

# Roy's Adaptation Model-Guided Education and Promoting the Adaptation of Veterans With Lower Extremities Amputation

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## Abstract

**Background:** Any defect in extremities of the body can affect different life aspects.

**Objectives:** The purpose of this study was to investigate the effect of Roy's adaptation model-guided education on promoting the adaptation of veterans with lower extremities amputation.

**Patients and Methods:** In a randomized clinical trial, 60 veterans with lower extremities amputation referring to Kowsar Orthotics and Prosthetics Center of veterans clinic in Tehran, Iran, were recruited with convenience method and were randomly assigned to intervention and control groups during 2013 - 2014. For data collection, Roy's adaptation model questionnaire was used. After completing the questionnaires in both groups, maladaptive behaviors were determined in the intervention group and an education program based on Roy's adaptation model was implemented. After two months, both groups completed the questionnaires again. Data was analyzed with SPSS software.

**Results:** Independent t-test showed statistically significant differences between the two groups in the post-test stage in terms of the total score of adaptation ( $P = 0.001$ ) as well as physiologic ( $P = 0.0001$ ) and role function modes ( $P = 0.004$ ). The total score of adaptation ( $139.43 \pm 5.45$  to  $127.54 \pm 14.55$ ,  $P = 0.006$ ) as well as the scores of physiologic ( $60.26 \pm 5.45$  to  $53.73 \pm 7.79$ ,  $P = 0.001$ ) and role function ( $20.30 \pm 2.42$  to  $18.13 \pm 3.18$ ,  $P = 0.01$ ) modes in the intervention group significantly increased, whereas the scores of self-concept ( $42.10 \pm 4.71$  to  $39.40 \pm 5.67$ ,  $P = 0.21$ ) and interdependence ( $16.76 \pm 2.22$  to  $16.30 \pm 2.57$ ,  $P = 0.44$ ) modes in the two stages did not have a significant difference.

**Conclusions:** Findings of this research indicated that the Roy's adaptation model-guided education promoted the adaptation level of physiologic and role function modes in veterans with lower extremities amputation. However, this intervention could not promote adaptation in self-concept and interdependence modes. More intervention is advised based on Roy's adaptation model for improving the adaptation of veterans with lower extremities.

**Keywords:** Amputation, Lower Extremity, Adaptation, Nursing, Model, Veterans

## 1. Background

Amputation is one of the disruptive and injurious events that a person may experience in his/her life (1). About 200 to 500 million amputations occur in the world every year due to some factors such as disease, trauma and congenital defects and approximately 80% of it relates to lower extremities (2). In countries that have recently experienced war, about 80% of amputations is due to war (2, 3). During Iraq-Iran war between 1980 and 1988, about 15,000 individuals got severely amputated in upper extremity or lower extremity (4). There are about 11517 veterans with lower extremities amputation in Iran and this number includes different levels of amputation including ankle, upper the knee, knee, lower the knee, and pelvis (3). Any defect in extremities of the body is not only regarded as a physical injury, but also leads to social and mental-emotional injuries and can affect different life aspects. This considerably reduces the physical activity and mobility of person, limits the performance of normal roles of the person, and leads to economic, social, personal, family and environmental

problems, making life difficult for the person (3, 5, 6). Many of these people suffer from chronic complications which can limit the performance of their physical activities. These limitations clearly reduce self-confidence of these people, change their body images negatively, reinforce their vulnerability, and increase tendency to abuse drugs and increase clinical depression and suicide thoughts (5). Studies have shown that there is a broad scope of chronic and acute complications such as post-traumatic stress disorder, anxiety disorder, aggression, depression, cognitive disorder, interpersonal relations problems, isolation, feeling of guilt, isolation from society, economic problems, unemployment, sleep disorders and many other problems in veterans, the survivors of war and their close relatives (5, 7). Studies showed that only 2% - 7% of war victims returned to their active performance before amputation (1). Some studies showed that only 62% of patients with major lower-limb amputations used their prosthesis daily or occasionally and adaptation to the prosthesis occurred in 40% of them (8).

This is important that after amputation, the person should return to his/her normal life as soon as possible (3). In all chronic diseases, the adaptation of patients to long-term complications of disease plays an important and effective role in promotion of their quality of life (9). In this regard, rehabilitation of the injured person in war and increase of their independence are important goals. Nurses as health-care professional staffs play important roles for finding patient, care, rehabilitation and adaptation to new situation and reduction of mental stresses of patients (10). One of the applied and effective models in nursing that has paid attention to this subject is Roy's adaptation model (RAM). Roy believes that when the human system is sick or can be sickened or when there are unusual stressors and the adaptive mechanisms are weakened and usual efforts of the person to adapt are ineffective, it is necessary for the person to receive care and nursing services (10). She believed that the goal of nursing is to promote adaptation in the four adaptive modes (physical, self-concept, role function and interdependence mode) (11). Three types of stimuli ie, focal, contextual and residual stimuli are effective on the adaptation and alteration of these stimuli with caring plans increases adaptation and better controls the disease (12). Focal stimuli are the ones that are directly and currently effective on person and are the most important stimuli that the person faces at present. Contextual stimuli are less important than the focal stimuli and residual stimuli are unclear stimuli which are related to personal beliefs, attitude and properties (13, 14). Contextual and residual stimuli involve education and experiences of person (12). This model is a conceptual model with a special design which is widely used for guiding, research and training in many countries (10, 12). The results of most studies that have used this model in practice have been indicative of improvement of nursing activities, focus, organization and direction of thoughts and actions of nurses in taking care of chronic patients and increasing adaptive responses in patients in the four modes of RAM (9). For example, studies have shown that training based on RAM had positive effects on adaptation of patients with chronic obstructive pulmonary disorder (COPD) (15) and hemodialysis (16). Studies have shown that the use of nursing models and theories can be effective as an organized framework for evaluating the effectiveness of nursing actions and care programs in some patients. However, it is unknown whether these models are effective on the adaptation of veterans. As, in our search, we did not find any study that investigated the effects of nursing models and theories on these patients. Considering the remarkable number of veterans with amputation in Iran and deep effects of this disorder on their life as well as the few studies on adaptation of these patients, our researchers decided to design a RAM-guided education.

## 2. Objectives

The aim of this study was to investigate the effects of RAM-guided education on promoting the adaptation of veterans with lower extremities amputation.

## 3. Patients and Methods

This study was a randomized clinical trial conducted during 2013 - 2014. Veterans with lower extremities amputation referring to Kowsar Orthotics and Prosthetics Center of Veterans Clinic in Tehran, Iran, were recruited with convenience method. This clinic is a referral center and patients refer to it from all parts of Iran. The mean differences and standard deviation in previous studies (2, 2.21) (17), alpha (0.05) and power level (90%), and the following formula were considered:

$$(1) \quad N = \frac{2\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2}{\left(\frac{\mu_1 - \mu_2}{\sigma}\right)^2} = \frac{2(1.98 + 1.28)^2}{(2/2.21)^2} = 26$$

Accordingly, the number of subjects in each group was estimated to be 26 persons and considering a drop-out rate of 20%, 62 subjects were included in the study. Then, successfully recruited, the recruiter randomly assigned the subjects into one of the two groups of intervention and control by the use of a simple random-numbers table. The table had been prepared by one of the researchers who was independent of data collection. The subjects were not notified of the group assignment until after the baseline data were collected. In addition, the randomization was kept concealed from the analyzer of data until the end of study. The inclusion criteria were ability to read and write in Farsi, age below 65 years, no affliction with known mental diseases, lack of spinal cord injury, and not being a chemical victim; the exclusion criteria included lack of tendency to continue participating in the study. After selection of the subjects, the goal of the research was explained to the subjects in addition to getting their informed consents. The subjects were explained the stages at the beginning. The researcher tried to coordinate the date of the next referral with the study prosthesis session for those who had transportation problem, as far as possible. The researcher also entertained them briefly while behaving politely and awarded a small gift (account book and felt-tip pen) to them. Lunch was prepared for the subjects when the educational class was organized and served in a quiet and suitable place. In this way, the researchers tried to attract participation and cooperation of the veterans.

Data collection instruments included demographic characteristics and RAM questionnaires. A demographic characteristics form consisting of 16 questions was used to list the subjects' demographic properties. The researcher-made questionnaire contained 35 questions in four modes of physiologic, self-concept, role function and interdependence, which examined the adaptation level of the subjects. The physiologic mode included 15 questions relating to activity, rest, nutrition, excretion, blood circulation and oxygenation, liquids and electrolytes, and endogenous glands. The self-concept mode included 11 questions relating to physical self, mental self and personal self. The role function mode included five questions relating to family, family roles and family expectations and the interdepend-

dence mode included four questions about personal and social communication of the patient. The number of items was equal in all the questions. The questions were ranked based on Likert five-choice scale (never, seldom, sometimes, often and always) and the score of each question varied from 1 to 5. The questions had negative and positive aspects. The total range of the questionnaire was between 35 and 175 points. The upper scores showed better adaptation. The quantitative and qualitative validities of the questionnaire were examined. Content validity ratio (CVR) and content validity index (CVI) of the instrument were examined; the total CVI of the instrument was calculated 0.95 and CVI and CVR for each item of the questionnaire were larger than 0.79 and 0.51, respectively (18). To determine the reliability, test-retest method was used. In this way, the questionnaires were completed by 30 veterans with lower extremities amputation in two stages, each lasting two weeks; Pearson correlation coefficients ( $r$ ) were 0.75, 0.83, 0.80 and 0.70 in physiologic, self-concept, role function and interdependence modes, respectively. Cronbach's alpha coefficients were acceptable for all the dimensions of the questionnaire (18). All the data were collected by one of the researchers (MSc student of military nursing with six years of experience).

The subjects completed the questionnaires before as well as two months after the intervention. After filling the questionnaire in the first stage, data of the intervention group was examined and analyzed. After determining maladaptive behaviors in the intervention group, the RAM-guided education was implemented. The educational content was determined based on the responses of the subjects in the

intervention group to the adaptation questionnaire and the identification of maladaptive behaviors as well as the stimuli of these behaviors in each of them. Education was presented with two collective and individual methods. In this regard, collective educational methods were used to modify the stimuli of maladaptive behaviors common among the subjects and face-to-face individual education was used to modify the stimuli of the special maladaptive behaviors for each one of the subjects. The collective education included organization of two sessions, each lasting two hours, with lecture education method within two weeks along with a 30-minute question and answer at the end of each session. For collective education, educational aid tools such as computer and projector were used for showing the slides prepared in Power Point software. An educational booklet was given to the subjects. This booklet contained information about the main problems of veterans with lower extremities amputation and related to the desired behaviors designed in the questionnaire. The subjects were followed within two months for following the performance of recommendations and elimination of problems by phone. The telephone number of the researcher was given to them to answer the potential questions of the subjects. After two months, both intervention and control groups completed the questionnaire again. During the research, one subject was excluded from the intervention group and one was excluded from the control group (3.22% drop-out) due to lack of tendency to continue participating in the research and travelling to another city, and finally, 60 persons were studied. The stages of the research are shown in Figure 1.

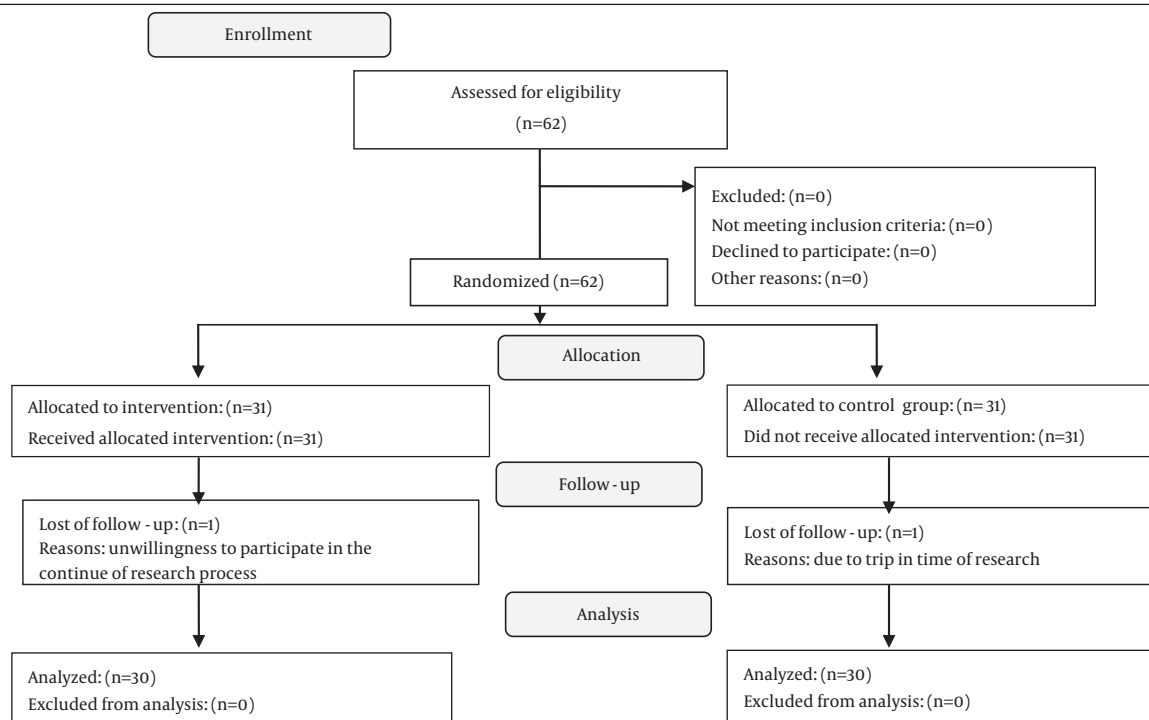


Figure 1. The Study Process

This research was confirmed by the Ethical Committee of AJA University of Medical Sciences and was registered in database of Iranian registry of clinical trials under code IRCT2014081118763N1. The ethical principles mentioned in Declaration of Helsinki were observed (19). The observed ethical considerations included receiving informed consent, justification the subjects about the research and its goals, observance of information confidentiality principle, and freedom of the subjects to give up study at any time of the research.

The data was analyzed by SPSS software. Since the results of Kolmogorov-Smirnov test indicate normality of data ( $P > 0.05$ ), descriptive statistics (mean, standard deviation, frequency and percentage) and analytical statistics (independent t-test, paired t-test, chi-squared test and Fisher's

exact test) were used for analysis of data. A significance level of  $P > 0.05$  was considered.

#### 4. Results

The mean age of the studied subjects was  $47.83 \pm 8.29$  years (range: 17 - 64 years). It is necessary to note that the youngest subject was a 17-year-old teenager from one of the border cities of Iran who had amputated lower extremities due to explosion of mine left from the wartime. Of the subjects, 98.3% were male, 51.7% had high school degree and lower degrees, 61.7% had lower extremities amputation lower the knee, and 83.3% were covered by the foundation of martyrs and veterans affairs (FMVA). All the subjects used prosthesis. The two groups had no significant differences in terms of individual characteristics ( $P > 0.05$ ) (Table 1).

**Table 1.** Individuals' Properties in the Intervention and Control Groups<sup>a</sup>

Characteristics	Intervention Group	Control Group	P Value
<b>Age, mean <math>\pm</math> SD, y</b>	48.37 $\pm$ 4.48	47.30 $\pm$ 10.92	0.62 <sup>b</sup>
<b>Gender</b>			0.50 <sup>c</sup>
Male	30 (50.8)	29 (49.2)	-
Female	0 (0)	1 (100.0)	-
<b>Weight, kg</b>	80.33 $\pm$ 13.08	75.13 $\pm$ 9.97	0.08 <sup>b</sup>
<b>Education level</b>			0.15 <sup>c</sup>
< High school diploma	15 (48.4)	16 (51.6)	-
Academic degree	15 (51.7)	14 (48.3)	-
<b>Employment</b>			0.08 <sup>d</sup>
Employed	9 (50.0)	9 (50.0)	-
Service retirement	10 (50.0)	10 (50.0)	-
Medical retirement	9 (75.0)	3 (25.0)	-
Disabled	2 (20.0)	8 (80.0)	-
<b>Marital status before amputation</b>			0.66 <sup>c</sup>
Married	10 (45.5)	12 (54.5)	-
Single	19 (51.4)	18 (48.6)	-
<b>Marital status after amputation</b>			0.55 <sup>c</sup>
Married	29 (50.9)	28 (49.1)	-
Single	1 (33.3)	2 (66.7)	-
<b>Number of children</b>	2.00 $\pm$ 0.96	2.63 $\pm$ 1.60	0.07 <sup>b</sup>
<b>Living with people at present</b>			1.00 <sup>c</sup>
Wife	2 (50.0)	2 (50.0)	-
Wife and children	26 (50.0)	26 (50.0)	-
Parents	2 (50.0)	2 (50.0)	-
<b>History of captivity</b>			0.33 <sup>c</sup>
Yes	0 (0)	1 (100.0)	-
No	28 (49.1)	29 (50.9)	-
<b>Amputation level</b>			0.59 <sup>c</sup>
One lower extremity			-
Above knee	2 (50.0)	2 (50.0)	-
Through knee	0 (0)	1 (100.0)	-
Below knee	18 (48.6)	19 (51.4)	-
Two lower extremity			-
Below knee	1 (25.0)	3 (75.0)	-
One below and one above knee	1 (100.0)	0 (0)	-
Concurrent amputation of the lower extremities and other handicaps	8 (61.5)	5 (38.5)	-

<b>Percentage of sacrifice</b>			0.15 <sup>c</sup>
0% - 25%	2 (100.0)	0 (0)	
26% - 49%	11 (57.9)	8 (42.1)	
50% - 75%	14 (41.2)	20 (58.8)	
75% <	4 (80.0)	1 (20.0)	
<b>Time living with prosthesis, y</b>	23.35 ± 7.14	21.35 ± 8.90	0.34 <sup>b</sup>
<b>Known physical disease</b>			0.79 <sup>c</sup>
Yes	16 (51.6)	15 (48.4)	
No	14 (48.3)	15 (51.7)	
<b>Daily physical activity, h</b>	6.60 ± 2.55	6.77 ± 2.70	0.80 <sup>b</sup>
<b>Supported by Foundation of Martyrs and Veterans Affairs</b>			0.48 <sup>c</sup>
Yes	24 (48.0)	26 (52.0)	
No	6 (60.0)	4 (40.0)	
<b>Total No.</b>	30	30	

<sup>a</sup>Data are presented as No. (%) or mean ± SD.

<sup>b</sup>Independent t-test.

<sup>c</sup>Fisher's exact test.

<sup>d</sup>Chi-squared test.

**Table 2.** The Mean and Standard Deviation of Adaptation and the Four Modes in the Two Groups<sup>a</sup>

Modes of Adaptation	Group		Independent Sample t-test (P Value)
	Intervention	Control	
<b>Pre-test</b>			
Physiologic	56.33 ± 7.60	54.23 ± 8.37	0.31
Self-concept	41.23 ± 4.98	39.23 ± 6.21	0.17
Role function	19.03 ± 2.57	18.13 ± 3.80	0.28
Interdependence	17.03 ± 2.25	16.73 ± 2.61	0.63
Total adaptation score	133.63 ± 12.49	128.33 ± 17.34	0.18
<b>Post-test</b>			
Physiologic	60.26 ± 5.45	53.73 ± 7.79	0.0001 <sup>b</sup>
Self-concept	42.10 ± 4.71	39.40 ± 5.67	0.05
Role function	20.30 ± 2.42	18.13 ± 3.18	0.004 <sup>b</sup>
Interdependence	16.76 ± 2.22	16.30 ± 2.57	0.45
Total adaptation score	139.43 ± 10.87	127.56 ± 14.55	0.001 <sup>b</sup>

<sup>a</sup>Data are presented as mean ± SD.

<sup>b</sup>Significant at the  $P < 0.05$ .

According to the results of the independent samples t-test, no significant differences were found in the mean total score of adaptation as well as in the four modes in the intervention and control groups before the education ( $P < 0.05$ ). However, this test revealed a statistical difference for the mean scores of physiologic ( $P = 0.0001$ ) and role function modes ( $P = 0.004$ ) as well as the total score of adaptation ( $P = 0.001$ ) between the two groups after the education (Table 2). The results of paired t-test showed that the total score of adaptation ( $P = 0.006$ ) as well as the scores of the physiologic ( $P = 0.001$ ) and role function ( $P = 0.01$ ) modes in the intervention group in the pre-test and post-test were significantly different, whereas the scores of self-concept ( $P = 0.21$ ) and interdependence ( $P = 0.44$ ) modes in the two stages did not have significant differences. This test did not show statistically significant

differences in total score of adaptation ( $P = 0.64$ ) and modes of physiologic ( $P = 0.63$ ), self-concept ( $P = 0.79$ ), role function ( $P = 1.00$ ), and interdependence ( $P = 0.32$ ) in control group in the stages of pre-test and post-test ( $P < 0.05$ ).

## 5. Discussion

The present research was conducted to determine the effects of RAM-guided education on promoting the adaptation of veterans with lower extremities amputation. The results indicated that intervention and control groups did not have statistically significant differences in terms of adaptation score and modes of RAM ( $P < 0.05$ ) before the intervention, which indicated the homogeneity of the two groups.



After the intervention, the two groups had a statistically significant difference in terms of physiologic mode. Therefore, the scores in the intervention group were higher than the control group. In addition, the results of paired t-test showed a statistically significant difference between the scores of physiologic mode in the intervention group before and after the intervention and led to an increase in the score of this mode. This case indicated the effectiveness of RAM-guided education in the intervention group and in increasing their adaptation level in the physiologic mode. Similar results have also been reported in other studies which are in line with the results of this research (10, 15, 16, 20-22).

The present study showed that RAM-guided intervention had a significant effect on the patients' role function. RAM-guided education increases patients' knowledge, better controls the situation, and consequently promotes the role function. Similar findings regarding the impact of nursing education on role function (10, 15, 16, 20-22) confirm our finding.

In the current study, after the intervention, the two groups did not have any statistically significant difference in terms of self-concept mode. Unlike this finding, a significant improvement was reported in self-concept of patients with hemodialysis and (chronic obstructive pulmonary disease) COPD after conducting RAM-guided patient education (15, 16). Naeim Hassani et al. in a study on effect of educational program based on RAM on mental adaptation of patients with heart failure also showed significant decrease in the number of maladaptive behaviors in the self-concept of the intervention group (22).

Our intervention could not increase the score of dependence/interdependence mode. There are controversy findings in this regard. Our finding is similar to some studies (15, 16) and is different from some others (22). Likely, the reasons for lack of significant effect of the educational plan in these modes are short-term educational course and follow-up period. It seems that if the educational plan is executed in a longer term and experiences of other healthcare personnel such as psychologists and social workers are used, there may be more evident changes in adaptation of patients in these modes. In fact, there is need for more specialized interventions to achieve more changes in modes, particularly self-concept and interdependence modes. These patients need more social, family and emotional supports and execution of many interventions was beyond the capacity of the researcher considering the term of study. It is necessary to note that the score obtained in all the modes and the total score of adaptation in the intervention group were higher than those of the control group. Generally, the results of this research indicated that RAM-guided education increased adaptation in veterans with lower extremities amputation. The obtained results emphasized on the successive educational courses in a proper manner after amputation. This plan can increase the feeling of usefulness and the activity level in this group of patients, after which, adaptation will increase.

Considering that imposed war victims are covered under the insurance of the Armed Forces and are supported by the FMVA, their occupational and economic problems have been adjusted to some extent. However, the increase and continuity of mental and physical supporting actions such as education, timely treatment, and counseling services can considerably help them. The recognition of the adaptation sources in the veterans and their reinforcement for more adaptation to disease can promote health and finally improve their quality of life.

One of the limitations of this research was the nonrandom sampling, which introduced a potential for sampling bias. One of the other limitations was the short term of the course and follow up and small sample size. It is recommended that similar studies replicate with larger sample sizes and long-term follow-ups. An additional limitation was using self-report questionnaire, which could lead to response bias. Considering that Iran-Iraq war was ended many years ago and there might be adaptation over time, attempt was made in this study to use the people who had amputated extremities recently during elimination of minefields, through which this limitation can be controlled to some extent. Unfortunately, such persons did not refer to the research place during the study.

The findings of the present study showed that RAM-guided education given to the veterans with lower extremities amputation had a positive effect on their physiologic and role-function modes as well as on the total score of adaptation. However, as to self-concept and interdependence modes, it did not confirm to be completely effective. The present research can be regarded as a basis of future studies. Considering the results of this research, it is recommended to study the effects of RAM-guided education on quality of life and adaptation of other veterans and their families.

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## Footnotes

**Authors' Contributions:** Zahra Farsi contributed in planning, analysis of data and critical revision of the paper. Somayeh Azarmi was involved in planning, data collection, and writing the initial draft of the paper. Zahra Farsi supervised this study. All the authors read and approved the final manuscript.

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