.<sup>[19,25]</sup> The study of McDonnell *et al.* found the usefulness of the treatment with adherence to the drug diet.<sup>[27]</sup> The above-mentioned studies introduced that a good relationship of the health staff with the patients and easy access to good clinical facilities helps to improve the treatment adherence level.<sup>[19,25,27]</sup> In these behaviors, if no condition is provided, there is no barrier for the behavior, despite the shortage of facilities; a person is less inclined to use the behavior. In the current study, the barriers of treatment adherence were evaluated by perceived barriers, questions and mostly drug side effects and long treatment duration were mentioned, and the studied sample achieved a mean and standard deviation score of  $50.97 \pm 21.5$  for perceived barriers, and the results showed that there was a reverse relationship between the perceived barriers variable and adopting healthy behaviors ( $r = -0.143$ ,  $P = 0.046$ ). The studies conducted by Tornee *et al.* proved the result of the study.<sup>[23]</sup> However, Taqizadeh *et al.* reported different results.<sup>[18]</sup> The studies of Jankan *et al.*, did not state a significant relationship between the perceived barriers and healthy behavior.<sup>[19]</sup> The probable reason for this contradiction with

the results of the research can be heterogeneity of the research population, such that, in our study the investigated samples were urban and rural patients. In the study conducted by Taqizadeh *et al.*, only urban patients were investigated. In the study of Jankan *et al.*, the cultural and social differences were effective on a different perception of patients' barriers.

Guidance for action were factors that prepared for active behavior change. In the current study, the mean and standard deviation for guidance of action of the patients was  $46.25 \pm 17.8$  and did not have significant relationship with healthy behavior ( $r = 0.126$ ,  $P = 0.078$ ). Other studies were in line with our study. The study of Tornee *et al.* did not report this relationship.<sup>[19]</sup>

The general result of the current study, based on the health belief model, showed that attitude factors could determine the healthy behavior of the patients well, such that, by increasing the positive attitude, healthy behaviors in patients showed positive changes and this result was expected. The study conducted by Jahani *et al.* reported a significant relationship between patients' attitude and adherence to orders quality.<sup>[21]</sup> The results of the studies by Mweemba *et al.* and Clark *et al.* showed similar results.<sup>[24,26]</sup> The study conducted by Pishkar *et al.* reported that the relationship between the attitude of patients and compliance was significant. Patients who observed many things in using the drugs and eliminating mucus had the highest performance, they also had high attitude scores.<sup>[22]</sup> The structures related to healthy behaviors were highly associated with knowledge, perceived susceptibility, and perceived benefits. The perceived barrier structure was inversely related to healthy behavior, and perceived severity structures and guidance for action were not related to healthy behavior.

### Recommendations

The results are related to the investigating sample and generalizing these results to other populations requires conducting other studies. The current study can be the basis of future educational interventions. This study has taken into consideration self-efficacy as a variable determining healthy behavior, which is not considered in other similar studies. In this study, to evaluate healthy behavior, self-reporting was used. Thus, the limitations of such a method should be considered. One of the proposed methods for the reduction of self-report limitations is a long-term study, which allows the observation of the outcome behavior possible for the researcher.

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