ORIGINAL ARTICLE

Effect of student's empowerment program on brucellosis prevention: an application of extended health belief model

K. KARIMYAN[1, 2], M. KHEZELI[3], A. LATIFI[4]
[1] Environmental Health Research Center, Kurdistan University of Medical Sciences, Sanandaj, Iran; [2] Environmental Health Engineering Department, Public Health School, Tehran University of Medical Sciences, Tehran, Iran; [3] Social Development and Health Promotion Research Center, Health Institute, Kermanshah University of Medical Sciences, Kermanshah, Iran; [4] Department of Public Health, Maragheh University of Medical Sciences, Maragheh, Iran

Keywords

Brucellosis • Health education • Health belief model • Self-efficacy • Rural community

Summary

Background. *To determine the effect of student's empowerment program using the extended health belief model on the brucellosis prevention in rural high school in Divandarreh, Kurdistan province, Iran.*
Materials and methods. *Quasi-experimental study with repeated measure (pre-test, post-test and at 2-month follow-up). In all 220 rural high school students were selected using a cluster sampling method. The data collection tool was a questionnaire based on the Health Belief Model (HBM). Five 1.5 hours sessions using lecture, group discussion, inquiry method, leaflet delivery, and the use of slides with Overhead projector and PowerPoints slide show, designed according to the Systematic Comprehensive Health Education and Promotion Model (SHEP), was presented for intervention group twice a week in schools. Data were analyzed by SPSS 18, using descriptive statistics as well as Chi-square, independent t-test and repeated measures at a significant level less than 0.05.*
Results. *The total mean age of participants was 14.6 ± 2.3. The intervention and control groups had no significant differences in terms of age, gender, and other demographic variables. There was no significant differences in the intervention and control groups before the intervention in terms of awareness, severity, benefits, barriers and self-efficacy. After educational program scores of awareness, severity, susceptibility, benefits, barriers and self-efficacy, and performance were higher in the intervention group compared to the control group.*
Conclusion. *Overall, implementation of the educational intervention based on theories and models had good effects on people that are in the risk of infection and zoonotic disease.*

Introduction

Brucellosis is a zoonotic disease in which a pathogen is transmitted to humans body through direct contact with infected animals, or indirectly through the consumption of contaminated animal products [1]. It affects both sexes in all age groups. Treatment of brucellosis may even last for several months, which is why it is considered as a chronic disease [2]. Brucellosis control programs have been implemented in most countries of the world, but due to animal resistance, consumption of non-pasteurized and domestic dairy, traditional livestock, no regular vaccination of livestock, and inadequate health education programs for livestock farmers disease remains in most countries and causes animal and human infection [1-4]. Hundreds of thousands of cases are reported annually in the Mediterranean countries of Europe, North and East Africa, the Middle East, North Asia, Central Asia and South America [4]. Attention to the economic burden of this disease is very important because of the long recovery of the disease in humans, the development of disability in humans, abortion in livestock, and the reduction of production and productivity in livestock [5]. Brucellosis can be considered as a potential bioterrorism agent due to its ability to develop and also its economic burden [6]. The disease has been eradicated in a few countries, but even there are still cases in those among the travelers to the countries in the disease is most common [7-9]. The spread of traditional animal husbandry, lack of efficient and appropriate veterinary systems, and the use of traditional foods especially dairy products, have caused the brucellosis to be one of the serious health risks in developing countries, especially Iran [5, 6]. Livestock trafficking has led to a rise in the trend of disease in recent years in the border provinces of Iran [10]. The first major factor in reducing and eliminating the disease is the control of disease in the livestock. In the absence of control of disease in livestock, the implementation of appropriate training programs by the health system can partly prevent the spread of disease in humans [3].
The effect of education depends on the proper use of the models and theories of behavioral science, so selecting a model for health education is the first step in the educational planning process [11]. Health Belief Model (HBM) is a model that can be used at the individual level to explain the health behaviors change [12]. This model treats behavior as a function of the individual's knowledge and attitudes and guides people towards health behaviors according to its structures HBM can raise the

perceived sensitivity and severity of individuals to brucellosis, and depending on the perceived barriers and benefits, guide the person to preventative behaviors. In other words, the Health Belief Model is a comprehensive model that is more effective in preventing disease and is based on motivating people to act on health behavior [13]. The Health Belief Model was established as a health behavioral model at the individual level in the United States in the early 1950s, and later was modified and expanded to improve its effectiveness [13, 14]. This model has been used by various experts in different domains of behavioral sciences to design and evaluate interventions for changing behavior. Based on this model, the preventive health behavior will be implemented by Based on this model, the preventive health behavior will be implemented by an individual depending on a number of factors [15]. These factors include perceived susceptibility: the perception and belief that a person is at risk of developing the brucellosis. Perceived severity: understanding and believing that brucellosis is a serious problem and can lead to serious complications or death. Perceived barriers: physical, psychological or financial barriers that prevent the person from behavior change. Perceived benefits: individual belief in adopting behavior or compliance with health recommendations that prevent or reduce the severity or Complications of brucellosis [12-15]. In addition to the correct use of theories and models, the impact of an educational program is related to selecting the appropriate target group. Due to their large population, their ability to train, and the capability to transfer information to other people such as family members, students are the target group of researchers for increasing the effectiveness of education and establishing appropriate health behaviors [16]. The present study therefore aimed to determine the effect of educational intervention among rural high school students in Divandarreh County, Iran, on brucellosis prevention, using the Extended Health Belief Model.

Method

This quasi-experimental study was conducted on 220 rural high school students in the Divandarreh County, Iran who were selected by cluster sampling method. Its need to notify that; education system in Iran is divided into two main levels: primary education and high-school education. All children spend six years of their lives at primary level from age's six to 12 and attend high school from ages 12 to 18. There are three section in Divandarreh (Central, Saral, and Karaftou). Four schools were randomly selected from each section and then all the third grade students from the first high school (ninth grade) entered the study. The study was held from February to July 2018. In each section, two schools were considered as a control group and two other schools were considered as intervention groups. The data collection tool was a questionnaire based on the Health Belief Model [17]. The reliability of the questionnaire was (Cronbach's alpha = 0.882) which were ranged about 0.762 to 0.948 for different parts of the questionnaire. The questionnaire contains; demographic awareness, perceived susceptibility, perceived barriers, perceived benefits, performance, subjective norm, normative beliefs, attitude about the behavioral outcome and seven questions about the attitude of behavioral changes. For scoring the responses, the five choices Likert scale (with strongly disagree as score of 1 and strongly agree as score of 5) was used [17].

In this study, the effect of educational intervention on the constructs of health belief model and behavior change was studied. In order to determine the effect of intervention, in both intervention and control groups, pretest was performed in equal conditions. The educational content used in this program includes introductions, overview, communicable diseases, zoonosis, general features of brucellosis, pathogens, symptoms, complications, prevention methods, and brief treatment, which are included in 'Prevention, Control and Treatment of the Brucellosis: A Guide to Trainer (the people's target group), a book adapted to the comprehensive health education and health promotion program of the Ministry of Health and Medical Education (MOH) of Iran. Educational intervention was conducted for all of students in the intervention group by two public health experts, with supervision of zoonotic diseases expert. Five sessions using lecture, group discussion, inquiry method, leaflet delivery, and the use of slides with Overhead projector and PowerPoints, designed according to the Systematic Comprehensive Health Education and Promotion Model (SHEP), approved by MOH of Iran, and conducted twice a week and every session for an hour and a half. The training program lasted a total of one month. Data were collected from the two groups before intervention, immediately after training, and two months after the intervention. Data were analyzed by SPSS 18 software and using descriptive statistics as well as Chi-square, independent t-test and repeated measures at a significant level less than 0.05. In this research, ethical issues were addressed. These included freedom and discretion to participate in research, confidentiality of information, and explanation of the steps and objectives of the program for the participants at the beginning of the research. Also, the informed consent form was obtained from all participants. Also, after completing the intervention and collecting the final questionnaire, training on brucellosis and distribution of educational materials in the control group were performed.

Results

In this study, In this study, the effect of education on brucellosis preventive behaviors, designed based on the Extended HBM, has been investigated among 220 rural high school students of Divandarreh, with112 and 108 students in the intervention and control groups, respectively. One hundred and twelve students were in the intervention group and 108 in the control group. The mean age of respondents in the intervention and control

groups were 14.3 ± 2.4 and 14.8 ± 2.3 years, respectively. Independent t-test showed no statistically significant difference between the ages of the groups. Chi-square test showed that there were no significant differences between study groups in terms of age, sex, number of family members, parental education, parent's job, livestock at home, history of brucellosis training, and history of brucellosis in family members (Tab. I).

For all constructs in the intervention group, there was a significant difference in the mean score obtained for the three time periods, such that there was a significant increase in all the structures immediately after the intervention compared to the before intervention. However, except for barriers, no statistically significant difference was observed between the mean score obtained immediately after the intervention and those obtained two months after the intervention (Tab. II). In the control group, the knowledge and behavior score increased significantly during the three time periods, but in other constructs, there was no significant difference in mean scores during the three periods (Tab. II). Results of comparison of the two groups before educational intervention, based on independent t-test, showed that they did not differ significantly in terms of knowledge, severity, benefits, barriers, and self-efficacy, but the mean scores for all structures in the intervention group were significantly higher than those of the control group immediately and two months after the intervention (Tab. II). Sources of information on brucellosis were distributed as follows: 68.0% through radio and television, 23.0% through health care personnel, 6.5% through relatives and friends, 5.0% through family members, 4.5% from books, 2.1% from the internet, 0.5% from magazines and newspapers, and 1.0% from other resources

Tab. I. Demographic characteristics, frequency distribution and statistical difference in the studied groups.

Variables	Control group	Intervention group	P-value
Gender			
Male	58 (53.7)	61 (54.4)	0.09
Female	50 (46.3)	51 (45.6)	
Mother's job			
Housewife	101 (93.5)	103 (92)	0.73
Employed	7 (6.5)	9 (8)	
Mother's education			
Illiterate	5 (4.6)	8 (7.1)	0.68
Elementary	39 (36.1)	44 (39.3)	
Guidance	47 (43.5)	42 (37.5)	
Diploma	13 (12)	13 (11.6)	
Academic	3 (3.8)	5 (4.5)	
Father's education			
Illiterate	3 (3.8)	5 (4.5)	0.93
Elementary	26 (24)	25 (22.3)	
Guidance	30 (27.8)	28 (25)	
Diploma	38 (35.2)	40 (35.7)	
Academic	11 (10.2)	14 (12.5)	
Father's job			
Livestock breeder	46 (42.7)	49 (43.7)	0.96
Farmer	26 (24)	25 (22.3)	
Employee	13 (12)	14 (12.5)	
Free job	23 (21.3)	24 (21.5)	
Keeping livestock			
Yes	73 (67.6)	81 (72.3)	0.53
No	35 (32.4)	31 (27.7)	
Education on brucellosis			
Yes	17 (15.7)	23 (20.3)	0.84
No	91 (84.3)	89 (79.77)	
History of brucellosis in subject or family members			
Yes	13 (12)	16 (14.3)	0.51
No	95 (88)	96 (85.7)	

Discussion

This study investigated the effect of educational interventions on prevention of brucellosis-related behaviors, based on health belief model education program. Results obtained revealed that the design and implementation of the program produced significant changes in levels of adoption of preventive behaviors related to brucellosis, which is consistent with previous studies [18-20]. Regarding the increase in awareness in the control group, it can be noted that there was no control over the information acquisition of individuals from other sources during the study. In this study, students obtained 45% of the maximum knowledge score before the intervention. In the similar study, the results indicated that knowledge of both groups before the intervention was low [18], but reported by another, the subjects had half of the knowledge score before the intervention [19]. This rate immediately after the intervention and two months later increased to 95% which is consistent with similar studies [20, 21]. Studies have shown that the success of disease prevention programs requires knowledge of the causative agent, transmission pathways, risk factors associated, levels of vulnerability of target populations, and early detection of the disease [22]. In this study, in the intervention group, the scores obtained for perceived susceptibility and perceived severity structures increased immediately and two months after intervention. Also, the high scores in the control group before and after the intervention indicate the sensitivity of the residents of the study area, which is consistent with similar studies [18, 19]. In this study, before intervention the score of the perceived benefits of preventive behaviors in both intervention and control groups was 8.4 and 9.3, respectively. After implementing the educational interventions, the score of perceived benefits in the intervention group increased significantly. These findings are akin to results of some previous studies [19, 20, 23]. The score of perceived barriers in the intervention group

Tab. II. Comparison of the mean changes in the score of knowledge and constructs of the health belief model at defined intervals of intervention in the study groups.

Variable	Intervention time intervals	Intervention group (n = 112)	Control group (n = 108)	RM ANNOVA
		Mean ± SD	Mean ± SD	
Awareness	Before	21.2 ± 4.2	20.4 ± 4.11	P < 0.001
	Immediately after	45.3 ± 6.3	22.4 ± 4.7	
	Two months after	43.6 ± 5.6	21.1 ± 5.3	
	T-test	P < 0.001	P < 0.39	
Perceived susceptibility	Before	11.7 ± 3.7	13.2 ± 3.5	P < 0.001
	Immediately after	23.6 ± 4.1	14.3 ± 3.1	
	Two months after	22.5 ± 3.3	14.6 ± 4.7	
	T-test	P < 0.001	P < 0.64	
Perceived severity	Before	13.3 ± 2.9	11.9 ± 3.8	P < 0.001
	Immediately after	24.3 ± 3.4	13.2 ± 4.5	
	Two months after	24.1 ± 3.5	12.6 ± 4.3	
	T-test	P < 0.001	P < 0.36	
Perceived barriers	Before	9.6 ± 5.3	9 ± 4.6	P < 0.001
	Immediately after	28 ± 4.2	11.1 ± 5.3	
	Two months after	26.5 ± 5.3	11 ± 5.1	
	T-test	P < 0.001	P < 0.57	
Perceived benefits	Before	8.4 ± 2.3	9.3 ± 2.8	P < 0.001
	Immediately after	17.3 ± 2.1	10.6 ± 3.3	
	Two months after	16.8 ± 2.9	10.8 ± 3.5	
	T-test	P < 0.001	P < 0.41	
Performance	Before	3.4 ± 0.6	3.9 ± 0.8	P < 0.001
	Immediately after	8.3 ± 0.7	3.1 ± 1.2	
	Two months after	8.1 ± 0.6	3.3 ± 1.5	
	T-test	P < 0.001	P < 0.46	
Subjective norm	Before	7.1 ± 1.6	6.6 ± 1.3	P < 0.001
	Immediately after	17.3 ± 2.3	7.3 ± 1.1	
	Two months after	16.4 ± 3.1	7 ± 1.6	
	T-test	P < 0.001	P < 0.32	
Normative beliefs	Before	12.8 ± 4.8	13.7 ± 4.3	P < 0.001
	Immediately after	23.3 ± 3.7	15.1 ± 5.8	
	Two months after	22 ± 5.1	13.9 ± 4.9	
	T-test	P < 0.001	P < 0.52	
Attitude about the behavioral results	Before	11.2 ± 5.5	12.8 ± 6.1	P < 0.001
	Immediately after	23.3 ± 1.7	14.2 ± 5.3	
	Two months after	23.4 ± 2.1	13.8 ± 5.8	
	T-test	P < 0.001	P < 0.42	
Attitude of behavioral changes	Before	13.7 ± 6.3	13 ± 5.4	P < 0.001
	Immediately after	31 ± 4.5	14.9 ± 6.1	
	Two months after	30.2 ± 4.8	15.2 ± 6.3	
	T-test	P < 0.001	P < 0.23	

indicated that there was no significant increase in mean score immediately after the intervention compared to the previous one. The measurements of this variable in the control group were not significantly different at all three times. In the study of Aligol et al., all three times (before, immediately and one month after intervention), had a significant difference, which is similar to findings of Karimi et al. before and six months after intervention. The performance score increased after intervention. In the study of Ghofranipour, the intervention group also had less perceived barriers to brucellosis prevention after educational intervention [19, 20, 23]. The performance score has increased after intervention.

Studies have shown that performance has a great effect on health behaviors, and increased awareness of this structure increases the ability to create preventive behaviors in the transmission of diseases [16]. In this study, the score of attitude about behavioral outcomes and attitudes toward changing behavior of brucellosis prevention in intervention group immediately increased significantly to 93% and 88.5% respectively, and two months later rose to 92% and 86%. These scores increased slightly in the control group (55% and 43% respectively) and there was no statistically

significant difference. These findings are akin to results of some previous studies [18-20]. According to the findings of this study, 94.5% of the respondents stated that cues to action enhanced adherence to preventive behaviors against brucellosis. The most frequent sources of information were radio and television (68.0%), followed by health care personnel (23.0%). This is in line with findings of a previous study which showed that among the components of the health belief model, cue to action is the strongest predictor of behavioral changes among livestock breeders [24].
The limitations of this research include the length of the questionnaire and difficulty of measuring behavior using self-reported techniques that can affect the quality of data However, the present study was able to examine the effect of model-based intervention on the behavior and beliefs associated with the prevention of brucellosis. Given the large population of students and their effective role in the transfer of health literacy to the community, this study can be considered as a successful experience in preventing brucellosis in school health education programs.

Conclusion

Brucellosis is one of the most important zoonotic diseases, which annually imposes huge costs on the health system of Iran. Learning to prevent this disease in rural areas is the best and most effective way to prevent the disease. The results of this study showed that using a suitable educational model based on a regular structure can be an effective factor in increasing awareness, knowledge and attitude of the individual towards preventing the disease and increase the adoption of preventive behaviors in the individual. All of the constructs of the health belief model after education in the students had significantly higher scores in the intervention group than the control group. These findings suggest that the use of theory and educational model can be important in identifying the factors influencing behavioral changes. In particular, this study showed that health belief model can be a good model for predicting the prevention of brucellosis in rural students. Therefore, health belief model can be used as a suitable model for prevention of disease in planning and designing educational interventions. Considering the positive effect of educational program based on health belief model and low cost preventive activities, and also considering the importance of empowerment of students and their impact on increasing the health and social well-being of the family through the use of educational programs and improving self-efficacy, the necessity of generalizations of such educational programs in health system programs, especially rural health centers and health houses, seems necessary.

Acknowledgements

We would like to thank the Vice-Chancellor of the Kurdistan University of Medical Sciences, the management of the education department of Divandarreh city, the colleagues of the project, and all the students who have helped us in this research.
Funding sources: this study was financially supported by the Vice-Chancellor of the Kurdistan University of Medical Sciences (Grant No 302/1394).

Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

KK conducted the statistical data analyses and wrote the manuscript. AL contributed to the study design, interpretation of results and writing the manuscript, MKH participated in designing the study protocol and wrote the manuscript. All authors gave substantial contribution to manuscript revising and editing.

References

[1] Moreno E. Retrospective and prospective perspectives on zoonotic brucellosis. Front Microbiol 2014;5:213. https://doi.org/10.3389/fmicb.2014.00213

[2] Rubach MP, Halliday JE, Cleaveland S, Crump JA. Brucellosis in low-income and middle-income countries. Curr Opin Infect Dis 2013;26:404.https://doi.org/10.1097/QCO.0b013e3283638104

[3] Seleem MN, Boyle SM, Sriranganathan N. Brucellosis: a re-emerging zoonosis. Vet Microbiol 2010;140:392-8. https://doi.org/10.1016/j.vetmic.2009.06.021

[4] Dean AS, Crump L, Greter H, Schelling E, Zinsstag J. Global burden of human brucellosis: a systematic review of disease frequency. PLoS Negl Trop Dis 2012;6:e1865. https://doi.org/10.1371/journal.pntd.0001865

[5] MOH. Prevention, Control and Treatment of the Brucellosis: National Guideline for Brucellosis control, ed. Z.O. Center Of Communicable Diseases Control. 2012, 2012 Ministry of Health and Medical Education Health Deputy of Iran.

[6] Alexander KA, Blackburn JK, Vandewalle ME, Pesapane R, Baipoledi EK, Elzer PH. Buffalo, bush meat, and the zoonotic threat of brucellosis in Botswana. PLoS One 2012; 7:e32842. https://doi.org/10.1371/journal.pone.0032842

[7] Aworh MK, Okolocha E, Kwaga J, Fasina F, Lazarus D, Suleman I, Poggensee G, Nguku P, Nsubuga P. Human brucellosis: seroprevalence and associated exposure factors among abattoir workers in Abuja, Nigeria-2011. Pan Afr Med J 2013:17;16:103. https://doi.org/10.11604/pamj.2013.16.103.2143

[8] Guerrant RL, Walker DH, Weller PF. Tropical Infectious Diseases: Principles, Pathogens and Practice (Expert Consult-Online and Print), 3e. 2011: Saunders. https://doi.org/10.1016/C2009-0-40410-0

[9] Seed R. Tropical infectious diseases: principles, pathogens and practice. J Parasitol 2007;93:391. https://doi.org/10.1645/0022-3395

[10] Mostafavi E, Asmand M. Trend of brucellosis in Iran from 1991 to 2008. Iran J Epidemiol 2012;8: 94-101.

[11] Becker MH. The health belief model and personal health behavior. Health Educ Monogr 1974;2:324-473. https://doi.org/10.1177/109019817400200407

[12] Janz NK, Becker MH. The health belief model: A decade later. Health Educ Q 1984;11:1-47. https://doi.org/10.1177/109019818401100101

[13] Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. Health Educ Q 1988;15:175-83. https://doi.org/ 10.1177/109019818801500203

[14] Tanner-Smith EE, Brown TN. Evaluating the Health Belief Model: A critical review of studies predicting mammographic and pap screening. Soc Theory Health 2010;8:95-125. https://doi.org/10.1057/sth.2009.23

[15] Lawshe CH. A quantitative approach to content validity 1. Pers Psychol 1975;28:563-75. https://doi.org/10.1111/j.1744-6570.1975

[16] Glanz K, Rimer BK, Viswanath K. Health behavior and health education: theory, research, and practice. 2008: John Wiley & Sons.

[17] Alimohammadi M, Bidarpour F, Sharafi H, Ghasemi M, Zahraei A, Karimyan K Design and determine the validity and the reliability of brucellosis education questionnaire based on health belief model. IJPTONLINE 2016;8:16761-71.

[18] Aminshokravi F, Khanian H R, Hashemian A H. Effect of training on preventive behavior of brucellosis. Iran J Health Educ Health Promot 2013;1:15-22.

[19] Aligol M, Nasirzadeh M, Hafezi Bakhtiari M, Eslami A A. The effects of education on promoting knowledge, beliefs and preventive behaviors on brucellosis among women: applying a health belief model. Jundishapur J Health Sci 2014;6:343-9.

[20] Karimy M, Montazeri A, Araban M. The effect of an educational program based on health belief model on the empowerment of rural women in prevention of brucellosis. 2012. AJ Arak Uni Med Sci 2012;14:85-94.

[21] Wong LP, AbuBakar S. Health beliefs and practices related to dengue fever: a focus group study. PLoS Negl Trop Dis 2013;7:e2310. https://doi.org/10.1371/journal.pntd.0002310

[22] Ramezankhani A, Jahani H, Hatami H, Sharifzadeh G, Hosseini S. Determine the effect of intervention on the adoption of preventive behaviours of the brucellosis was based on the health belief model. JNKUMS 2016;8:33-45.

[23] Ghofranipour F. The application of Health Belife Model on prevention Brucellosis in the Shahrekord. Persian. Thesis presented for the Assistant professor in Health Education. Tarbiat Modares University. 1998;1:12-15.

[24] Babaei V, Babazadeh T, Kiani A, Garmaroodi G, & Batebi, A. The Role of effective factors in preventive behaviors of brucellosis in stockbreeder of Charaoymaq County: a health belief model. J Fasa Univ Med Sci 2016;5:470-8.

Received on May 1, 2019. Accepted on January 14, 2020.

Correspondence: Arman Latifi, Department of Public Health, Maragheh University of Medical Sciences, Maragheh, Iran. Tel. +98 4137275551 - E-mail: Latifiarman@gmail.com

How to cite this article: Karimyan K, Khezeli M, Latifi A. Effect of student's empowerment program on brucellosis prevention: an application of extended health belief model. J Prev Med Hyg 2020;61:E25-E30. https://doi.org/10.15167/2421-4248/jpmh2020.61.1.1267