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The effectiveness of simulation training in obstetric emergencies: A meta-analysis

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Abstract:

Role of clinical skill training in the formation of skills and professional competencies of midwifery students is important. Hence, the use of “training new methods are essential in clinical settings.” This study aimed at determining the effectiveness of simulation training in obstetric emergencies. In this meta-analysis study, international databases of Web of Science, Scopus, Proquest, and PubMed and Iranian databases such as Irandoc, Magiran, and SID were searched for studies published between 2000 and 2020 using related keywords. Based on the consortium checklist, the full text of the selected articles was reviewed and in case of a specific score, the article was analyzed. The results show that, out of 420 studies after applying the inclusion and exclusion criteria, only nine clinical trial articles were reviewed. Studies were conducted in Iran, the United States, France, China, and Chicago. The results of meta-analysis showed that the simulation training method can be effective in managing midwifery emergencies. Hence, the use of simulation training method can be effective in various areas of learning related to obstetric emergencies.

Keywords:

Educational method, midwives, obstetrics emergency, simulation, student

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Introduction

One of the fields of study related to medical sciences which tends to improve health and wellness in human society is midwifery.^[1] Midwifery is one of the occupations that aims to ensure the health of mothers and infants and to maintain and promote community health.^[2] In general, more than 80% of direct patient care in the maternity ward and gynecology ward is performed by midwives.^[3] Midwives need to acquire clinical skills and professional standards during their studies so that they will be able to serve in the midwifery profession.^[4] Clinical practice is what medical students and medical staff do in dealing with the patient at the office and patient's bed.^[5] If midwives are competent in diagnosing pregnancy and natural childbirth, diagnosing

activities and taking appropriate measures to diagnose high-risk cases and if necessary, timely referral to a specialist, the maternal mortality rate will be significantly reduced and thus arrangements also save government spending.^[6] Considerable attention has been given to the health of women and children, especially mothers, by the WHO to ensure the health of the people all around the world.^[5] Iran has achieved these MDG goals in 2015 and the maternal mortality rate was 25 deaths per 100,000 livebirths. However, it is still a long way from developed countries.^[7] Many studies have shown that the quality of care and clinical skills of midwives is not appropriate. Farrokhi *et al.* (2009) reported that the quality of midwifery care provided by midwives is only 55% good.^[8] Using a variety of training methods such as role playing, accuracy, and speed techniques, electronic and virtual education and simulation are learner-based educational

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methods. These methods can increase individuals' awareness and knowledge and also improve their clinical performance.^[9-12] One of the new educational methods is simulation. Simulation educational environments create a suitable educational environment, without harming the patient; moreover, they can promote clinical skills and cooperation among students. In the simulation method, the problem is presented and taught to the students like a comprehensible reality, therefore, the student learns the problem and offers new solutions.^[13]

Materials and Methods

Study design and setting

A meta-analysis study was conducted by researcher to identify the effectiveness of simulation training in obstetric emergencies.

Data collection tool and technique

In order to access the study on the subject under study, a search was conducted between 2000 and 2020 in reputable Persian and English databases including Magiran, SID, Google Scholar, ProQuest, Web Of Sciences, PubMed, and Scopus. To access all articles in Persian and English including simulation, midwifery emergency and high-risk pregnancy were used. It should be noted that the search for these keywords in the title and abstract of the article is limited. In addition, various experimental and quasi-experimental studies were selected. In detail, the method was as follows: first, a list of titles and summaries of the articles were prepared. The main inclusion criteria for these studies in the present review study were published articles with clear objectives, methodology, and results. Exclusion criteria also included conference papers, letters to the editor, and insufficient data on the papers. First, based on the search strategy and the keywords, a list of all the articles in the databases was prepared. The titles of the articles searched by the authors were reviewed, and duplicated articles were excluded. Then, the titles and abstracts of the reviewed articles and unrelated articles were discarded. Then, the full text of the related articles was reviewed using consort checklist. Finally, the articles that had the highest score and were relevant to the purpose of the present study were selected and reviewed. In the next step, after choosing the selected articles, the researchers evaluated the articles in accordance with the 2010 CONSORT checklist. The 25-item CONSORT checklist consists of six general sections: 1 – title and abstract, 2 – introduction, 3 – methods, 4 – results, 5 – discussion, and 6 – other information. It is recommended that the results of each group are plotted and summarized in a flow chart. Articles that received a score of 15 or more from the CONSORT checklist were considered good quality and a score <15 was considered poor quality.^[14] Out of 78 articles, nine articles received 15 scores or

more. Two reviewers independently extracted data from the full text of the study. After extracting the data, the extracted data were reviewed again [Table 1]. In this study, the effect size was used to interpret and analyze the results. Cochran test and I2 index were used to determine the heterogeneity of the studies, and random-effects model was used in the case of statistical heterogeneity. To investigate the effect of simulation on midwifery emergencies, the difference between the mean numbers of samples to *P* value was used.

Ethical consideration

Ethical aspects of this study were approved by research deputy in Isfahan University of Medical Sciences (IR.MUI.RESEARCH.REC.1399.690).

Results

In the initial search, 420 articles were found, and after reviewing the titles and abstracts of the articles and removing duplicate and irrelevant items, 220 possible related articles were examined. From these 220 articles, 90 ones were excluded from the study due to noncompliance with the inclusion criteria, lack of access to the original article and insufficient information in the abstract, failure to report mean and standard deviation, and finally nine clinical trials were reviewed. The studies were experimental (clinical trial), and the characteristics of these studies are shown in Table 1.

The data were extracted from all studies and recorded in the computer using Excel software. After reviewing the eligible studies and extracting the desired information, the data were analyzed using R statistical software. Random- and fixed-effect statistical models were applied to analyze and integrate the results. The fixed-effects model assumes that all studies considered in the share treatment so that the met effects can be considered as a part of the same distribution. In the model with the default random effect, the effect of the treatment is not the same in different studies; therefore, the effect of the treatment varies from one study to the next and the main purpose of the meta-analysis is to estimate the mean. Finally, the evaluation of nine articles included in the meta-analysis was examined, which showed high heterogeneity with $I^2 = 89\%$, $df = 8$, and $Tau^2 = 0.794$. By observing the high heterogeneity, finally, all nine articles were included in the meta-analysis. The results of the meta-analysis showed that there was no statistically significant difference between the intervention and control groups ($P = 0.182$) [Figures 1 and 2].

Discussion

The results of the study showed that simulation training method can be effective on the performance

Table 1: Summary of experimental studies conducted on the effect of simulation training method on midwifery emergencies in Iran and the world

Author/year of reference	Country	Method	Samples	Obstetrics emergencies	Results
Gonzalves <i>et al.</i> (2018) ^[15]	France	Experimental two groups (simulation with video, power point)	50 midwifery and medical students	Dystocia	The mean score of dystocia management in the simulation group increased compared to the control group after the intervention and there was a statistically significant difference after the intervention ($P<0.001$)
Lee <i>et al.</i> (2017) ^[16]	Chine	Experimental two groups (simulation, lecture)	64 midwives	Dystocia	There was no statistically significant difference between the mean scores of distosis management in the simulation group compared to the control group after the intervention ($P<0.05$)
Kordi <i>et al.</i> (2017) ^[11]	Iran	Experimental two groups (simulation, lecture)	51 midwives	Dystocia	The mean performance score of midwives in the simulation group increased compared to the lecture group after the intervention and there was a statistically significant difference after the intervention ($P=0.040$)
DiGiacomo (2017) ^[17]	State of pennsylvania	Experimental two groups (simulation, routine)	81 nursing students	Postpartum hemorrhage	The mean performance score of midwives in the simulation group increased compared to the lecture group after the intervention and there was a statistically significant difference after the intervention ($P=0.040$)
Tabatabaeian <i>et al.</i> (2018) ^[18]	Iran	Experimental three groups (simulation, lecture, integrated)	90 midwives	Preeclampsia and eclampsia	The mean cognitive skill score compared to the management of preeclampsia and eclampsia of midwives in the simulation group and the lecture and integrated group increased after the intervention and there was no statistically significant difference between the three groups after the intervention ($P<0.05$) but the mean cognitive skill score between The two groups of combination and lecture were significantly more than the simulation group ($P<0.001$)
Fakari <i>et al.</i> (2015) ^[19]	iran	Experimental three groups (simulation, lecture, web-based)	105 midwifery students	Postpartum hemorrhage	The mean score of clinical competence compared to postnatal bleeding management in the web-based, simulation and traditional groups before the intervention increased compared to after the intervention, but there was a statistically significant difference between the three groups after the intervention ($P=0.185$)
Reynold <i>et al.</i> (2010) ^[20]	Portugal	Experimental two groups (simulation, lecture)	50 midwifery students	Dystocia	The mean score of knowledge in the simulation group increased compared to the lecture group after the intervention and there was a statistically significant difference after the intervention ($P=0.004$)
Andrighetti <i>et al.</i> (2012) ^[21]	USA	Experimental two groups (simulation, class discussion and video)	28 midwifery students	Dystocia and postpartum hemorrhage	The mean score of postpartum hemorrhage management skills and dystocia in the simulation group increased compared to the speech control group after the intervention and there was a statistically significant difference ($P<0.001$)
Fisher <i>et al.</i> (2010) ^[22]	Chicago	Experimental two groups (simulation, lecture)	26 obstetricians and midwives	Eclampsia	There was no statistically significant difference between the mean scores of eclampsia in the simulation group compared to the lecture group after the intervention ($P<0.05$)
Goffman <i>et al.</i> (2008) ^[23]	America	Experimental two groups (simulation in both groups)	66 residents of obstetrics and gynecology and obstetrics	Dystocia	The mean score of documentation in the simulation group increased compared to the control group after the intervention and there was a statistically significant difference after the intervention ($P=0.004$)

of students, midwives, and residents of gynecology and midwifery. In the review of articles and according to Table 1, only the articles that have been included in the meta-analysis on the management of hard labor (dystocia), postpartum hemorrhage, eclampsia, and preeclampsia; in addition, the effect of simulation training method on these midwifery emergencies was analyzed. In all the reviewed articles, only the articles that had mean and standard deviation before and after the intervention were analyzed. The results of Gonzalves *et al.* in France showed

the mean and standard deviation of performance score of midwifery and medical students before the intervention in the simulation group were 7 (1.7) and in the control group (PowerPoint) were 7.2 (1.6), respectively, whereas the mean and standard deviation of performance score after the intervention in the simulation group were 9.3 (1.4) and in the control group (PowerPoint) were 7 (2.61), respectively.^[15] The results of this study suggest that the use of simulation can be a useful method for managing difficult labor. In this study, the use of PowerPoint reduced the

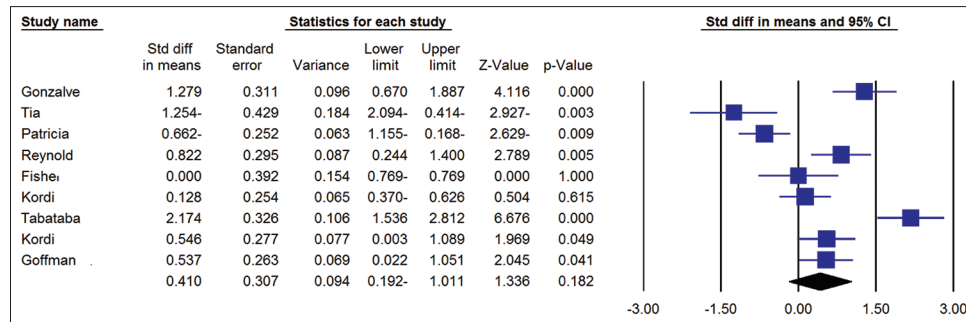


Figure 1: Estimated effect of means and 95% confidence interval for the studied studies. Simulation training method on performance improvement related to midwifery emergencies

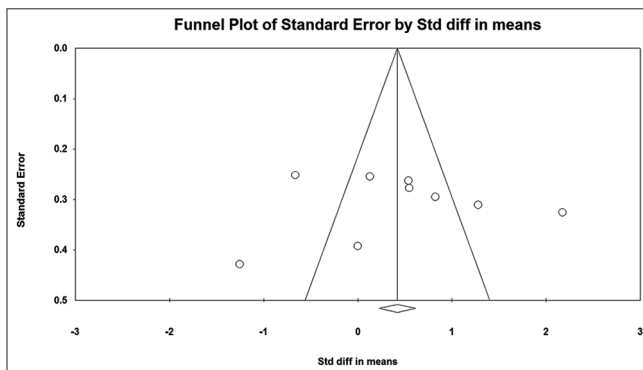


Figure 2: Funnel diagram of standard error based on analyzed studies

interaction of students in managing difficult labor and like other conventional methods of lecturing, it has become a passive method. Therefore, it is expected that this method will be much less effective in comparison with the simulation method. In addition, the results of the study by Andrighetti *et al.* (2012) also showed that the mean and standard deviation of the skill score of midwifery students before the intervention in the simulation group were 29.4 (2.8) and in the control group (lecture) were 29.8, respectively (5.4). However, the mean and standard deviation of performance score after the intervention in the simulation group were 35.3 (2) and in the control group (lecture) were 30.6 (4.4), respectively. However, both training methods (i.e., simulation and lecture) can improve the students' skills.^[21] The management of eclampsia and preeclampsia has also included in this review using the simulation training method. The results of Fisher *et al.*'s study showed that the mean score of eclampsia before the intervention in the simulation group was 15 (3.5) and in the lecture group was 16 (1.5). Moreover, the mean score after the intervention was 19 (3) in the simulation group and 19 (2) in the lecture group. Although the scores of eclampsia management skills increased significantly in both groups and the mean scores in both educational groups changed significantly, no statistically significant relationship was found between the two groups after the intervention.^[22]

Limitation and recommendation

This suggests that both simulation and lecture methods can be effective on managing eclampsia as an obstetric emergency. However, the meta-analysis has shown that the simulation method is effective in the four emergencies studied including the management of difficult labor, eclampsia and preeclampsia, and postpartum hemorrhage.

Conclusion

The use of simulation training method can be effective in various areas of learning related to midwifery emergencies. Furthermore, the results of the study showed that simulation training method can be effective on the performance of students, midwives, and residents of gynecology and midwifery.

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Conflicts of interest

There are no conflicts of interest.

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