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Comparison of the Effects of Educational Software and Training Booklet on Maternal Self-efficacy and Infant Care Behavior in Iranian Mothers: A Randomized Controlled Trial

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Abstract

Background: To achieve the optimal care of baby, mothers need to have sufficient self-efficacy in infant care. This study aimed to compare the effects of educational software and training booklet on the maternal self-efficacy and infant care behavior.

Materials and Methods: This randomized controlled trial was done on 126 Iranian pregnant women. The Participants were assigned into two intervention groups (42 women received software and 42 women received booklet) and a control group (42 women received routine trainings) through block randomization. A training session was provided orally to the participants in both intervention groups. Then they were provided with the booklet or software. The questionnaires of standard maternal self-efficacy and researcher-made infant care behavior were completed before intervention and at the end of the fourth week of postpartum.

Results: Before the intervention, there was no significant difference in terms of the mean scores of the maternal self-efficacy (P=0.192) and infant care behavior (P=0.937) between groups. Controlling the baseline values, a statistically significant increase was observed in the mean scores of the maternal self-efficacy in the booklet group (mean difference: 3.7; 95% Confidence Interval: 2.2 to 5.2) and software group (2.5; 1.0 to 3.9) compared to the control group; however, no statistically significant difference was observed between the two intervention groups. In addition, there was no statistically significant difference in the infant care behavior mean score between the groups at the end of the study (P=0.398).

Conclusion: The results indicate the effectiveness of both the software and booklet in enhancing the maternal self-efficacy. The effect of booklet was more compared to the Educational Software, but not statistically significant.

Key Words: Booklet, Behavior, Educational Software, Infant, Maternal Self-Efficacy.

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1- INTRODUCTION

The concept of "care" is quite subjective and complex (1), so that no health and treatment can be existed without care, and almost more than half of the health care services include the care, while there is care without treatment (2). To achieve the optimal care of baby, mothers need to have adequate and sufficient self-efficacy in infant care (3). Increasing the information and capability of mothers about the infant care leads to the improved living environment of infant and children and reduces the number of children who are exposed to damages caused by the improper functioning of parental roles (4). However, only knowing how to do these tasks is not enough to perform them in a successful way. Other variables also affect the realization of these processes; among these variables are parental self-efficacy and awareness of the child development; these variables have been introduced as the good indicators of appropriate parental behavior of parents (5). Self-efficacy refers to individuals' belief in their abilities for the certain levels of a specific performance (6) and it's an important concept in Bandura's social cognitive theory (7).

Self–efficacy is one of the main determinants of the human behavior which affects individuals' expectations and choices, their hope and level of effort and perseverance, their persistence in opposing the difficulties and problems, and their vulnerability to depression (8). Maternal self-efficacy refers to the mother's self-belief in her own abilities to be an efficient mother and it's strongly affected by the maternal sense and the level of mother's self-confidence and the level of understanding of her competence (9). Self-efficacy is one of the most important indicators in a successful transition to the motherhood role and a predictor of the behavior of the mother. According to the Bandura's theory, the level of self-efficacy and capability of mothers can be improved through adopting appropriate strategies and educational interventions to achieve the required knowledge and skills; training courses will help women to become familiar with parenting experiences that ultimately lead to an increase in the quality of the family life (3). Several training methods have been used to educate people; however, some problems such as lack of the trainers, the necessity for continues presence in the classes and the existence of educational facilities in that area and access to the new educational technologies has caused to the spread of the virtual training methods by the use of educational software (10, 11). In electronic training, the clients can get face to face or distance information and individuals learn how to learn (12). Furthermore, this method has no time and place limit and sometimes working mothers who don't have enough time to refer to the clinic, can learn the materials without the anxiety (13).

The results of the study conducted by Kuo et al. (2009) showed that the e-learning program has been more effective than the routine care methods in infant care (14). In addition, the study done by Mohammadi Rizi et al. (2013) indicated that e-learning can increase the women’s satisfaction from postnatal cares (15). The results of other study in Iran indicated that e-learning and educational booklet are effective in enhancing mothers' childbirth self-efficacy (16). Other studies have also studied the impact of different educational methods (17-20). Also, the results of other study conducted in Iran showed the effect of computer-based education on self-efficacy of pregnant women to cope with labor (21). Unfortunately, the client education program is not in a desirable status in Iran and patient training is not performed or runs in an irregular manner (22). According to the best of the researcher's knowledge, no study has been carried out in Iran in this regard. Considering the

effect of promoting the quality of education on maternal and newborn health (14), the present study aimed to compare the effects of educational software and training booklet on the maternal self-efficacy and infant care behavior (primary outcomes) in primiparous mothers. The results of secondary outcomes of this research have been published in other article (23).

2- MATERIALS AND METHODS

2-1. Study design and participants

This study was a randomized controlled clinical which was conducted on 126 pregnant women referred to the health centers of Miandoab city-West Azerbaijan province, Iran, from February 2016 to May 2016. The inclusion criteria included: having desire to participate in the study, having the literacy level of reading and writing at least, being at the 36 to 38th week of pregnancy, being primiparous, a singleton pregnancy, access to computer, and the ability to work with the computer. The exclusion criteria consisted of: the existence of mental illness in mothers according to their statements, the high-risk pregnancy based on the records of pregnancy care, and giving birth to infants hospitalized in the Neonatal Intensive Care Unit (NICU) or an abnormal baby.

According to the study of Jafarnezhad et al. (2014) (24), the sample size was calculated using the G-power Software based on the maternal self-efficacy, by considering the m_1= 176.8, sd_2= sd_1=34.4 and with the default increase of 15% in the score of self-efficacy due to the intervention (m_2= 203.32), α = 0.05, power=95% equal to 38 individuals that after taking in to account the 10% loss, the final sample size was considered 42 individuals in each group.

2-2. Sampling

After approving the project and getting the code of ethics from the ethics committee of Tabriz University of Medical Sciences (ethics code: TBZMED.REC.1394.344) and recording on the randomized clinical trial site of Iran with the number of IRCT.2015071410324N23, the sampling was started. This study was conducted in the health centers of Miandoab city, West Azerbaijan province, Iran. The researcher referred to the health centers and extracted the names of the 36 to 38 week pregnant women. Then the pregnant women were called and the objectives and the methods of the study were briefly explained to them and they were offered to participate in the study. The individuals who had desire to take part in the study were asked to be present in a day and a specific time at a certain health center.

At the in person meeting, the goals and methods of the study were fully explained to them and the women were investigated in terms of the inclusion and the exclusion criteria. After confirming the qualification, they were asked to fill out a written informed consent; then the questionnaires of the socio-demographic and obstetrics characteristics, the maternal self-efficacy and the infant care behavior were filled out by interviewing with the participants. The participants were followed up until fourth weeks after the childbirth and at the end of the fourth week, the self-efficacy and the infant care behavior questionnaires were completed by the three groups of participants. Since the intervention was of an educational type, it was not possible to blind the researcher; therefore, to reduce the bias, the co-researcher completed the fourth week questionnaires through the interview with the mothers.

2-3. Randomization and Intervention

The participants were assigned into the two intervention groups (42 mothers received training with the electronic software and 42 mothers received training through the booklet) and a control group (42 mothers received routine training after the childbirth) using a randomized

blocking method with the block sizes of 3 and 6 and with the allocation ratio of 1:1:1. Blocking was performed by an uninvolved individual in the sampling and data collection. For allocation concealment, the type of the received intervention was written on a piece of paper and was put in consecutively numbered opaque envelopes. The envelopes were opened in the order of the entry of the participants into the study and the specified intervention was performed. If the participants were placed in the intervention groups, an oral face to face training session was presented to them at the health center by the researcher. Then, the participants were provided with the training booklet or the electronic software.

The educational electronic software was developed by the Ministry of Health of Iran and its contents includes information about the nutrition, care of the umbilical cord, baby covering and dressing, bathing, risk symptoms of the infancy, etc. The software was presented in easily understandable language with sound and photos demonstrating the infant care. The playing length of software was 72 minutes. Before the educational software was delivered to mothers, the necessary instructions in order to use it were presented by the researcher (first author). The booklet was also formulated by the researchers with the same educational contents of software consisted of a sixteen page of texts and colored images. The booklet was written at a level in which all participants could easily read and understand it. The phone number of the researcher (first author) was given to participants of three groups in order to answer their questions.

The participants were asked to refer to the health centers at the end of the fourth week after the childbirth. At the end of the second and third week after the childbirth, the participants of the intervention groups were called and reminded about the study of the booklet and the electronic software. After the completion of the study, the electronic software or the training booklet were also given to the mothers in control group.

2-4. the Data Collection Tools

The data collection tools included the socio-demographic and obstetrics characteristics, the infant care behavior and the maternal self-efficacy questionnaires.

The socio-demographic and obstetrics characteristics questionnaire consisted of some questions about the age, education level of the mother and the spouse, mother's and spouse's occupations, level of income, housing status, planned pregnancy, the desired sex of the fetus, the desired sex of the fetus by the spouse, having help in keeping the baby and supporting individuals of the mother.

The infant care behavior questionnaire was developed by the research team and based on the educational contents. It was consisted of 22 items and scored based on a 4 point Likert scale from always (4), often (3), sometimes (2), and never (1). The scores ranged from 22 to 88. The validity of the infant care behavior questionnaire was measured by the content validity index (CVI) and the content validity ratio (CVR) and the CVI and CVR were calculated 0.95 and 0.99, respectively. The reliability of the questionnaire was tested through a test-retest on 20 primiparous women and the Cronbach's alpha coefficient and the ICC (Intra-class Correlation Coefficient) were equal to 0.76 and 0.85, respectively.

The maternal self-efficacy questionnaire (MSQ), is a specific tool to measure the maternal self-efficacy which has been used in many studies. It has focused more on the mother's tasks in the care of babies and includes 10 items; 9 items are related to the mother's activities and 1 item is general. It is based on a 4 Likert scale (1-

Worse than the others, 2- Almost worse than the others, 3- As well as the others, 4- Better than the others). The highest score represent a higher maternal self- efficacy. The psychometrics of this questionnaire has been implemented by Mirghafourvand et al. (2016) (25). In the present study, the reliability of this questionnaire was measured on 20 primiparous mothers using the test-retest that it's Cronbach's alpha coefficient and the ICC were calculated equal to 0.82 and 0.89, respectively.

2-5. Ethical approval

All procedures performed on participants were in accordance with the ethical standards of the research committee of Tabriz University of Medical Sciences and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

2-6. Analysis of the Data

The collected data was analyzed using the SPSS version 20.0. The Kolmogorov–Smirnov test was applied to determine the normality of the quantitative data. To investigate the homogeneity of the two intervention groups and the control group in terms of the socio-demographic characteristics, the Chi-square and Chi-square for trend tests, Fisher's exact test, and one-way ANOVA were used. One-way ANOVA was applied to compare the mean scores of the maternal self-efficacy and the infant care behavior between the studied groups before the intervention; and after the intervention, ANCOVA test was used with controlling the baseline scores. The paired t-test was used for intra-group comparisons.

3- RESULTS

This study began in January 20, 2016 and finished in May 20, 2016. A total of 250 pregnant women were evaluated in terms of the inclusion and exclusion criteria. Among them, 126 individuals were qualified for the entrance into the study that they were assigned into the three groups of 42 individuals. The pregnant women were followed up for up until the four week after the childbirth and there was no loss in any of the groups (**Figure.1**). The mean (SD) age of the pregnant women in the educational software, the training booklet, and the control groups were 28.78 (5.2), 28.09 (5.68), and 28.61 (4.49) years old, respectively. All the three groups were similar to each other in terms of the obstetrics and socio-demographic characteristics except the level of education of participants and their husbands and the spouses' interest to the sex of the fetus, that these three variables were also adjusted in the statistical test (**Table.1**).

Before the intervention, there was no statistically significant difference in the mean score of the maternal self-efficacy (P=0.192). The mean score (SD) of the self-efficacy in the electronic software group increased from 32.9 (2.9) before the intervention to 35.0 (2.6) (min: 30, max: 40) in fourth week after the childbirth. In the booklet group, this amount was also increased from 32.8 (4.0) before the intervention to 36.2 (3.3) (min: 30, max: 40) in fourth week after giving birth; this amount was 31.7 (3.0) before the intervention and 32.3 (2.5) in fourth week after the childbirth (min: 38, max: 37) (**Table.2**).

Based on the general linear model and by controlling the baseline values, there was a significant increase in the mean score of the maternal self-efficacy in the booklet group (Adjusted Mean Difference: 3.7; Confidence Interval (CI) 95%: 2.2 to 5.2) and in the electronic software group (2.5; 1.0 to 3.9) compared to the control group. But no statistically significant difference was observed between the two groups of the booklet and the electronic software at the end of the fourth week after the childbirth (P=0.133). According to paired

t-test, the effect of booklet was more than other two groups (Mean difference= -3.4, 95% CI= -4.8 to -1.9) (**Table.2**). Before the intervention, there was no statistically significant difference between the mean score of infant care behavior between the three groups (P=0.937). The mean score of the infant care behavior in the electronic software group decreased from 36.6 (6.0) before the intervention to 34.6 (5.7) in fourth week after giving birth (min: 23, max: 47). In the booklet group, this amount decreased from 36.6 (6.3) to 33.6 (2.5) (min: 27, max: 39) at the same period. In the control group, this amount was equal to 36.2 (6.4) before the intervention and 34.2 (3.1) (min: 28, max: 39) at the end of the fourth week of the childbirth. Based on the general linear model and by controlling the baseline values, there was no statistically significant difference between the intervention groups and the control group in terms of the infant care behavior's mean score (P= 0.556). Based on paired t-test, the infant care behavior score decreased after intervention in all three groups (**Table.3**).

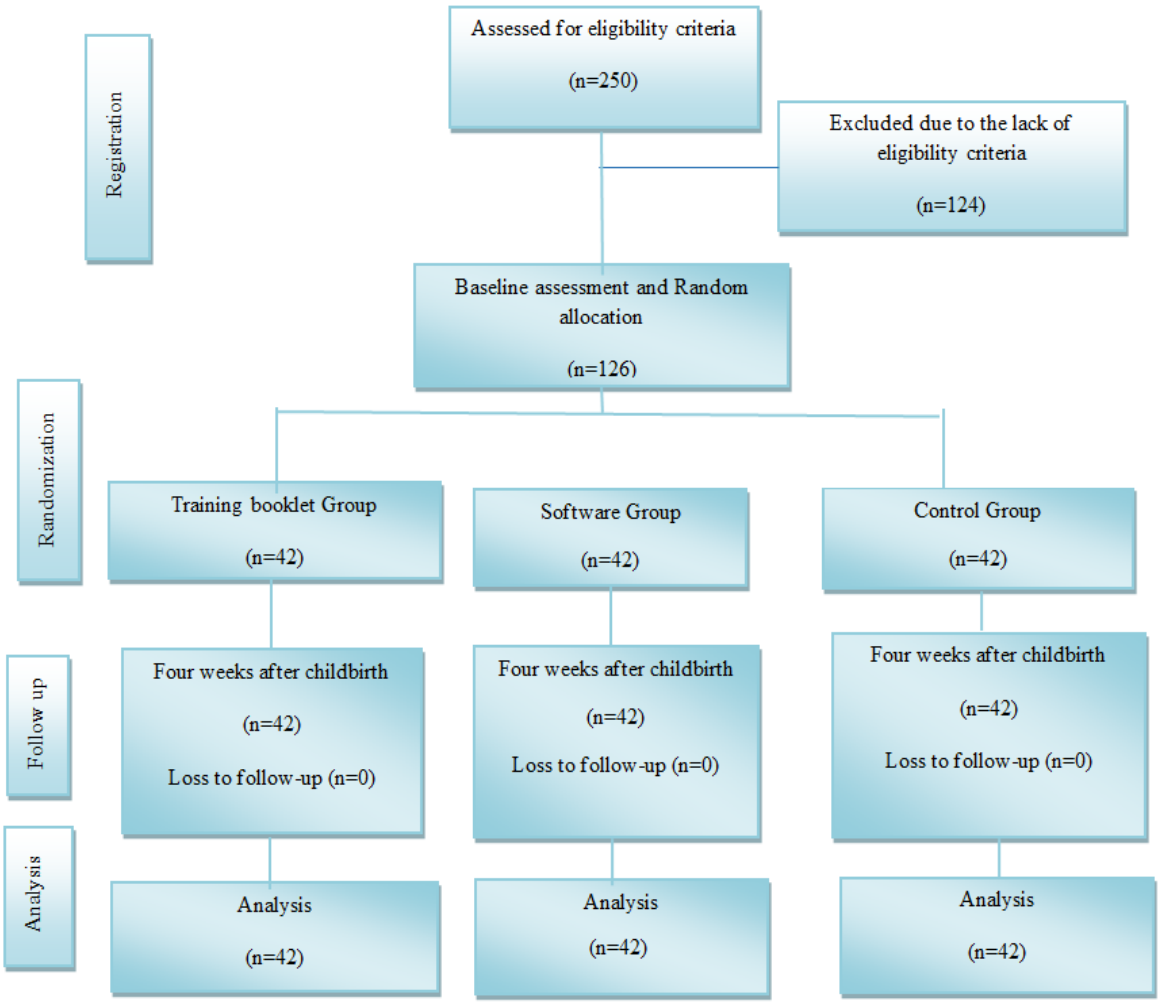

Fig.1: Study flowchart

Table-1: Socio-demographic and midwifery characteristics in study groups

Variables	Booklet n=42 Number (Percent)	Software n=42 Number (Percent)	Control n=42 Number (Percent)	P-value
Age*, year	28.1 (5.7)	28.8 (5.2)	28.6 (4.5)	0.815†
Education				
Secondary school	45.2 (19)	33.3 (14)	19.0 (8)	0.001§
High school	16.7 (7)	28.6 (12)	9.5 (4)	
Diploma	38.1 (16)	21.4 (9)	52.4 (22)	
University	0 (0)	16.7 (7)	19.0 (8)	
Spouse's level of education				
Primary school	30.9 (13)	23.8 (10)	4.8 (2)	0.008§
Secondary school	33.3 (14)	21.4 (9)	19.0 (8)	
Diploma	19.0 (8)	35.7 (15)	38.1 (16)	
University	16.7 (7)	19.0 (8)	38.1 (16)	
Job				
Employed	5.4 (2)	12.9 (5)	9.6 (4)	0.722‡
Housewife	94.6 (35)	88.1 (37)	90.5 (38)	
Spouse's job#				
Employee	16.7 (7)	)19.0 (8	19.0 (8)	0.366‡
Self-employed	83.3 (35)	)81 (34	81 (34)	
Income adequacy				
Income more than expenditure	16.7 (7)	4.8 (2)	9.5 (4)	0.052§
Expenditure more than income	59.5 (25)	47.6 (20)	28.6 (12)	
Equal income and expenditure	40.5 (17)	47.6 (20)	61.9 (26)	
Planned pregnancy	85.7 (36)	85.7 (36)	90.5 (38)	0.751‡
Desired fetal sex	78.6 (33)	90.5 (38)	3.83 (35)	0.323‡
Desired fetal sex according to the husband	81.0 (34)	100.0 (42)	90.5 (38)	0.012‡
Having help in neonatal care	66.7 (28)	73.8 (31)	78.6 (33)	0.465‡
Mother's supporters				
Mother	60.7 (17)	35.5 (11)	36.4 (12)	0.450‡
Mother-in-law	14.3 (4)	32.3 (10)	33.3 (11)	
Spouse	17.9 (5)	19.4 (6)	18.2 (6)	
Other **	7.1 (2)	12.9 (4)	12.1 (4)	
Receiving education on newborn care	59.5 (22)	47.5 (19)	67.5 (27)	0.190‡

* Numbers are expressed based on number (percentage) unless they are shown using * (mean and standard deviation). † One-way ANOVA; ‡ Chi-square; § Chi-square for trend; # There were two women in the software group whose husband had no job; ** Sister or sister-in-law or newborn sitter.

Table-2: Comparing the mean score of maternal self-efficacy in study groups

Group	Before intervention Mean (SD) †	After intervention Mean (SD) †	Intra-group comparison* MD (95% CI)‡
Booklet (n=42)	32.8 (4.0)	36.2 (3.3)	-3.4 (-4.8 to -1.9)
Software (n=42)	32.9 (2.9)	35.0 (2.6)	-2.1 (-3.2 to -3.7)
Control (n=42)	31.7 (3.0)	32.3 (2.5)	-0.5 (-1.5 to 0.4)

P-value	0.192		<0.001	
Comparing groups	MD (95% CI)‡	P-value	MD (95% CI)‡	P-value
Booklet with Software	0.1 (-1.6 to 1.3)	0.871	1.2 (-0.2 to 2.7)	0.133
Booklet with Control	1.1 (-0.3 to 2.5)	0.137	3.7 (2.2 to 5.2)	<0.001
Software with Control	2.7 (1.3 to -4.2)	0.100	2.5 (1.0 to 3.9)	<0.001

* Paired t-test; One-way ANOVA test was used to compare t groups before the intervention and the general linear model was used to investigate group's differences by controlling baseline scores and level of education of participants and their husbands after the intervention; †Mean (Standard Deviation); ‡Mean difference (95% Confidence Interval).

Table-3: Comparing the mean score of Infant care behavior in study groups

Group	Before intervention Mean (SD)†		After intervention Mean (SD)†	Intra-group comparison* MD (95% CI)‡
Booklet (n=42)	36.6 (6.3)		33.6 (2.5)	2.9 (1.2 to 4.6)
Software (n=42)	36.6 (6.0)		34.6 (5.7)	2.0 (1.0 to 3.0)
Control (n=42)	36.2 (6.4)		34.2 (3.1)	2.0 (0.0 to 4.0)
P-value	0.937		0.556	
Comparing groups	MD (95% CI)‡	P-value	MD (95% CI)‡	P-value
Booklet with Software	0.0 (-2.7 to 2.7)	1.000	-0.9 (-2.7 to 0.8)	0.466
Booklet with Control	0.4 (-2.3 to 3.1)	0.775	-0.7 (-2.4 to 1.1)	0.720
Software with Control	0.4 (-2.3 to 3.1)	0.775	0.3 (-1.5 to 2.0)	0.975

*Paired t-test; One-way ANOVA test was used to compare t groups before the intervention and the general linear model was used to investigate group's differences by controlling baseline scores and level of education of participants and their husbands after the intervention; †SD:Standard Deviation;‡Mean difference (95% Confidence Interval).

4- DISCUSSION

The results of the present study indicated a statistically significant increase in the maternal self-efficacy mean score of the two intervention groups (the booklet and the electronic software groups) compared to the control group at the end of the fourth week after the delivery; however, no statistically significant difference was observed between the groups at the end of the fourth week after the childbirth in terms of the infant care behavior mean score. In the present study, both the electronic and the booklet training methods were effective in improving the maternal self-efficacy. The study of Hamzehkhani et al. (2014) on the effect of a computer training program on the self-efficacy of pregnant women in coping with the childbirth showed that the mean score of the self-efficacy is significantly higher in the experimental group than the control group after the intervention. These researchers confirmed the effectiveness of the computerized educational program in increasing the self-efficacy of pregnant women to cope with the labor (21). In this regard, it's in line with the result of the present study. The results of a randomized controlled trial on 136 primiparous women showed that a training package (including a face to face training session, three phone sessions, and a booklet) had a positive effect in increasing mothers' self-confidence and improving their functional status (26). The study of Asadollahi et al. (2016) on the comparing the effect of simulation and video-based education on mothers' self-efficacy in bathing preterm infants showed that both simulation and video helped the mothers to increase their self-efficacy in bathing preterm infant (27). Furthermore, Fonseca et al. (2012)

have also stressed the need for providing the training packages with the contents of the daily care of the baby, feeding, health care, special care of infant in the case of illness, and family relations (28). In the present study, an increase was observed in the infant care behavior mean score of the three groups (the electronic software group, the booklet group and the control group) after the intervention but these differences were not statistically significant. Kuo et al. (2009), in the study conducted to determine the effectiveness of e-learning in infants care in primiparous women in the third trimester of pregnancy, showed that e-learning program is more effective than the routine training (14).

Farris et al. (2013) investigated the effects of the educational intervention on mothers of toddlers with behavioral problems and maternal adjustment in the three intervention groups including the training booklet, face to face training, and the electronic booklet and training; they concluded that mothers' behavior problems decreased in all groups and the greatest improvement was observed in the third group due to the use of both the booklet and the electronic training in this group (29). While in the present study, two different training methods were applied (booklet in one group and electronic training in other group) in two intervention groups, they showed the similar results. The observed increase in the infant care behavior mean scores of the three groups may be due to increase of a mother's experience and also improvement of her self-efficacy and self-confidence overtime. In a study, Krouse (2002) showed that through combining the visual and auditory information, video is an effective educational tool for patients to raise their knowledge, easy understanding and maintenance of information, reducing the anxiety and increasing the self-care behaviors (30). Mohammadi-rizi et al. (2013) (15) carried out a prospective and quasi-experimental study to determine the impact of e-learning on satisfaction of primiparous women with the postpartum cares. They showed that e-learning package and pamphlets can increase the level of awareness about the postpartum cares, therefore, planning and establishing of this type of education was recommended as an effective training method. In addition, the results of the Mohammadi-rizi et al.'s study showed that the women's awareness of the postnatal care of infants is at a low level and this can hinder mothers in recognizing the risk factors and consequently will lead to the weakness in their performances. The results of a study aimed to determine the effect of a training program based on the online electronic software on the knowledge and attitude of pregnant women done in Taipei showed that the scores of knowledge and the attitude towards breastfeeding increased in the intervention group compared with the control group and there was a statistical significant difference between the two groups (13).

Since mothers are responsible for the infants' and their own health in the postpartum period and client education is one of the most important central components of the health care centers, and on the other hand, with the increasing development of Information, Communication, technology (ICT), all aspects of human life have been intentionally or unintentionally influenced; therefore, the use of e-learning and educational booklets in mother and infant cares seems essential. Among the strengths of the study is the comparison of the effects of the two training methods (through the booklet and the electronic software) on the maternal self-efficacy and the infant care behavior of primiparous mothers. In addition, the observing of all principals of randomized controlled trials such as random allocation and

concealment of the allocation is the other strengths of the study. It is recommended to consider longer follow-up periods in measuring the maternal self-efficacy and the infant care behavior variables. Given the significant impact that the social support of a spouse has on the improvement of the mother-child outcomes, it is recommended to provide the spouses with the training packages (booklets, electronic software, pamphlets, etc.) to raise their infant care awareness. As well as it is recommended to provide mothers the various forms of educational support and training to improve self-efficacy and effective infant care practices.

4-1. Limitations of the study

One of the limitations of this study was the short follow-up period. Thus a longer follow-up period in the future studies was suggested. Also, infant care behavior questionnaire wasn't standard questionnaire and was a researcher-made questionnaire. Thus, for reducing the effect of this limitation, the indices of content validity (CVI and CVR) and reliability of this questionnaire were determined before starting the study.

5- CONCLUSION

The results indicate the positive effects of both the electronic software and the training booklet on the improvement of the maternal self-efficacy. Therefore, all forms of training (booklets, electronic software, and etc.) should be offered to parents to increase the likelihood of effectiveness especially given the variability learning preferences/styles and educational backgrounds as well as parents are recommended to use these training methods to enhance the health care of their babies.

6- CONFLICT OF INTEREST

The authors declare no conflict of interest.

7- ACKNOWLEDGMENTS

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