



## The effect of health belief model-based training on preventing major thalassemia in thalassemia carrier couples

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### Abstract

Thalassemia is among the most common genetic diseases in humans that can largely be prevented if adequate levels of public knowledge are obtained. This study examines the efficiency of a health belief model-based training program on preventive behaviors of thalassemia carrier couples. This quasi-experimental study was conducted on 100 thalassemia carrier couples benefiting from the services of healthcare centers across Sistan region. Participants of the study were randomly selected and then divided into two groups, the intervention group and the negative control group. Data collection tool was a questionnaire designed based on the health belief model. Following the initial data collection, the educational intervention was carried out; within two months, data were collected once again and were then analyzed in SPSS-15. The educational content was designed based on the data collected during the first stage and then the training intervention was conducted in two sessions of 60 minutes each. After the training intervention, only the intervention group showed a significant increase in its mean scores for knowledge, behavior and all the constructs of the health belief model. Unlike the pre-intervention stage, after the training, a significant difference was observed between the two groups with regard to their thalassemia test results. This study demonstrated that a health education program designed based on the health belief model helps promote preventive behaviors for thalassemia.

**Keywords:** Education, Carrier, Thalassemia, Prevention, health belief model

### Introduction

Thalassemia is considered the most common genetic disorder in humans all across the world as well as in Iran and affects the globin chains differently in that they are either impaired or not produced at all. The incidence of this disease is a worldwide phenomenon; however, it is more prevalent in the Mediterranean region, the Middle East and Southeast Asia [1].

In Iran,  $\beta$ -thalassemia is more prevalent; an average of 4-8% people carries the thalassemia gene. At the present moment, the number of

people afflicted with thalassemia is about 20000 and the number of carriers around 2.5-3 million [2]. In Sistan and Baluchestan province, 8% of the populations are disease carriers; however, in Sistan region, the rate is 5.5% [3].

Major thalassemia is the most severe clinical form of the disease in which the symptoms appear in the shape of severe anemia; not administering the appropriate treatment measures and blood transfusion might cause the patient his life. Treating major thalassemia

is an extremely difficult and costly process; patients afflicted with this type of thalassemia's should keep receiving their treatments for life. These patients might also suffer from multiple problems, including cardiac diseases, liver diseases, diabetes, short stature, etc. The prevention of the disease, however, costs much less than its treatment and can be carried out with a few simple tests [4].

Studies show that people's knowledge about this disease is poor, and even those who have sufficient knowledge perform very poorly on its prevention [1,5,6].

Given the high prevalence of thalassemia in our country and its remarkable healthcare costs as well as the physical, mental-psychological and social consequences of the disease, it appears that the most reasonable approach to the problem is to prevent the birth of people who will be afflicted with major thalassemia altogether. This purpose will only be achieved when public knowledge, particularly among carrier couples, rises to such a level that people will proceed with the proper preventive behaviors [1]. Educational programs are therefore required for promoting people's knowledge and attitudes about preventing the disease.

The efficiency of educational programs depends on their effectiveness and this effectiveness itself depends on the selection and proper use of educational models. The health belief model used as the main frame work of this study is among the oldest theories to predict health behaviors. The individual's decision and motivation to adopt a health behavior depend on three distinct issues, namely, individual perception, moderating behaviors and the likelihood of pursuing that behavior. Individual perception comprises the factors affecting the perception of the disease or illness and the outcomes of a particular health behavior. The likelihood of pursuing an action explores the factors affecting the likelihood of adopting a proper behavior. Moderating factors, including demographic variables, perceived threat and practice guideline, develop their roles once individual perception is achieved. Self-efficacy

is a new concept derived from Bandura's social cognitive theory and is considered a key factor influenced by moderating variables. Bandura defines self-efficacy as "the individual's confidence in his ability for behaving in a way whereby the desired result is accomplished, or the belief in one's own ability for successfully performing a certain behavior in order to achieve the desired results" [7].

To date, common health education programs focusing on thalassemia have not been fully successful in achieving preset objectives, merely because, in addition to cousin marriages and cultural and ethnic barriers regarding thalassemia, these programs have had a general perspective on the issue and have not been able to introduce proper structures for the better success of the programs. Model-based educational programs have structures within themselves that predict the probability of their own success and predefine the kinds of interventions that can be more efficient. The present study takes advantage of a health belief model-based educational program and can therefore provide greater success for the prevention of thalassemia and the promotion of its preventive behaviors.

### **Method**

The statistical population of this quasi-experimental study consisted of every thalassemia carrier couple in Sistan region of Iran already married when the study begun. Using results of previous studies [8] and the sample size formula for "comparison of the means of two independent populations", and with a confidence level of 95% and a statistical power of 80%, and also taking into account a 20% loss, the sample size for each group was estimated to be 50 and a total of 100 Participants were then studied. Due to the low number of couples in a small city and their close relationships, samples were selected from two different cities with the highest similarity. First, one city was randomly selected as the case (Hirmand) and another city as the negative control (Zahak); next,

samples were selected from among thalassemia couples at a ratio of couples covered by each healthcare center to all couples covered by that city. Couples who did not want to have children or those who were infertile were excluded from the study. Entering the study was voluntary and participants could withdraw from the study at any time; details of the study were also explained to the participants prior to its beginning. Data collection tool was a multi-section questionnaire containing demographic information (5 questions) and questions pertaining to knowledge and practice (10 questions each). In addition, in order to measure the health belief model constructs including perceived susceptibility, severity, benefits and barriers as well as self-efficacy, five questions were designed for each. Three questions explored the practice guideline. In order to measure knowledge, a correct answer received a score of 2, an incorrect answer a score of zero, and lacks of knowledge a score of 1. In order to measure the health belief model dimensions, Likert's three-point attitude scale was used in the form of "agree, neutral and disagree". The constructs of perceived susceptibility, severity, benefits and barriers and also self-efficacy received a score of 3 for the most desirable state, a score of 1 for the worst state and a score of 2 for the "neutral" option. Overall scores for each individual were between 0 and 20 for the knowledge aspect, between 5 and 15 for the health belief model constructs, and between 10 and 20 for behavior. In the practice guideline construct, individuals' responses to all options were expressed as percentages. The questionnaire's validity and reliability were measured and evaluated using content validity and Cronbach's alpha test. The questionnaire's validity was confirmed by valid scientific resources and articles and by surveying research specialists and benefiting from their revisionary comments. The questionnaire's reliability was also measured by Cronbach's alpha, which confirmed a reliability of 78% for the knowledge construct, 76% for behavior, 72% for perceived susceptibility, 92% for perceived severity, 82% for perceived benefits,

81% for perceived barriers and 82% for self-efficacy. The questionnaire was completed within both groups prior to the beginning of the educational intervention. After collecting and analyzing the questionnaire data, the educational content was produced and edited in both Persian and Balochi languages in the form of an educational video using results of the initial questionnaire, review of literature around the topic, educational films edited by the Ministry of Health and also with the help of the Thalassemia Prevention Center of Zahedan. The case group was then exposed to the researcher's intervention, i.e. the health education program, so that, based on this model for promoting thalassemia preventive behaviors, they first feel at risk by the problem, i.e. becoming afflicted with major thalassemia (perceived susceptibility), then perceive the depth of the risk and the severity of its various complications (perceived severity), and believe the usefulness and applicability of their own behaviors (perceived benefits) based on the positive signals they receive from their external or internal environment (practice guideline), find the inhibiting factors of this practice less costly than its benefits (perceived barriers) and confide in their own ability to pursue thalassemia preventive behaviors so that they ultimately promote their thalassemia preventive behaviors. The educational program benefited from the group training method and incorporated showing a movie and holding a Q & A in two sessions of an hour each at the healthcare centers for the intervention group. At the beginning of each session, a brief introduction of thalassemia was delivered, an educational video was played for the couples and then the session ended with the Q & A. At the end of the training sessions, the couples received their own copy of the educational video so as to watch it again at home. Within two months of the educational program, data pertaining to knowledge, the health belief model dimensions and the research Participants' performance were collected using the same questionnaire. After extracting the data, they

were analyzed in SPSS-15 software using descriptive statistics and the independent t-test, the paired t-test and the correlation coefficient. The level of statistical significance was taken to be  $P < 0.05$ .

**Results**

The mean age of Participants was 28 years. There was a significant relation between the Participants' age and their mean knowledge

( $P = 0.04$ ); in fact, Participants below the age of 22 boasted a greater knowledge compared to others. Among participants, 39% were illiterate, 48% did not have a high school diploma and 13% had a high school diploma or higher education (Table 1). The ANOVA test revealed a significant relation between the mean score of knowledge in thalassemia couples at different levels of education ( $P = 0.001$ ); couples who had a high school

**Table 1** Frequency distribution of the study population according to age, education

Study group		Intervention		Control		Total	
Variable		F	%	F	%	F	%
Age	<22	14	28	4	8	18	18
	22-30	24	48	29	58	53	53
	>30	12	24	17	34	29	29
	Total	50	100	50	100	100	100
Education level	Illiterate	17	34	22	44	39	39
	Less than diploma	29	58	19	38	48	48
	Diploma and higher	4	8	9	18	13	13
	Total	50	100	50	100	100	100

diploma or higher education had greater knowledge. Findings showed the absence of any significant differences between the case group and the negative control group in terms of demographic variables.

Before the educational intervention, no significant differences existed between the intervention group and the negative control group with respect to their mean scores for the variables of knowledge, perceived susceptibility, severity, benefits and barriers and also self-efficacy and behavior; however, after the educational intervention, a significant difference was observed between the two groups in terms of all these variables ( $P < 0.001$ ). Given that the lower and upper limits are positive in all these variables, it can be argued that the mean scores for knowledge and all the health belief model constructs are higher in the intervention group compared to the control group (Table 2). The paired t-test indicated a significant difference between the mean scores of these variables in the intervention group pre and post intervention ( $P < 0.05$ ), and since the lower and upper limits are positive in all these variables, the mean scores for

knowledge and the health belief model constructs were higher in this group post-intervention compared to pre-intervention ( $P < 0.05$ ). Meanwhile in the negative control group, despite the slight changes in the mean scores of behavior and the model constructs, no significant difference was observed aside from the significant increase in their scores for knowledge ( $P = 0.42$ ).

Before the educational intervention, 23 out of 50 participants of the negative control group (46%) and 28 out of 50 participants of the experimental group (56%) underwent the first test of thalassemia; the difference between the two groups was not statistically significant based on the comparison of two independent populations test ( $P = 0.15$ ). Findings of the study showed that, after the educational intervention, 26 out of 50 participants of the negative control group (52%) and 44 out of 50 participants of the experimental group (88%) underwent the first test of thalassemia; based on the aforementioned comparison test, the difference between the two groups was statistically significant ( $P < 0.001$ ).

As the second test of thalassemia is performed



**Table 2** The mean and standard deviation of scores of health belief model constructs in the intervention group before and after intervention

		Before intervention		After intervention	
		Mean±SD)	Independent t-test	Mean±SD)	Independent t-test
Awareness	Intervention Control	13.06(±2.67) 12.84(±3.03)	P= 0.70	17.10(±1.98) 13.94(±2.82)	P<0.001
Perceived susceptibility	Intervention Control	11.88(±2.04) 12.90(±2.25)	P= 0.15	13.72(±1.24) 12.36(±1.83)	P<0.001
Perceived severity	Intervention Control	13.58(±2.25) 13.46(±2.19)	P= 0.77	14.76(±0.51) 12.9(±2.26)	P<0.001
Perceived benefits	Intervention Control	13.34(±1.89) 12.98(±2.19)	P= 0.38	14.24(±1.25) 12.44(±2.14)	P<0.001
Perceived barriers	Intervention Control	7.92(±2.89) 8.60(±2.91)	P= 0.24	6.74(±1.73) 8.90(±2.07)	P<0.001
Self-efficacy	Intervention Control	12.82(±2.43) 12.98(±2.88)	P= 0.76	13.82(±1.13) 12.26(±2.89)	P<0.001
Behavior	Intervention Control	12.46(±2.30) 11.28(±2.25)	P= 0.84	13.58(±2.14) 11.42(±1.95)	P<0.001

during pregnancy, some people did not qualify for undergoing it. Findings of the study showed that, before the educational intervention, 22 out of 45 qualified participants of the negative control group (48.8%) and 17 out of 28 qualified participants of the experimental group (60.7%) underwent the second test of thalassemia; the difference between the two groups was not statistically significant (P=0.16). Nevertheless, after the intervention, 25

out of 48 qualified participants of the negative control group (52%) and 23 out of 31 qualified participants of the experimental group (74.1%) underwent the second test of thalassemia; the difference between the two groups was statistically significant (P=0.02). Table 3 presents the relative frequency distribution of the practice guideline in the study Participants. Healthcare workers comprised the largest

**Table 3** Frequency distribution of Cues to Action in the study groups

		Before intervention		After intervention	
		F	%	F	%
Health worker	Intervention	34	68	42	84
	Control	42	84	40	80
Relatives	Intervention	6	12	4	8
	Control	4	8	6	12
Family	Intervention	7	14	4	8
	Control	0	0	1	2
Television	Intervention	3	6	0	0
	Control	4	8	3	6

source of information for the Participants. The correlation test showed that, post-intervention, a significant relation exists between

self-efficacy and performance of thalassemia carrier couples belonging to the experimental group (Table 4).

**Table 4** *HBM components correlated with the performance of the experimental group couple after the intervention*

Behavior	Awareness	Perceived susceptibility	Perceived severity	Perceived benefits	Perceived barriers	Self-efficacy
The correlation coefficient	0.11	0.15	0.02	0.21	0.22	0.45 **
p-value	0.43	0.28	0.85	0.12	0.12	0.001
N	50	50	50	50	50	50

\*\*Correlation is significant at the 0.01 level.

## Discussion

Results showed that the Participants' knowledge was moderate pre-intervention and most of them had proper information about the nature of the disease and its methods of transmission, but did not have much information about its methods of prevention ;a study conducted by Rafie zadeh and Arab also yielded similar results [5,9].After the educational intervention ,the mean score of knowledge in both groups increased significantly, with the increase in the negative control group possibly owing to refraining from the removal of common trainings of the health system. An increase in post-intervention levels of knowledge was also observed in other studies [10].

According to researchers, knowledge alone is not enough for adopting preventive behaviors, but the mindset and attitude toward the disease is a major factor in taking preventive measures [11]. In the present study, the mean score of behavior in the two groups did not differ pre-intervention; however, post-intervention, the score of behavior increased significantly in the intervention group while in the negative control group, despite the increase in levels of knowledge, the Participants' performance did not improve. A study regarding thalassemia conducted by Jafari and Sadaghiani on couples about to get married also showed that having proper knowledge of the disease alone does not lead to an increase in performance [6,12].These findings are of great importance and suggest that theory-based educational interventions built on changes of the model constructs are more efficient in developing behavioral changes. Findings of this study showed that the implementation of health education programs was effective in improving the knowledge and performance of subject's regarding thalassemia

preventive behaviors. These findings are consistent with findings of a study conducted Sharifirad et al on the topic of providing nutrition education to diabetics [13] and also another study conducted by Karimi et al on AIDS [14].

In the present study ,the score for perceived susceptibility increased significantly in the intervention group post-intervention, which is consistent with results of the study conducted by Karimi and Baghiani moghadam [14,15]; however ,in a study conducted by Sharifirad and Reiner on smoking cigarettes, no difference was observed, possibly due to the short period of intervention [16,17]. If a person is more susceptible toward a health issue, he will certainly make greater efforts toward adopting disease preventive and health behaviors [14].

In the present study, the score for perceived severity increased significantly in the intervention group post-intervention, unlike in the negative control group. This increase owes to the couples' participation in classes about thalassemia. Having knowledge of the severity of the disease and noting its complications and costs of treatment are significant factors contributing to the increase in scores of perceived severity. In the study conducted by Karimi et al, a direct relation existed between perceived severity and breast screening [18]. The study conducted by Lane on immigrants in Taiwan revealed a significant relation between perceived severity and perceived threat of AIDS and the decrease in risky behaviors [19].

The mean score of perceived benefits increased significantly in the intervention group post-intervention .Results of certain studies emphasize how an individual's

perceived benefit allow for his easier adopting of preventive behaviors [20]. A study led by Cyr et al investigating preventive behaviors of colorectal cancer showed that perceived benefits had played a major role in the group where participants had pursued that particular behavior [21]. A study conducted by Davation women residing in Yazd showed that perceived benefits have the highest correlation with the adopting of protective behaviors against sun rays [22]. The decrease in the mean score of perceived barriers suggests that, post-intervention, Participants have made an effort to remove the barriers that have hindered their pursuing of preventive behaviors and have managed to reduce certain factors inhibiting that behavior. Some studies show that perceived barriers contributes most powerfully to predicting health protective behaviors [23,24]. The self-efficacy theory was also applied to the present study. Self-efficacy is a precursor to pursuing a certain behavior; special attention should therefore be paid to increasing self-efficacy [25]. In the present study, the mean score of self-efficacy increased significantly post-intervention and a significant relation was also found to exist between self-efficacy and behavior. In a study conducted by Gulford, there was also a significant relation between the students' self-efficacy and their performing of breast self-examination [26], which is consistent with results of the present study. A study conducted by Sung also showed that programs designed to promote self-efficacy can greatly affect self-efficacy levels [27].

The present study revealed the role of health workers as the most important external practice guideline factor for promoting disease preventive behaviors ;results of a study conducted by Pirzadeh and Enjezab also confirmed this finding [28,29]. Furthermore, according to the present study, the spouse of an individual has the main role in accepting or rejecting abortion, which is indicative of the necessity of implementing training programs for both parents .Findings of the present study showed that health training programs designed based on the health belief model have a significant

effect on thalassemia preventive behaviors by promoting knowledge and positively affecting perceived benefits, barriers, susceptibility and severity. Limitations of the study included the small number of couples and their close relationships in the small city where they resided; therefore, the intervention group and the negative control group were each selected from two different cities. In addition, some of the qualified patients were not willing to participate in the study, which resulted in more time spent for selecting the samples.

### **Conclusion**

Results of this study showed that a health belief model-based training including participants' attitudes and beliefs can help promote thalassemia preventive behaviors .This educational program is mainly effective because efforts were made to detect its points of weakness through pre-intervention assessments, which then provided the basis for designing the educational content and strategies .Our study showed that self-efficacy is the most significant predictor construct of thalassemia preventive behaviors; therefore ,educational programs should be designed in ways that enhance couples' self-efficacy. Coherent educational programs based on the audience's need a real ways considered the most effective method for preventing any disease. Increasing knowledge, attitude and performance of thalassemia couples is clearly a priority that requires extensive planning and activism at the community level.

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### **Contributions**

Study design: RRK

Data collection and analysis: RRK, GHM, IZ, MSHP, MN

Manuscript preparation: RRK

### Conflict of interest

"The authors declare that they have no competing interests."

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