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Effect of the PRECEDE-PROCEED Model-Based Training on the Cutaneous Leishmaniasis Preventive Behaviors among Rural Population under the Coverage of the Comprehensive Health Centers of Larestan, Iran; A Quasi-Experimental Study

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ABSTRACT

Aims Leishmaniasis is a skin disease spread by mosquitos from infected animals or humans to healthy humans. It can have a negative effect on a patient's quality of life. The purpose of this study was to assess the impact of PRECEDE model-based training of healthcare personnel on the preventive behavior of the disease in covered households in Larestan, Iran.
Materials & Methods This controlled semi-experimental study was done on the households served by comprehensive rural health centers in Larestan, Iran. First, two comprehensive health centers were randomly assigned to the intervention or control groups. Eighty covered households were divided into two groups. The intervention group's health workers received training in four face-to-face sessions. Health workers then trained the families who were covered by them. Both groups completed a researcher-made questionnaire before and two months after the intervention. The independent t-test, paired t-test, ANCOVA, and Cohen's D were used to analyze the data by SPSS 20 software at a significance level of less than 0.05.
Findings The mean scores of predisposing factors, enabling factors, reinforcing factors, and behavior in the intervention group differed significantly from the control group after training, and the effect size of each construct indicated the effectiveness of training.
Conclusion Training of health workers based on the PRECEDE model plays a significant role in adopting Leishmaniasis prevention behavior in people under their care.

Keywords Leishmaniasis, Cutaneous; Health Personnel; Prevention and Control; Health Education

CITATION LINKS

[1] A comprehensive review of cutaneous leishmaniasis in Sri Lanka ... [2] IA review of leishmaniasis: Current knowledge ... [3] Ecological niche modeling for the prediction of cutaneous leishmaniasis epidemiology ... [4] Leishmaniasis: A ... [5] The study of epidemiological cutaneous leishmaniasis in Aran ... [6] Cutaneous leishmaniasis in Iran: A systematic review ... [7] Psychological and psychosocial consequences of zoonotic ... [8] The impact of illegal waste sites on the transmission of zoonotic ... [9] Modeling spatial-temporal variations of cutaneous ... [10] Application of BASNEF model in students training regarding ... [11] Effect of an educational program based on the health ... [12] A PRECEDE-PROCEED model-based educational intervention to promote ... [13] Effects of an educational intervention program based on the ... [14] Effect of the PRECEDE-PROCEED model on health programs: A ... [15] Planning, implementation, and evaluation of educational intervention based ... [16] Stakeholders' perspectives on system-level barriers to and facilitators ... [17] management program for preventing occupational blood-borne ... [18] Application of the PRECEDE-PROCEED model in prevention of ... [19] Predicting the preventive behaviors of ... [20] Effect of educational intervention based on the PRECEDE-PROCEED ... [21] The effect of educational intervention on preventive behaviors ... [22] Community-based interventions ... [23] Knowledge and attitude towards cutaneous leishmaniasis ... [24] Effect of health workers' training programs on preventive ... [25] Basic knowledge about visceral leishmaniasis before ... [26] Primary health care quality improvement patterns: ... [27] Effectiveness of training Persian medicine principles ... [28] Roles and functions of community health workers ... [29] Determinants of self-management behaviors among ... [30] Effect of educational intervention based ... [31] Malaria preventive behaviors among housewives ... [32] The effect of stress management training through ... [33] Preventive factors related to brucellosis among rural ... [34] Using the precede-proceed model in needs ... [35] Effect of health educational intervention based ... [36] The effects of educational intervention for anxiety ... [37] The effect of intervention using the PRECEDE-PROCEED ... [38] The impact of cognitive-behavioral stress management ... [39] The effect of educational intervention based on PRECEDE model health ...

Introduction

Cutaneous Leishmaniasis (CL) is a skin disease caused by the single-celled parasite Leishmania [1]. This disease is transmitted to healthy people by mosquito bites from infected animals (rodents and dogs) or infected humans, and non-purulent papules develop at the site of the bite, progressing to painless ulcers with dense margins that can heal spontaneously over months to years or cause scarring and disfigurement [2]. Three-quarters of two million new cases of leishmaniasis in the world are CL [3]. Leishmaniasis is a major public health concern around the world. This disease is native to Asia, Africa, parts of South and Central America, and the Mediterranean and has affected nearly 98 countries [4]. It is reported that 12 to 15 million people are affected worldwide. Also, around 350 million people worldwide are at risk of leishmaniasis. The World Health Organization (WHO) has designated leishmaniasis as one of the world's seven most serious tropical diseases [4]. Each year, approximately 200,000 cases of CL are reported in Iran [5]. The Isfahan province has the highest prevalence (66%), while Kermanshah has the lowest. Its prevalence in Fars province has been estimated to be around 63% [6]. CL is not fatal, but some of the disease's unfortunate consequences are malformed lesions, social and psychological complications, and the high cost of treatment [7, 8]. This vector-borne disease has many negative effects on economic growth and people's quality of life, making it a major economic burden on households and public health systems every year [9]. Because researchers have not succeeded in developing a vaccine against CL, and because the disease is so widespread, the WHO has made health education a top priority. Many researchers have proposed disease control and prevention programs, such as vaccine and drug production, environmental improvement, rat eradication and spraying, and health education programs [10]. One of the ways to prevent and control the disease is to increase the awareness of society about the ways of disease transmission as well as preventive measures. The use of educational theories and models determines the effectiveness of health interventions. A model directs the educational program and provides a framework for measuring and evaluating educational programs [11].

The PRECEDE-PROCEED model is one of the health education models that provides a framework for identifying predisposing factors (knowledge, attitudes, and perceptions), reinforcing factors (influence of others, family, and peers), and enabling factors (accessibility, resources, and skills) that can be used to identify effective factors on behavior.

Predisposing, reinforcing, and enabling structures in educational diagnosis and evaluation policy, regulatory, and organizational structures in educational and environmental development (PRECEDE-PROCEED) is a useful theoretical framework for planning, implementing, and evaluating [12]. The most useful application of this model is to explain behavioral factors [13]. Greene developed the PRECEDE section to identify health and education needs and later added the PROCEED section by adding the elements of policy, regulation, organization, and environment to emphasize the impact of ecological aspects in the modified model, which includes eight phases, namely social assessment, epidemiological assessment, educational/environmental assessment, administrative/policy assessment and intervention planning, implementation, process evaluation, impact evaluation, and performance evaluation. It is a multi-step approach to developing and implementing a health promotion program [14]. As a result, using the PRECEDE-PROCEED model improves preventive behaviors and can be used to plan health [15, 16]. For example, in the field of infection, the effect of using the PRECEDE-PROCEED model on increasing performance and knowledge has been confirmed [17]. It has also been used in Iran [18, 19].

The effectiveness of this model was confirmed by Jeihooni *et al.*, where an educational intervention based on the PRECEDE-PROCEED model was carried out in order to improve behavior to prevent and control disease among housewives in Fasa, Iran [20]. Nazari *et al.* reported that the mentioned model improved the preventive behavior of the families in Kharameh [21]. The result of a systematic review showed that health education interventions are not sufficient to prevent and control CL, as knowledge is not always put into practice. The authors recommended interventions that address other factors, such as financial barriers and access to healthcare. This could explain the application of the PRECEDE model in leishmaniasis education, with a focus on the facilitating factor [22].

Instead of reliable sources, people get their information from family members, neighbors, and friends, who are likely to convey incomplete information and false beliefs to members of the community [23, 24].

The WHO has recommended that primary healthcare workers receive health education in order to prevent and control the disease [25]. Because health workers are the primary service providers in the country's healthcare team and are directly responsible for providing basic health services to the people of the society, particularly the villagers [26], increasing their knowledge and correct performance can play an important role in health education to different people and groups according to the culture of the region [27]. Health education in the field of disease control and prevention is an important function of healthcare workers [28]. Kashfi *et al.* found that training healthcare workers in Marvdasht, Iran regarding

leishmaniasis improved the performance of the population they served [24]. Given the prevalence of leishmaniasis in Fars province and the importance of health workers in health education and disease control, as well as the fact that studies in the field of using the PRECEDE model for education about this disease are limited, we investigated the effect of training based on the PRECEDE model on leishmaniasis preventive behaviors, with a focus on the mediation role of healthcare workers in Larestan.

Materials and Methods

This was a semi-experimental study conducted on health workers acting as mediators and their covered households. Two comprehensive rural health centers in the most common leishmaniasis endemic areas of Larestan, Iran, were randomly assigned to the experimental and control groups (Khor Comprehensive Health Service Center as the experimental group and Latifi Comprehensive Health Service Center as the control group). Using Nazari *et al.*'s theoretical study [21] and the NCSS-PASS version 15 software, 160 households were chosen considering a 10% sample dropout rate, the test power of 0.95, and the influence coefficient of 1.45%. All health workers from the mentioned centers and the health houses under their supervision (each comprehensive health center has four health houses) took part in this study. In addition, 20 households were chosen at random from the list of households covered by each health house, and 160 people (heads of households) were studied (80 cases in the intervention group and 80 in the control group; Figure 1). The inclusion criteria were no history of leishmaniasis and being motivated to participate in the educational program, while the exclusion criteria were unwillingness to continue cooperation and contracting leishmaniasis during the research.

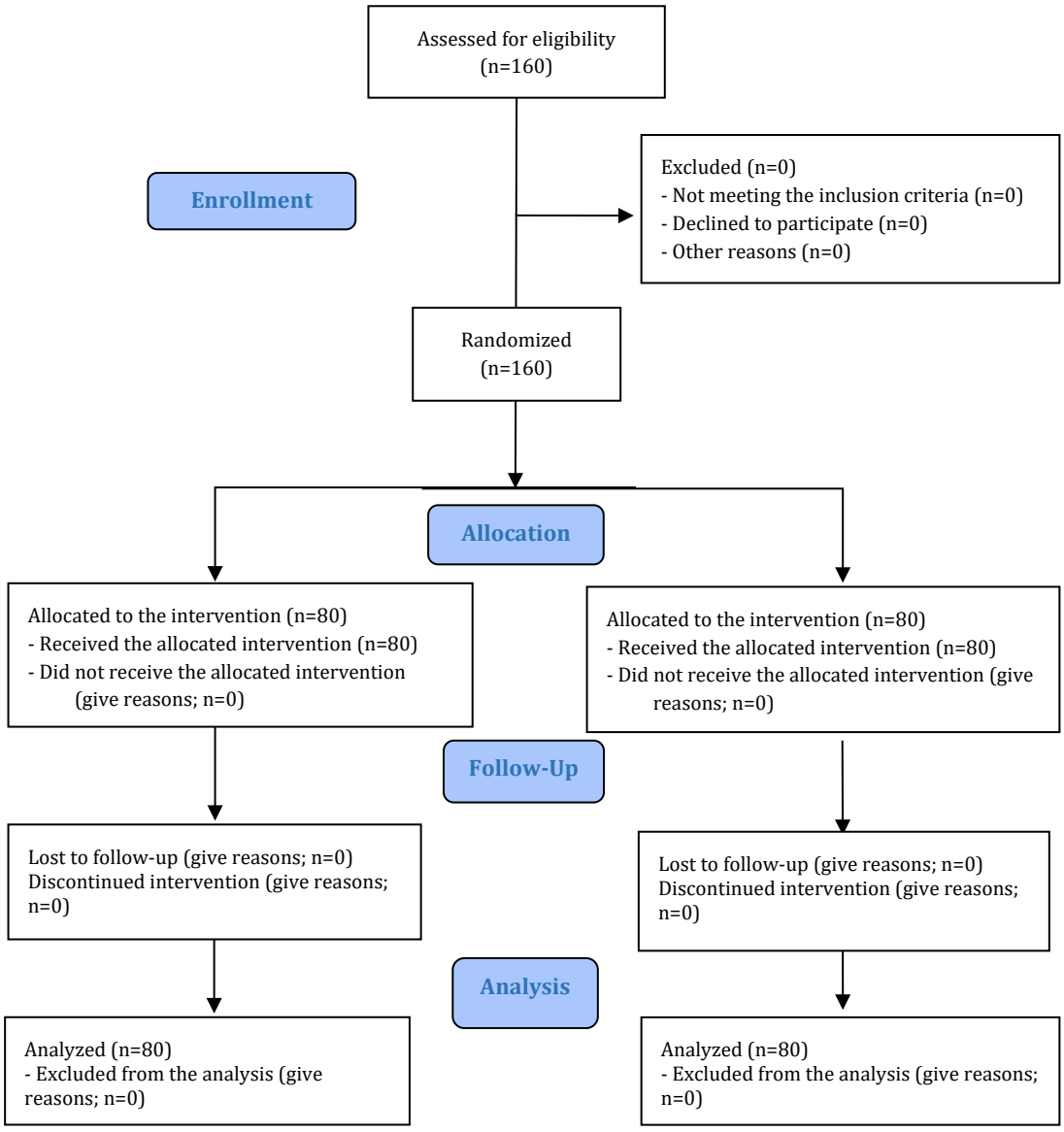

Figure 1. CONSORT Diagram.

Data Collection

A demographic information questionnaire and a researcher-made questionnaire based on the PRECEDE-PROCEED model were used to collect data. The demographic questionnaire for the heads of the household asked about their age, occupation, gender, education level, average monthly income, and history of leishmaniasis.

The PRECEDE-PROCEED model-based questionnaire included questions on predisposing factors (12 questions regarding knowledge and nine questions regarding attitude), reinforcing factors (11 questions), and enabling factors (14 questions).

The knowledge section included 12 questions with four answers about people's knowledge of the symptoms and methods of contracting and spreading the disease. The correct answer received one point, while the incorrect answer received zero. The minimum and maximum knowledge scores were 0 and 12, respectively, and a higher score indicated that people were more aware of this disease. The attitude section included nine questions with 6-point Likert scale responses (strongly agree, agree, slightly agree, slightly disagree, disagree, strongly disagree) about leishmaniasis prevention behaviors. The attitude score ranged from 9 to 54, with a higher score indicating a more positive attitude toward leishmaniasis prevention behaviors.

The enabling factors included 14 questions about access to leishmaniasis insect disposal facilities, which were scored by answering yes or no. A yes answer is worth one point, while a no answer is worth zero points. The minimum and maximum enabling factor scores were 0 and 14, respectively, and a higher score indicated the presence of controlling factors to prevent leishmaniasis. The reinforcing factor questionnaire contained 11 questions with a three-point Likert scale (yes, somewhat, and no) about the reinforcing factors of leishmaniasis preventive behaviors, with minimum and maximum scores of 0 and 22, respectively.

A panel of experts was formed to validate this questionnaire. Cronbach's alpha coefficient for questionnaire reliability was 0.79, CVR for attitude questions was 0.77, for knowledge was 0.72, for reinforcement was 0.69, and enabling factors was 0.73, and Cronbach's alpha coefficient for knowledge was 0.72.

Study Design

Before the intervention, the PRECEDE-PROCEED model questionnaire (predisposing factors, enabling factors, and reinforcing factors) was completed to assess the condition of the studied health workers and the population served by them. Then, a training program was held for the health workers of the intervention group, but no training was held for the control group.

The training intervention included four two-day training sessions in person with full compliance with health protocols (maintaining social distancing and wearing masks) for the patients.

The first session was spent familiarizing students with leishmaniasis and its carrier, the second session was spent familiarizing students with methods of prevention and combating the leishmaniasis disease, the third session was spent familiarizing students with interpersonal communication skills, and the final session was spent familiarizing students with group work and participation.

It should be noted that a group was formed in the context of a social network for better communication between the students and the researcher so that if the students had any questions during the training, the researcher would answer them and these answers were shared with other people. Then, health workers were given up to two months to train the population under their coverage.

The questionnaires were completed again for the heads of the households covered by them eight weeks after the training.

After the post-test stage, the researcher conducted training sessions for the control group in order to comply with the research's ethical and professional principles, as well as to thank and appreciate the control group's cooperation.

Statistical Analysis

Data were analyzed using SPSS 20 software and the Chi-square test, independent t-test, paired t-test, ANCOVA, and Cohen's D. It should be noted that in all tests, the significance level of 0.05 was used.

The first step in data analysis is to determine their normality using the Kolmogorov-Smirnov test.

The data were then processed at the descriptive level using central tendency and dispersion indices and at the inferential level using the ANCOVA to determine the effect of training on leishmaniasis preventive behaviors based on the PRECEDE model and to check the significance of the difference between the intervention group's mean scores.

Findings

The two groups were not significantly different in terms of demographic variables (age, level of education, monthly income, occupation, history of leishmaniasis, history of training about leishmaniasis, and source of information about leishmaniasis) ($p>0.05$; Table 1).

The results of the independent and paired t-tests showed that the scores of predisposing factors (Knowledge and attitude), reinforcing factors, enabling factors, and behavior increased significantly after the intervention in the intervention group compared to the control group. Cohen's D coefficient can express the positive effect of training on all constructs (Table 2).

Table 1. The mean score of predisposing factors (knowledge and attitude), enabling factors, reinforcing factors, and behavior in the intervention and control groups

Parameter	Intervention group	Control group	Chi-square value	p-Value
	No.(%)	No.(%)		
Age (year)			0.437	0.508
<35	18(22)	20(25)		
35-40	14(18)	13(16)		
45-40	28(35)	29(36)		
>45	20(25)	18(23)		
Education Degree			3.616	0.057
Illiterate	2(2)	3(4)		
Fifth grade	7(9)	9(11)		
Middle school diploma	5(6)	6(7)		
Diploma	28(35)	25(31)		
Associate degree	20(25)	18(23)		
Bachelor's degree and higher	18(23)	19(24)		
Monthly income (Tomans)			1.138	0.566
<500,000	0(0)	0(0)		
500-750,000	0(0)	0(0)		
>750,000	80(100)	80(100)		
Previous training about leishmaniasis			3.61	0.15
Yes	63(79)	59(74)		
No	17(21)	21(26)		
Source of information			0.58	0.12
Radio and TV	10(13)	7(9)		
Books and magazine	0(0)	2(2)		

Table 2. The mean score of predisposing factors (knowledge and attitude), enabling factors, reinforcing factors, and behavior in the intervention and control groups

Parameter	Intervention group	Control group	p-Value (independent t-test)	Cohen's D
Knowledge				0.74
Before intervention	5.59±2.62	5.91±2.16	t(160)= 0.84*	
After intervention	10.05±1.25	6.08±1.12	t(160)=13.86**	
Paired t-test	t(80)=13.38**	t(80)=1.45*		
Attitude				0.71
Before intervention	14.24±2.94	15.57±2.31	t(160)= 3.4*	
After intervention	19.25±2.12	15.53±2.35	t(160)=10.14**	
Paired t-test	t(80)=14.83**	t(80)=1.00*		
Enabling factors				0.62
Before intervention	13.85±2.27	13.32±1.82	t(160)=1.56*	
After intervention	18.50±1.38	13.37±1.87	t(160)=18.97**	
Paired t-test	t(80)=15.24**	t(80)=1.27*		
Reinforcing factors				0.61
Before intervention	13.97±1.66	13.12±1.66	t(160)=2.40*	
After intervention	24.11±2.04	14.20±2.11	t(160)=21.97**	
Paired t-test	t(80)=24.95**	t(80)=1.89*		
Behavior				0.68
Before intervention	18.35±2.78	18.31±2.66	t(160)=0.09*	
After intervention	25.24±1.82	18.35±2.67	t(160)=18.34**	
Paired t-test	t(80)=19.2**	t(80)=1.00*		

*Non-significant.
**Statistically significant at the 1% level (p-value≤0.001).

Discussion

The findings of this study revealed a significant difference in the mean scores of enabling factors, predisposing factors, reinforcing factors, and behavior between the intervention and control groups after the intervention. This means that the increase in the scores of these constructs was greater in the intervention group, indicating the effect of training. The score of reinforcing factors in the intervention group increased significantly both before and after the intervention compared to the control group. Support and encouragement from others, such as a spouse, family members, clergy, friends, and healthcare workers, were considered reinforcing factors in this study.

Li *et al.* [29], Ebrahim Fard *et al.* [30], and other studies [31-33] reported results in line with our findings. Encouragement and social support of people improve self-efficacy and help them to perform a behavior. Satisfaction and having social support, as well as positive emotions, are indicators of perceived social support. Reinforcing factors predicted the adoption of preventive behavior, according to Hajjari *et al.*'s study, which used the PRECEDE model to assess the educational needs for the prevention of Malt fever in rural areas of Isfahan. People's expectations from

veterinary personnel, health workers, and family members were strengthened by encouraging them to adopt correct preventive behaviors such as vaccination of animals, and the use of masks and gloves when entering the animal shelter and during milking [34]. Reinforcing factors were not predictive of preventive behaviors of CL in the study by Jajarmi *et al.*, which was conducted to investigate preventive behavior of leishmaniasis based on the questionnaire in families with children under ten years of age [19], which was inconsistent with our study. Encouragement and support from others to perform preventive behaviors against CL (using mosquito nets, installing nets on doors and windows, and using insect-repellent ointment) were identified as reinforcing factors in the mentioned study. Jajarmi *et al.* believed that changing societal customs in rural communities is difficult. Influential people, such as a chief or dean, usually can promote unusual behavior in society and encourage others to do the same. Behavior change will be facilitated if these people support and encourage people to adopt healthy behaviors.

Money to purchase facilities, such as insecticides and insect repellant pens, holding training classes, and providing an educational pamphlet about leishmaniasis from the health center, as well as the health liaisons themselves as the people who answered the participants' questions, were considered enabling factors in the current study. After training, the mean score of this construct in the intervention group increased significantly more than in the control group. In line with this finding, we can refer to the study by Jeihooni *et al.* [20] on leishmaniasis control in housewives, Ghahremani *et al.* [33] on malaria prevention, and Jahangiri *et al.* [33]. The results of Fadaei *et al.* [35] on the preventive behavior of Malt fever did not agree with our findings. They discovered the reason for the lack of influence of the enabling factor on the failure to achieve Malt fever preventive behaviors, which is a set of factors, such as supervisory and management department interventions to increase the budget and resources required in brucellosis control projects (livestock vaccination programs, killing, and compensation to livestock owners).

In our study, the score of predisposing factors with two components of knowledge and attitude increased significantly after training in the intervention group compared to the control group. This finding is consistent with several studies [36, 37]. According to Hajjari *et al.*, the construct of attitude and knowledge of the PRECEDE model predicted Malt fever preventive behavior [34]. All constructs except attitude were significantly different in the study by Moaieni *et al.*, who used the PRECEDE model to reduce occupational stress in nurses. The difference in attitude scores before and after training was not significant compared to the control group, and the reason for the high attitude and need to deal with stress in nurses could be due to their level of education and scientific knowledge [38].

The behavior score was also significant when comparing the intervention and control groups. After the training, the intervention group participants outperformed the control group in terms of adopting leishmaniasis preventive behaviors; this result was consistent with some studies [20, 24, 39]. The PRECEDE model states that behavior change is dependent on increasing knowledge and improving attitude, the availability of facilities and resources as an enabling factor, and the support and encouragement of those around you as a reinforcing factor. In our study, improvements in the reinforcing, predisposing, and enabling factors resulted in the desired and meaningful behavior change. According to the current research, Jajarmi *et al.*, who measured the predictive power of the PRECEDE model in the preventive behavior of leishmaniasis in families with children under the age of ten, concluded that by relying on predisposing and enabling factors, the chances of people to adopt health behaviors are higher, while reinforcing factors do not play an important role [19]. Employees in the healthcare system can take action to control and prevent diseases by emphasizing the role of this model's predisposing, reinforcing, and enabling factors. The government and officials must pay attention to and support social workers as pioneers in providing health services.

The use of teachers as a mediator in training is a strength of this study. Training is done based on the culture of each region and will be more effective due to their familiarity with the culture and characteristics of the region under their cover. One of the limitations was the overlap of the educational program with the COVID-19 pandemic, which could have a negative impact on education quality and subject participation in face-to-face sessions. Another limitation of our study was the small number of health workers in each group, which made comparing the intervention and control groups in this population impossible. In future studies, it is suggested to use a larger number of health workers to enable comparison between the two groups.

Conclusion

Training health workers as mediators using the PRECEDE model has a positive effect on changing the behavior of the population they serve.

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Ethical Permissions: The current study was approved by the Faculty of Nursing and Midwifery of Shiraz University of Medical Sciences (IR.SBMU.PHARMACY.REC.1398.134).

Conflicts of Interests: There are no conflicts of interests.

Author's Contribution: Didehvar M (First Author), Introduction Writer/Original/Main Researcher/Statistical

Analyst (25%); Rakhshani T (Second Author), Methodologist/Assistant Researcher (15%); Janfaza E (Third Author), Assistant Researcher/Discussion Writer (15%); Slotani A (Forth Author), Methodologist/Assistant Researcher/Statistical Analyst (15%); Nazari M (Fifth Author), Assistant Researcher/Discussion Writer/Statistical Analyst (15%); Ghahremani L (Sixth Author), Introduction Writer/Methodologist (15%)

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