

# The Effectiveness of Modified Early Obstetric Warning System Training on Midwives' Knowledge and Interpersonal Skills for Early Detection of Maternal Complications in Indonesia

## Abstract

**Background:** The maternal mortality rate in Indonesia is still high. Efforts are needed to increase the capacity of midwives. The study aims to evaluate the effectiveness of Modified Early Obstetric Warning System (MEOWS) training on midwives' knowledge and interpersonal skills, while also assessing the feasibility of employing MEOWS training, as perceived by participants. **Materials and Methods:** We used a mixed-methods study. The study was carried out from November to December 2022 in Indonesia. A purposive sampling technique was employed to select 60 midwives for the quantitative study and 20 midwives for the qualitative study, equally divided between the blended and online groups. The intervention consisted of 82 sessions that were equal for both groups, with each session lasting 45 minutes. Quantitative data were collected using questionnaires and Likert scales, while qualitative data were gathered through focus group discussions. Quantitative data were analyzed using *t*-tests, while thematic content analysis was employed for the qualitative data. **Results:** Significant improvements in midwives' knowledge were seen in both groups. The mean (SD) knowledge was 97.10 (5.80) in the intervention group and 94.00 (8.80) in the control group ( $p = 0.12$ ). Midwives reported greater engagement with blended training, perceiving it as feasible and valuable, and expressing eagerness for its implementation to enhance early detection of maternal complications. **Conclusions:** While both blended and online training effectively enhanced knowledge and self-efficacy in the early detection of maternal complications, participants found blended training to be more practical. Continuous evaluation is necessary for the retention of knowledge over time.

**Keywords:** Attitude and practice, early diagnosis, health knowledge, in-service training, interpersonal skills, midwifery

## Introduction

Maternal mortality remains a significant global health challenge. The Sustainable Development Goals (SDGs) aims to reduce the maternal mortality ratio (MMR) to less than 70 per 100,000 live births by 2030.<sup>[1]</sup> However, progress has been uneven, particularly in low- and middle-income countries, where direct causes such as postpartum haemorrhage, pre-eclampsia, and infections, as well as indirect factors like noncommunicable diseases, persist as major contributors.<sup>[2]</sup> In Indonesia, the Ministry of Health reported an MMR of 183 per 100,000 live births in 2022, far from the SDG target.<sup>[3]</sup> Bleeding, hypertension during pregnancy, and infections remain the leading causes of maternal deaths.<sup>[3]</sup>

Despite various interventions, including in-service training and auditing maternal care, maternal mortality reduction in Indonesia has been slow. Syairaji *et al.*<sup>[4]</sup> highlighted that while maternal deaths steadily declined from 1990 to 2020, Indonesia's rate remains one of the highest in Southeast Asia. Additionally, Agus *et al.*<sup>[5]</sup> reported that midwives aided in 55.8% of deliveries, indicating the critical role play in health service. Strengthening the health system, particularly midwives' skills in the early detection of pregnancy risks, remains a critical priority.

Prompt detection and effective management of obstetric complications play a crucial role in lowering maternal mortality rates.<sup>[6]</sup> However, delays in recognizing

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## Access this article online

Website: <https://journals.iww.com/jnrmr>

DOI: 10.4103/ijnmr.ijnmr\_67\_24

## Quick Response Code:



**How to cite this article:** Nugraheny E, Ulfa Y, Allailiyah N, Kismoyo CP, Sulistiyawati N, Margiyati M, *et al.* The effectiveness of modified early obstetric warning system training on midwives' knowledge and interpersonal skills for early detection of maternal complications in Indonesia. *Iran J Nurs Midwifery Res* 2026;31:60-6.

**Submitted:** 19-Feb-2024. **Revised:** 13-Jul-2025.

**Accepted:** 01-Aug-2025. **Published:** 02-Jan-2026.

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and treating pregnancy-related risks are common due to physiological changes during pregnancy that mask early symptoms.<sup>[7]</sup> Tools like the Modified Early Obstetric Warning System (MEOWS) have shown promise in improving the early detection of high-risk conditions and enhancing pregnancy outcomes.<sup>[8,9]</sup>

In the post-COVID-19 era, blended learning has emerged as a practical approach to continuing education for health workers. Combining the advantages of online flexibility and face-to-face interaction, blended learning minimizes costs and increases accessibility, making it especially suitable for resource-limited settings.<sup>[10]</sup> Previous research has demonstrated its effectiveness in skill development across various disciplines.<sup>[11,12]</sup>

Therefore, this study explores the effectiveness of MEOWS training on midwives' knowledge and interpersonal skills for the early detection of maternal complications. By assessing its effectiveness, the research aims to inform sustainable education policies for healthcare workers, particularly in low-resource settings, and contribute to efforts to reduce maternal mortality through enhanced training and capacity building.

## Materials and Methods

The study was conducted from November to December 2022 in the Bantul District, Indonesia. Bantul District is the district that has the highest absolute MMR in the DIY Province, Indonesia. This research employed a mixed-methods study with a sequential explanatory approach. The design was chosen with the step of gradually analyzing quantitative data first and then continuing with qualitative data to clarify the results of the quantitative data.<sup>[13]</sup> This study used a quasi-experimental design with pre- and post-tests and a control group in quantitative and qualitative phenomenological approaches. The benefits of adopting a control group were to ensure that the results obtained are solely due to the provided intervention and not the influence of other variables.<sup>[13]</sup> Qualitative research with a phenomenological design was conducted to explore the participants' perceptions of the feasibility and benefits of the MEOWS training. The primary advantage of phenomenological design is that it allows for a deep understanding of individual experiences.<sup>[13]</sup> The training was carried out over 24 days. One group used a Blended Training Program (BTP: online and face-to-face), and the control group used an Online Training Program (OTP: fully online). The independent variable in this study was MEOWS training, and the dependent variables were midwives' knowledge, interpersonal skills, and communication skills.

The sample size was 60 midwives, with 30 in each group. The selection of 30 participants in each group aligns with Gay and Diehl,<sup>[14]</sup> who stated that the minimum sample size in an experimental study is 30 samples per group.

This sample size provides sufficient statistical power and improves the rigor of the study. Purposive sampling was employed. Sample selection took into account the representation of midwives at each primary health care facility in Bantul District. Inclusion criteria included consenting to participate. Exclusion criteria included the midwife's continuous absence from training sessions, unwillingness to continue participating, and unavailability during questionnaire completion.

Quantitative data collection tools consisted of four parts. The first part included demographic information. The second part was a knowledge questionnaire (30 vignette questions with a maximum score of 100) made by the Indonesian Midwives Association, Bantul District. The third part, the communication aspect questionnaires, was adopted from Pereira and Puggina<sup>[15]</sup> with a 5-point Likert scale. The Likert scale ranged from strongly agreeing with a score of 5 to strongly disagreeing with a score of 1 (11 questions). A higher score indicated better communication skills, with a score of 33 considered neutral. Cronbach's alpha from the CES is 0.712. The fourth part was the self-efficacy instrument, which was adopted from Bonsaksen *et al.*<sup>[16]</sup> with a 4-point Likert scale. The Likert scale ranged from "strongly agree" (score of 4) to "strongly disagree" (score of 1) across 10 questions. Higher scores indicated better self-efficacy. The Cronbach's alpha for the CES was 0.82. The validity and reliability of the knowledge questionnaire were assessed using item analysis, conducted on 20 midwives with demographic characteristics similar to the target population.

The training design was conducted in five stages: pretest, independent learning (asynchronous), face-to-face learning (synchronous) with BTP for the intervention group and OTP for the control group, workplace actualization (action plan), and evaluation. The training covered four topics: midwife character education, evidence-based midwifery, early detection using the MEOWS, and emergency management. Training materials, including modules, learning videos, and PowerPoint presentations, were made accessible to participants through the LMS. A bivariate analysis was conducted to determine differences in interpersonal knowledge and skills before and after the intervention. Independent and paired *t*-tests were performed following a normality test. The statistical significance was determined at an alpha level of 0.05 with a 95% confidence interval. Data analysis was performed using SPSS version 20. Qualitative data were collected through FGD using a guide developed by the research team. Each group consisted of 10 informants, selected to ensure representation of midwives from different primary health care centers and the length of services. The FGDs were guided by the corresponding author, with each session lasting approximately 60 to 90 minutes. Qualitative data were analyzed using thematic content analysis using Atlas.ti software. The findings were represented in the form of themes, codes, and verbatim quotations.

## Ethical consideration

Ethical approval for this study was granted by the Ethics Committee of Universitas Jenderal Ahmad Yani Yogyakarta, Indonesia (Approval No. SKep/346/KEPK/XI/2022) on November 2, 2022. Before completing the questionnaire, all participants received a written explanation outlining the purpose and significance of the study. Participation was entirely voluntary, and informed consent was obtained from those who agreed to take part. Participants were also informed of their right to withdraw from the study at any time without penalty.

## Results

### Characteristics of the participants

The baseline characteristics of the midwives in Group 1 and Group 2 are presented in Table 1. An unpaired *t*-test and the Chi-square test were performed to compare characteristics between the two groups. There was a significant difference in age between groups 1 and 2 ( $p = 0.001$ ). However, no significant differences were observed in the workplace, work experience, education, and prior experience in similar training programs ( $p > 0.05$ ).

Midwives' Knowledge, Communication Skills, and Self-Efficacy for Early Detection of Maternal Complications.

The comparison of mean scores for knowledge, communication skills, and self-efficacy in early detection of maternal complications between the pretest and post-test in Groups 1 and 2 is shown in Table 2. Paired *t*-tests were conducted to compare the mean scores within each group.

**Table 1: Comparison of the baseline characteristics of the participants in Group 1 and Group 2**

	Group 1 (n=30)	Group 2 (n=30)	<i>p</i>
Age (years) ( <i>SD</i> )	35.47 (3.57)	39.13 (4.52)	0.001*
Workplace			
Public health Center (%)	27 (90.00%)	27 (90.00%)	1.0**
Hospital (%)	3 (10.00%)	3 (10.00%)	
Work experience			
0–5 years	6 (20.00%)	3 (10.00%)	0.15***
6–10 years	1 (3.30%)	0 (0.00%)	
11–15 years	21 (70.00%)	18 (60.00%)	
16–20 years	2 (6.70%)	8 (26.70%)	
21–25 years	0 (0.00%)	1 (3.30%)	
Education			
Diploma of Midwifery	20 (66.70%)	16 (53.30%)	0.43****
Advanced diploma of midwifery	10 (33.30%)	14 (46.70%)	
Experience of similar training			
Yes	0 (0.00%)	4 (13.30%)	0.12**
No	30 (100.00%)	26 (86.70%)	

\**t*-test, \*\*Fisher Exact, \*\*\*Continue correction, \*\*\*\*Chi-square test

As shown in Table 2, there were significant improvements in both groups on midwives' knowledge and self-efficacy. However, there was no significant difference between the pre- and post-test scores of communication skills in both groups. Besides, Table 2 shows a comparison of mean scores between Group 1 and Group 2. There was no significant difference in knowledge, communication skills, and self-efficacy at the pre- and post-test between Groups 1 and 2. The findings indicate that both the BTP and OTP showed effectiveness in improving midwives' knowledge and self-efficacy.

Feasibility and Benefits of Training Based on Participants' Perceptions.

Table 3 shows participants' perceptions of the early detection training using the MEOWS instrument according to the needs and duties of midwives. In addition, the feasibility of the MEOWS instrument was tested by training participants during the action plan stage, confirming its suitability for use in both hospital and primary care settings in Indonesia. In addition to updating their knowledge, participants reported that the training empowered them to serve as initiators in monitoring and evaluating maternal complications using the MEOWS instrument within their respective work areas.

The data indicate several key factors supporting the success of the training, including the user-friendly LMS, qualified facilitators, and leadership support for implementing the MEOWS instrument at the action plan stage. In addition, qualitative data show that participants in the control group (OTP) experienced challenges, such as limited interaction with facilitators, difficulty maintaining focus during training activities, and barriers in terms of internet connectivity.

## Discussion

This study aimed to assess the effectiveness of blended and online training programs (BTP and OTP) on midwives' knowledge, self-efficacy, and communication skills regarding the use of the MEOWS. The results revealed that the training programs significantly improved midwives' knowledge and self-efficacy in using MEOWS for early detection of maternal complications.

The integration of BTP, which combines face-to-face and online learning, appeared to foster greater engagement and focus among participants. Qualitative data revealed that BTP participants felt more engaged in the learning process, particularly during the face-to-face components. This finding aligns with prior research, which found that blended learning strategies are more effective at engaging learners due to the interaction and feedback they provide.<sup>[17,18]</sup> OTP participants, however, reported difficulties in maintaining focus, possibly due to limited interaction with facilitators and potential Internet connectivity issues. These results reflect previous studies highlighting the importance of interaction in online learning and the challenges posed

**Table 2: Comparison of mean knowledge, communication skills, and self-efficacy scores between pretest and post-test in Group 1 and Group 2**

	M (SD)		t	p
	Pretest (n=30)	Post-test (n=30)		
<b>Group 1</b>				
Knowledge (Range: 0–100)	64.5 (7.90)	97.1 (5.80)	-18.0	<0.001
Communication Skill (Range: 11–55)	51.3 (4.40)	50.8 (4.80)	-0.4	0.708
Self-Efficacy (Range: 10–40)	29.2 (4.40)	31.7 (5.80)	2.9	0.007
<b>Group 2</b>				
Knowledge (Range: 0–100)	64.6 (14.60)	94.0 (8.80)	-10.6	<0.001
Communication Skill (Range: 11–55)	49.3 (5.70)	49.0 (6.60)	0.2	0.816
Self-Efficacy (Range: 10–40)	29.8 (5.50)	31.7 (4.20)	-2.2	0.037
	Group 1 (n=30)	Group 2 (n=30)	t	p
<b>Knowledge</b>				
Pretest	64.5 (7.90)	64.6 (14.60)	0.3	0.97
Post-test	97.1 (5.80)	94.0 (8.80)	1.6	0.12
<b>Communication skill</b>				
Pretest	51.3 (4.40)	49.3 (5.70)	1.5	0.145
Post-test	50.8 (4.80)	49.0 (6.60)	1.2	0.241
<b>Self-Efficacy</b>				
Pretest	29.2 (4.40)	29.8 (5.50)	-0.5	0.624
Post-test	31.7 (5.80)	31.7 (4.20)	0	1.0

Values are expressed as mean±SD, t-test

by technological limitations, such as poor Internet access, which could hinder the effectiveness of OTP.<sup>[19]</sup>

In comparing the effectiveness of BTP and OTP, it is clear that both modes of training have their advantages. The BTP's blend of online and in-person components allows for greater interaction and engagement, making it preferable for many participants. The OTP, though convenient and flexible, was often hindered by factors such as Internet access and limited facilitator interaction. These challenges highlight the importance of considering these factors when implementing OTP in resource-limited settings.

Despite the success of the training programs in enhancing knowledge and self-efficacy, practical challenges remain in implementing MEOWS. Participants reported low staff-to-patient ratios and occasional shortages of printed forms as obstacles to using the MEOWS tool effectively. These barriers, along with the need for continuous support and multidisciplinary coordination, align with findings from other studies that emphasize the importance of leadership support and integration into hospital culture for the successful implementation of quality improvement tools like MEOWS.<sup>[20,21]</sup>

However, while these programs effectively enhanced knowledge and self-confidence, the results showed that the improvement in communication skills remained limited. Notably, the lack of substantial progress in communication skills post-training warrants further exploration. Several factors could explain the lack of improvement in communication skills. First, participants in this study reported high levels of communication competency before the training. However, the focus of the training was more

on obstetric case management rather than communication skills. This prioritization may have limited the development of communication abilities. Previous research supports this finding, suggesting that training programs that emphasize clinical skills over communication are less likely to enhance the latter effectively.<sup>[22]</sup>

Furthermore, participants' experience and workload may have contributed to the stagnant improvement in communication. Midwives with less than 5 years of experience may face challenges in demonstrating effective communication compared to their more experienced counterparts,<sup>[23]</sup> and high workloads can reduce the time and attention required for optimal communication.<sup>[24]</sup> Future training programs should integrate communication skills training into the clinical content to ensure that midwives not only understand the technical aspects of patient care but also possess the communication abilities necessary to manage complex obstetric cases effectively.<sup>[23]</sup>

One strength of this study is its mixed-methods design, which allowed for a comprehensive understanding of the training programs' effects. The combination of quantitative and qualitative data provided valuable insights into both the measurable outcomes and the participants' perceptions of the training. However, the study also has several limitations. The small sample size and the focus on short-term outcomes are important considerations. Finally, while this study assessed changes in midwives' knowledge, self-efficacy, and communication skills, it did not evaluate patient outcomes. Further research should explore how these improvements in midwives' competencies translate into better patient outcomes.

**Table 3: The perception of training participants regarding feasibility and benefits of training**

Theme	Subtheme	Quotation	
		Participants BTP	Participants OTP
Feasibility	Appropriate for the main duties of midwives	This training is useful because it serves as a screening, which is indeed carried out by midwives in their services (Midwife: P4:41)	The topics of the training are very appropriate to the needs, main duties, and functions of midwives (Midwife P2:17)
	Practicality of MEOWS instruments	This instrument is very practical because it is very fast for early detection so that you can immediately consult a doctor, and the doctor's advice can also be given quickly. The instrument is also effective (Midwife: P3: 122)	In my opinion, the MEOWS instrument is very useful because after we do the scoring, there are recommendations for follow-up, so it is easier to implement (Midwife P5:59)
Supporting factors	Easy-to-use LMS	I really like the material that is shared at the LMS in electronic form. This makes it easier for participants to understand the material (Midwife: P7:87)	Using the LMS makes it easy to access it using various devices (P2: 159)
	Professional resource person	The material provided was very good, and with a team of professional midwives, I really appreciate the implementation of this training (P7:102)	The resource persons are already good; it is advisable to add additional resource persons with obstetrical and pediatric specialist backgrounds (P2: 155)
	Leadership supports	The head of the community health center strongly supports the use of this instrument, and the instruments already available at the community health center have been reproduced for use (Midwife P5:141)	The MEOWS application has no problems, and there is also support from the leadership. In our hospital, the MEOWS instrument has been used. The form is also available at the hospital (Midwife P4: 128).
Benefits	Monitoring team evaluating	Very helpful. After the training, my colleagues and I who had participated in this training became like the police, warning other colleagues. If there are women who are pregnant, giving birth, or post-partum who need MEOWS screening, they should continue to use it (Midwife: P3:17)	
	Update knowledge	Very useful; I get knowledge updates; before that, I didn't know about MEOWS (P2: 13)	The MEOWS topic was something new for me because I had never received this material before, and the topic was relevant according to the needs of midwives. (Midwife P1:23)
Barriers	Technology information limitation	When I self-actualized at work, I faced problems carrying out assignments in implementing MEOWS in the field because during detection it had to be documented in video, even though I had never made a video before, so I was not proficient in technology information. In the end, they learn and are challenged so that they are more confident and able to make media (Midwife P1:7)	For myself, I had problems making videos and uploading activities to social media when implementing self-actualization at work in reporting training assignments (Midwife P5: 166)
	Not all midwives have attended MEOWS training.	We still have limitations in implementation because not all midwives have attended training, so even though they have transferred knowledge, not all of them are capable to use MEOWS instruments (Midwife P1:78)	After participating in the training, I socialized about it with my supervisors, and a colleague. There are still barriers in its implementation because not all have been trained (Midwife P6:65)
	Internet signal		In my opinion, the training material is appropriate, but due to Internet signal constraints, the training process is not optimal (Midwife P5:137)
Methods evaluation	Full interaction	I think blended training is fun because it can be full of interaction with facilitator and another participant (Midwife: P3: 167)	

*Contd...*

**Table 3: Contd...**

Theme	Subtheme	Quotation	
		Participants BTP	Participants OTP
	More focus	I also like the blended one because the facilitator pays more attention, and we are forced to pay attention to the facilitator too because we are in the same room, because offline means we can focus more automatically and cannot do other activities, unlike online, which allows you to do other activities while doing it (Midwife P7:171)	
	Less interaction		In my opinion, the discussion with the facilitator in online training is less interactive than the blended group. Sometimes I feel bored because I only face the laptop (Midwife P5:140)
	Less focus		I think, blended training is better than online training. In online training allows participants to carry out other activities so that their focus and attention are not optimal (Midwife P5: 146)

The findings of this study are important for maternal and neonatal health, particularly in limited resources. By improving midwives' knowledge and self-efficacy in early detection of maternal complications, the training programs may contribute to better management of obstetric complications, thereby reducing maternal morbidity and mortality.<sup>[25]</sup> The integration of communication skills into these training programs is crucial as effective communication is key to ensuring the timely identification and management of obstetric complications. Further research is needed to assess the impact of these training programs on patient outcomes, with a focus on reducing maternal and neonatal mortality and improving overall health system performance.

## Conclusion

This study showed that both BTP and OTP can effectively improve midwives' knowledge and interpersonal skills for early detection of maternal complications using MEOWS in Indonesia. The availability of both BTP and OTP options provides greater flexibility and access to training resources. These results carry important implications for midwifery education and training in Indonesia, especially in preventing maternal deaths caused by delays in receiving appropriate health services due to midwives' limited capacity for early detection of maternal complications. Overall, these findings have important implications for midwifery training in Indonesia and other low-resource settings. The availability of technology-based training programs can help overcome barriers to education and training, such as limited access to traditional training facilities or a lack of funding for in-person training programs.

## Acknowledgments

This study was completed with the effort, contribution, guidance, and support of individuals and Midwifery organizations. We would like to extend our sincere thanks

and gratitude to all of them. We are thankful to Personal Human Resource and Development Agency, Bantul District, Yogyakarta, Indonesia, for financial assistance with approved project number 50/BKPSDM/2022 to conduct this study.

## Financial support and sponsorship

The Personal Human Resources and Development Agency Bantul District, Yogyakarta, Indonesia

## Conflict of interests

Nothing to declare.

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