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Comparing the effects of simulation-based training, blended, and lecture on the simulated performance of midwives in preeclampsia and eclampsia

Maryam Tabatabaeian, Masoumeh Kordi[1], Salameh Dadgar[2], Habibollah Esmaeily[3], Talat Khadivzadeh[4]

Department of Midwifery, School of Nursing and Midwifery, Student Research Committee, Mashhad University of Medical Sciences, [1]Department of Midwifery, Evidence-Based Care Research Center, School of Nursing and Midwifery, Mashhad University of Medical Sciences, [2]Ovulation Disorders Research Center, School of Medicine, Mashhad University of Medical Sciences, [3]Department of Medical Statistics, Mashhad University of Medical Sciences, [4]Midwifery, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran

Address for correspondence:
Asst. Prof. Masoumeh Kordi, Department of Midwifery, Evidence-Based Care Research Center, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran.
E-mail: Kordim@mums.ac.ir

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Abstract:

INTRODUCTION: Preeclampsia is the most common medical complication in pregnancy; along with bleeding and infection, it is one of the three causes of death in pregnant women. Most of these deaths were due to delays in the diagnosis and improper midwifery management and care. On the other hand, the quality of midwifery education has a profound effect on the proper provision of services. Therefore, the present study has been done to compare the effect of simulation-, blended-, and lecture-based education on simulated midwife performance in the management of preeclampsia and eclampsia.

MATERIALS AND METHODS: This three-group clinical trial study was performed on 90 midwives of selected hospitals in Mashhad in 2016. Midwives were divided into three groups of simulation-, blended-, and lecture-based education using the random number table. The simulation group was trained for 6 h at the Center for Clinical Skills, the blended group was trained for 4 h by lecture, and 6 weeks through the educational website, and the lecture group was trained for 6 h through lecture. An objective structured clinical test was performed before and 2 weeks after the intervention. Data were analyzed using SPSS Version 16 software and descriptive statistics, paired *t*-test, one-way ANOVA, and Wilcoxon and Kruskal–Wallis tests. Significance level was considered to be $P < 0.05$ in all cases.

RESULTS: The mean score of midwives' performance was not statistically significant before education in all three groups ($P < 0.05$). The mean score of midwives' performance was significantly increased in all three groups 2 weeks after education ($P < 0.001$), and the results of intergroup comparison showed that the mean score of performance in the simulation group was significantly higher than the blended group and the lecture group ($P < 0.001$), and it was higher in the blended group compared to the lecture group ($P < 0.001$).

CONCLUSION: Education increased the midwives' simulated performance in preeclampsia and eclampsia. The performance of the management of preeclampsia and eclampsia in the simulation educational group is more than that of the blended and lecture groups, so we can use the simulation education which is a self-centered method.

Keywords:

Eclampsia, preeclampsia, simulation education, lecture

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Introduction

Preeclampsia is the most common medical complication in pregnancy; along with bleeding and infection, it is one of the three causes of death in pregnant women. After 20 weeks of pregnancy, it is diagnosed with systolic blood pressure ≥140 or diastole ≥90 and urine protein.[1] Preeclampsia affects about 5% to 8% of all preterm pregnancies[2] and is called eclampsia in case of seizure.[3] The prevalence of preeclampsia in developing countries and Iran has been reported to be 1.8%–16.8%[4] and 1%–8%, respectively.[5] According to the WHO report, 2.3% of all cases of preeclampsia lead to eclampsia[6] and most of the deaths associated with this problem were due to delays in diagnosis, improper management, and midwifery care program. Since midwives, as a health-care provider, are responsible for the diagnosis, care, and management of preeclampsia,[7] acquiring the necessary qualifications to manage midwifery crises is essential for these people.[8] Christine *et al*. (2013) stated that promoting midwifery clinical skills in preventing, identifying, and managing pregnancy complications such as preeclampsia and eclampsia leads to reduction of maternal and fetal mortality.[3] In his study entitled as "The Effects of Education on Midwives' Performance for Clinical Decision Making," Soyufi states that educating midwifery life skills is a new strategy for reducing maternal and neonatal mortality, and increasing the midwives' ability to make decisions will improve their performance.[9] Today, midwifery education is a topic under discussion in many countries, and adoption of new policies and methods to empower and improve the performance of midwives is one of the most urgent educational needs.[10]

Lecture is one of the most commonly used educational methods[11] which has a long history in educational systems and deals with the presentation of oral concepts by the instructor and learning through listening and taking notes by the trainee.[12] The lecture methodology is not responsive to the increasing production of science and its changes,[13] so it is necessary to use new web-based, simulation-based methods, or blended method.[14] In this regard, Taekman *et al*. stated in their study that simulation is effective not only on self-efficacy but also on psychological, motor, and cognitive skills.[15] Christine states in a study that the simulation based on Jeffrey's framework is consistent with Bandura's self-efficacy resources such as direct experiences, substitute experiences, social persuasion, and motivation, and simulation can be used as an educational method for high-risk pregnancy emergencies with low incidence to improve midwives' self-efficacy.[3] But in the study conducted by Gordon *et al*. in America, after the simulation and traditional education of myocardial infarction and respiratory diseases, learning outcomes were the same in both methods.[16] Since contradictory results have been reported in studies,[17,18] and on the other hand, simulation faces constraints such as cost problems, the time required to prepare scenarios, the lack of realism in scenarios, and the anxiety of learners when using simulation,[19] considering the importance of midwives' education, and establishing and developing different patterns of teaching and combining patterns are of the important measures in this regard.[20] Ajam in his study emphasizes the blended of web and lecture as an blended educational approach in midwifery nursing education system.[21] Blended learning is an blended of face-to-face learning, simultaneous and asynchronous electronic and nonelectronic learning, aiming to optimize learning efficiency along with cost reduction.[22] In fact, in the blended method, teaching is conducted with a holistic attitude toward the learner considering individual characteristics, including attitudes, beliefs, perspectives, levels of knowledge, skills, and mental capacities of individuals[23] where the benefits of both e-learning and face-to-face learning are used.[24] A study by Taylor *et al*. in the United States showed that blended education is an appropriate educational method for midwifery emergencies, especially severe hypertension during pregnancy and postpartum.[25] Ruiz *et al*. emphasizes that e-learning should not be a substitute for the in-person classroom but should be used as a complementary to other common approaches.[26] McCutcheon *et al*. stated in their study that there is insufficient evidence on blended educational field for clinical skills education and more research is needed to measure the effectiveness of this teaching method.[27] Considering the importance of the management of preeclampsia and eclampsia by midwives and finding the appropriate educational method to achieve proper performance, and limited information in this regard as well as the contradictory results of various studies, the researcher decided to compare the effects of simulation-, blended-and lecture-based educations on simulated performance of midwives of selected hospitals in Mashhad in the management of preeclampsia and eclampsia in 2016.

Materials and Methods

This clinical trial study was performed after obtaining permission from the Ethics Committee of Mashhad University of Medical Sciences. The sample size was determined according to the study conducted by Fisher *et al*.[18] with a confidence level of 95% and a test power of 80%. The sample size was estimated to be 22 in each group; with a sample drop of 20%, ultimately, the sample size was considered to be 30 in each group. The sampling was done by an accessible method; it included all eligible midwives with an associate degree, BA and MA at selected hospitals in Mashhad who were enrolled for in-service education and they attended the

designated place at the Faculty of Midwifery Nursing in Mashhad at the time appointed. The research units were divided into three groups randomly through a random number table. The inclusion criteria were: the willingness to participate in the research, the absence of adverse events during the past 3 months, having midwifery degree (associate degree, BA or MA), internet access in the blended education group, and no further education on the preeclampsia/eclampsia. Exclusion criteria were lack of participation in all stages of the education or periodic tests, receiving education on preeclampsia and eclampsia during education and testing sessions, and <2 h of use of the educational website in the blended education group.

In each group, after expressing the objective and obtaining informed consent and completing the demographic questionnaire, a pretest was conducted on eligible individuals using an objective structured clinical test. Objective structured clinical test for the midwives' performance assessment includes six stations: station 1, obtaining history and diagnosis (containing 24 items); station 2, mild preeclampsia management (containing 28 items); station 3, severe preeclampsia management (containing 17 items); station 4, management of eclampsia (containing 12 items); station 5, poisoning with magnesium sulfate (containing 8 items); and station 6, the study of the report of mother's death with preeclampsia (containing 6 items). The range of the scores in this questionnaire was 0–95. The validity of the checklist of the objective structured clinical test observation was evaluated using content validity and its reliability was determined to be α =0.75 by determining the internal consistency by Cronbach's alpha. The time set for each of the first five stations was 10 min, while it was 5 min for the sixth station. To prevent the exchange of information between the research units, each group was tested in a separate day. The research units rested in a separate room before entering the test room. After explaining the test, the research units entered the test rooms in the form of six-member groups. Each person entered a room (a station) and after completion, he went out of the station, and changed his place with the adjacent person in a clockwise circle, so that each person passed all the six stations and left the test room. Immediately after the pretest, education started for each group. In all three groups, the educational content (diagnosis, prediction, prevention, complications of preeclampsia and eclampsia, and therapeutic measures) were the same and according to the country guidance protocol for providing midwifery and obstetrics services in mother-friendly hospitals and books and authoritative scientific resources.

In this research, the simulation was carried out based on Jeffrey's framework (prelecture, simulation, observation, and feedback). First, a summary of the educational content and the Jeffrey's simulation schema was described for 60 min. Then, for a period of 5 h, the history was obtained and diagnosis was performed; the mild preeclampsia, severe preeclampsia, eclampsia seizure, and magnesium sulfate poisoning were managed in the simulated conditions by standardized patient and mannequins in groups of five members (three observers and two people for simulation) at 5 stations (45 min for each station). After simulation in each group, immediate feedback from the trainer and group discussion on the learners' performance and reimplementation with necessary modifications were made (the total duration of the educational program was 6 h). In the group that received the blended education, education was done through lecture by presenting PowerPoint for 4 h (two 2-h sessions from 8 am to 12 pm); then, in an educational session, it was educated how to use the web with the username and password in the form of educational pamphlets. Web content included images, text, references, links, and video related to preeclampsia and eclampsia. Midwives had access to the educational website for a week. The duration of using the website was determined by midwives through the daily record sheet as well as the central server. The midwives' username and password credentials were revoked after a week and midwives were no longer able to access educational materials. The minimum web usage time was determined to be 120 min. During this period, the midwives contacted the researcher through the news forum of the educational website and asked their questions. In the lecture group, the educational materials were presented with PowerPoint for 6 h.[8-14] Finally, the performance of midwives was evaluated using an objective structured clinical test, 2 weeks after the intervention and compared in three groups. The pre- and post-test results were compared in three groups by statistical tests such as central and dispersion indexes, Chi-square, paired *t*-test, one-way ANOVA, and Wilcoxon and Kruskal–Wallis with SPSS statistical software (version 16, IBM Company Armonk, NY, USA). SPSS 16 software.

Ethical considerations

The present study is a part of the research dissertation project of Mashhad University of Medical Sciences with the code number 950016 and IRCT2016091528744N1 code. Informed consent was obtained from all midwives participating in the study.

Results

The results of one-way ANOVA indicated that the age range of the studied midwives was 31-60 years and the mean age in the simulation, integration, and lecture groups was 42.70 ± 6.26, 44.30 ± 8.16, and 43.97 ± 6.55, respectively (P = 0.651).

The results showed that there is no significant difference between the groups in terms of frequency of education level (P = 0.562), place of employment (P = 0.173), dealing with a patient with preeclampsia and eclampsia (P = 0.587), and the need for acquiring skills in the management of preeclampsia and eclampsia. The three groups are homogenous so that the majority of research units in the simulation group (80%), the combined group (86.7%), and the lecture group (83.3%) were undergraduate students. 76.7%, 76.7%, and 83.3% of them in the simulation, integration, and lecture groups were working in the maternity ward. In addition, the majority of research units in the simulation group (83.3%), integration group (76.7%) and lecture group (86.7%) dealt with preeclampsia and eclampsia during their service [Table 1].

The mean score of the performance before intervention in the three groups was not statistically significant (P = 0.462), but the mean score of the performance 2 weeks after intervention was significantly increased in all three groups (P = 0.001). The result of Kruskal–Wallis test for intergroup comparison showed that the mean score of the performance 2 weeks after the intervention in the three groups was statistically significant (P = 0.001). The results of the Mann–Whitney test showed that the mean score of performance in the simulation group was significantly higher than that of the blended group and the lecture group (P = 0.001). In addition, the performance score in the blended group was significantly higher than that of the lecture group (P = 0.001) [Table 2].

Evaluation and comparison of the research units in terms of the level of satisfaction with the educational method based on one-way ANOVA showed that there were significant differences between the three groups (P = 0.001). The results of Tukey's test showed that the mean score of satisfaction with the educational method in the simulation group was significantly higher than that of the lecture group (P = 0.001). Moreover, the satisfaction with the educational method in the blended group was significantly higher than that of the lecture group (P = 0.001), but there were no significant differences in the mean score of satisfaction with education between the two groups of simulation and blended (P = 0.68) [Table 3].

Discussion

The results of the present study showed that simulation-, blended-, and lecture-based education significantly increased the midwives' performance in the management of preeclampsia and eclampsia 2 weeks after education

Table 1: Frequency distribution of midwives under study in terms of level of education, place of employment, dealing with patients with preeclampsia and eclampsia, and the need for acquiring skills in the management of preeclampsia and eclampsia, divided into three groups of simulation, blended and lecture

Group / Variable	Simulation		blended		Lecture		Test
	Number	Percentage	Number	Percentage	Number	Percentage	
Level of Education							
Associate Degree	3	10	1	13.3	4	3.3	Exact Chi-square test
B.A	24	80	26	56.7	25	83.3	χ^2=2.93
B.A	3	10	3	10	1	3.3	df=4
M.A							P=0.562
Total	30	100	30	100	30	100	
Place of Employment							
Maternity ward	23	76.7	23	76.7	25	83.3	Exact Chi-square test
Prenatal	7	23.3	7	23.3	5	16.7	χ^2=9.01
Total	30	100	30	100	30	100	df=6
							P=0.173
Dealing with patients with preeclampsia and eclampsia							
Yes	25	83.3	23	76.7	26	86.7	Exact Chi-square test
No	5	16.7	7	23.3	4	13.3	χ^2=1.06
Total	30	100	30	100	30	100	df=2
							P=0.587
The need for acquiring skills in the management of preeclampsia and eclampsia							
Very high	7	23.3	6	20	10	33.3	Exact Chi-square test
High	17	56.7	16	53.3	14	46.7	χ^2=3.53
Medium	6	20	7	23.3	6	20	df=6
Low	0	0	1	3.3	0	0	P=0.739
Total	30	100	30	100	30	100	

Table 2: Mean and standard deviation of midwives performance score in the management of preeclampsia and eclampsia before and two weeks after the intervention in the simulation-, blended-, and lecture-based education groups

Group Variable	Simulation		Blended		Lecture		Test Kruskal–Wallis
Performance score	*N*	Mean±SD	*N*	Mean±SD	*N*	Mean±SD	
Before intervention	30	36.13±8.58	30	39.23±10.61	30	36.93±9.03	χ^2=1.54 df=2 *P*=0.462
Two weeks after intervention	30	82.63±6.33	30	76.53±7.39	30	66.40±8.45	χ^2=42.11 df=2 *P*=0.001
Difference before and after the intervention	30	46.50±9.85	30	37.30±13.18	30	29.46±11.02	χ^2=27.97 df=2 *P*=0.001
Test	*Z*=−4.789 *P*=0.001 Wilcoxon		*t*=15.50 df=29 *P*=0.001 T-paired		*Z*=−4.705 *P*=0.001 Wilcoxon		

SD=Standard deviation. N=Number

Table 3: Mean and standard deviation of score of satisfaction with the education and test methods in the midwives under study in the simulation-, blended-, and lecture-based education groups

Variable	Group variable						Test
	Simulation		Blended		Lecture		
	Number	Mean±SD	Number	Mean±SD	Number	Mean±SD	
Satisfaction with the education method	30	17.56±1.47	30	16.85±1.09	30	14.05±1.09	χ^2=67.90 df=2 *P*=0.00.1 One-way ANOVA

SD=Standard deviation

so that the performance in the simulation group was significantly higher than those of the blended and lecture groups, and the performance in the blended group was significantly more than that of the lecture group.

The results of the study conducted by Fisher *et al*. on a resident of Obstetrics and Gynecology in Chicago showed that simulation education in better than lecture in teaching lifetime critical skills to manage eclampsia and magnesium sulfate poisoning, two life-threatening pregnancy emergencies.[18] Khooshab *et al*. stated that the mean score of practical skill in performing cardiovascular resuscitation in the group participating in the mannequin-based simulation education, immediately and 4 months after the education, was higher than that of the lecture group.[28] Bello *et al*. showed that simulation education is more effective than lecture education in improving the performance of students.[29] The results of these studies are consistent with the results of the present study. Education in the traditional form preserves the content instead of putting emphasis on the understanding of concepts and their application. In this method, the only recipient of information is silent and inactive, while better, more effective, and lasting learning is achieved through more activation and participation of the learner in learning.[30] Simulation is one of the active techniques of learning[31] so that the possibility of using different levels of simulation in learning according to the participant, providing multiple learning situations and simulating the real situation in clinical environments lead to effective and satisfying learning. On the other hand, the learning environment itself is very important in the simulation method, in a way that the simulation environments are usually quiet and safe.[32]

Liaw *et al*. reported in their study that simulation education with mannequins with virtual simulation education did not show significant differences in the promotion of competence of the management of sepsis and septic shock.[33] This inconsistency with the results of the present study may be due to the fact that in Liaw's study, the web environment was designed similar to the actual laboratory and the virtual patient was used, but in the present study, blended education in the web section was through multimedia and the interaction of learners and instructors was established through the lecture section.

Fakari *et al*. conducted a clinical trial study to compare the effect of traditional, web-, and simulation-based

education on the clinical competence of midwifery students in postpartum hemorrhage management on 91 midwifery students in Mashhad. The results showed that clinical competence of students was significantly increased 1 week after education in all three groups, but the results of intergroup comparison showed no significant difference in clinical competence 1 week after intervention in the three groups.[34] This inconsistency with the results of the present study may be due to the fact that the web-based education in their study was through multimedia, and there was no interaction between the designed website and the student, but in the present study, with the blended education, the limitations of e-learning such as face-to-face communication and human and emotional interactions were reduced to a large extent.

In the study conducted by Anboohi *et al*., the skills of nursing students in the laboratory lessons in the web-based simulation group were more than those of the lecture group.[35] The results of the study carried out by Bahadorani *et al*. on 40 medical students in Isfahan showed that the knowledge and skill scores of the students in the blended education group were higher than those of the online and in-person group.[36] In the study conducted by Manavifar and Jamali, using integrated in-person virtual method in the learning and teaching of students in laboratory sciences was more effective than traditional and electronic methods.[37] The results of the above study are consistent with the current study.

In the blended education, teaching is conducted with a holistic attitude toward the learner considering individual characteristics, including attitudes, beliefs, perspectives, levels of knowledge, skills, and mental capacities of individuals.[23] blended learning leads to the use of learners' potential abilities and reinforcement of their practical skills and changing their behavior and responsibility toward the community and the university.[37]

Furthermore, the results of the present study showed that the satisfaction of the research units with the educational method in the simulation group was significantly higher than that of the lecture group and it was higher in the blended group than the lecture group. However, there was no significant difference in the satisfaction with education between the two groups of simulation and blended. Christian and Krumwiede reported in their study that Jeffrey's simulation education had a positive effect on nursing students' satisfaction with the management of preeclampsia and eclampsia.[3] Tiffen *et al*. also showed that education by simulation with Jeffrey's framework provides more satisfaction compared to the lecture group.[38] The research conducted by Heidarzadeh *et al*. compared the effect of two mannequin-and computer-based simulation methods on satisfaction and knowledge of nursing students and concluded that satisfaction with mannequin-based simulation method was higher than that of the computer-based method.[39] The reason for increased satisfaction with the simulation method can be the activation of the learners in the simulation, which leads to a more tangible outcome of the work.[28] It seems that student-centered education method can increase the level of satisfaction of learners, accelerate learning, create problem-solving skills, and continue learning and critical thinking.[40]

In his research, Yom studied the satisfaction of nursing students with an blended learning curriculum (blended of face-to-face traditional and web-based approach) and stated that most students enjoyed this course and wanted more education courses in this way.[41] Furthermore, Bahadorani *et al*. reported in their study that the students' satisfaction in the blended education group was higher than that of the online and in-person group.[36] The reason for this can be inclusion of student-centered learning in blended education and satisfaction with the possibility of choosing the place and time as the learners like (compared to face-to-face education) and practical skill education (compared to mere online education).

One of the strengths of this study was the possibility of simultaneous communication between the research units and instructors in the blended education group. The limitations of this research were the lack of easy access to the computer and the low level of computer skills of the participants in the research, despite the provision of educational pamphlets. It is suggested to conduct studies on the effect of simulation and blended education on the clinical performance of midwives in other fields.

Conclusions

Finally, it can be concluded that the present study showed that education increases the performance of midwives in the management of preeclampsia and eclampsia. The performance of preeclampsia and eclampsia management in the simulation education group is more than that of the blended and lecture groups, so simulation education that is an active method can be used.

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Conflicts of interest

There are no conflicts of interest.

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