The Effect of Educational Intervention About Screening Preeclampsia on Midwive' Knowledge, Implementation and Incidence Rate of Severe Preeclampsia

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Abstract: Preeclampsia affects 2-8% of pregnancies globally, leading to 60,000 maternal deaths and over 500,000 preterm births. The incidence of severe preeclampsia in Rehatta Hospital, Jepara, Central Java, April 2023 to April 2024 was 79 cases. The placement of midwives in village areas is an improvement in the quality and distribution of services in reducing the mortality rate of mothers and children under five. The purpose of the study is to assess the impact of an educational program on midwives' knowledge, preeclampsia screening activities at primary health facilities, the number of pregnant women requiring ICU/HCU care and maternal mortality rates. Experimental study of pre-post-test one group design by educating 68 midwives at primary health facilities in Jepara Regency. The effectiveness of education was assessed based on differences in midwives' knowledge levels, preeclampsia screening activities at primary health facilities, the number of pregnant women requiring ICU/HCU care and maternal mortality rates. The study was conducted between April 2023 - August 2024 at Primary Health Facilities and Rehatta Regional Hospital, Jepara Regency. Data were analyzed using the SPSS statistical tool edition 29. Educational interventions can raise midwives' knowledge levels considerably ($p<0.001$). The distribution of preeclampsia screening actions varied significantly between the pre- and post-education stages ($p<0.001$). Giving midwives education raised the chance of preeclampsia screening implementation 4.30x (RR 4.30; CI95% 2.52-7.35). The distribution of referrals between the study groups showed a significant difference ($p=0.002$), with intended referrals being substantially more common in the post-education phase. The chance of intended referrals increased by 7.41x (RR 7.41; CI95% 1.70-32.29) when midwives received education. Giving midwives education was able to lower the number of patients needing ICU/HCU care (22.8% to 9.1%) and the mortality rate (3.8% to 0%), even though there was no statistically significant effect. When midwives at primary health centres received education, their level of expertise, preeclampsia screening practices, and planned referrals all increased significantly.

Keywords: education; midwifes; preeclampsia screening

INTRODUCTION

The hypertensive disorders of pregnancy (HDP) are well-known contributors to maternal morbidity and mortality worldwide. HDP encompasses chronic hypertension diagnosed before 20 weeks gestation, gestational hypertension diagnosed after 20 weeks gestation, and preeclampsia, which is characterized by gestational hypertension, systemic features, and often proteinuria. Preeclampsia affects 2-8% of pregnancies globally, leading to 60,000 maternal deaths and over 500,000 preterm births annually in the United States, and accounting for 9% of deaths in Asia. In Indonesia, there were 1,077 reported cases of preeclampsia out of 7,389 pregnant women in 2021, highlighting the ongoing

significance of this condition in the country. This data underscores the continued need for further solutions to address this issue.

In high-resource countries, early identification of preeclampsia is a key goal of antenatal care. Effective screening during the first half of pregnancy can help categorize women based on their risk levels. This information can then be used to customize improved prevention, management, and treatment of preeclampsia.6 In Indonesia, pregnant women are required to have a maternal and child health book in 2022, which includes early preeclampsia screening. Moderate risk factors for preeclampsia include being multiparous with a new partner, pregnancy with assisted technology, nulliparous, age over 35, multiparous with a previous child older than 10, history of preeclampsia in mother or sibling, obesity before pregnancy (BMI > 35 kg/m2), mean arterial pressure > 90 mmHg, and proteinuria. If a woman has two moderate risk factors, she is recommended to be referred for further evaluation. High-risk factors for preeclampsia include being multiparous with a previous history of preeclampsia, multiple pregnancy, diabetes in pregnancy, chronic hypertension, kidney disease, autoimmune disease, antiphospholipid syndrome, and intrauterine fetal death. If a woman has one high-risk factor, she is recommended to be referred for further evaluation.

Preeclampsia is diagnosed as the onset of high blood pressure (systolic blood pressure ≥ 140 mmHg and/or diastolic ≥ 90 mmHg) occurring after 20 weeks of gestation. Severe preeclampsia is defined as systolic blood pressure (SBP) ≥ 160 or diastolic blood pressure (DBP) ≥ 110 mmHg. Preeclampsia is a serious medical condition with a high level of complexity. It impacts mothers during pregnancy, childbirth, and can also cause postpartum problems due to endothelial dysfunction in various organs, leading to the risk of cardiometabolic disease and other complications. Most cases of preeclampsia are confirmed by the presence of urine protein. However, if urine protein is not found, a diagnosis of preeclampsia can be made using symptoms and other disorders, namely:

1. Thrombocytopenia: platelets < 100,000/microliter
2. Kidney disorders: serum creatinine > 1.1 mg/dL or an increase in serum creatinine levels in the absence of other kidney disorders
3. Liver disorders: increased transaminase concentration 2 times normal and/or pain in the epigastric area/upper right region of the abdomen
4. Pulmonary Edema
5. Neurological symptoms: stroke, headache, visual disturbances

6. Impaired fetal growth, which is a sign of impaired uteroplacental circulation: Oligohydramnios, Fetal Growth Restriction (FGR), or the presence of absent or reversed end-diastolic velocity (ARDV).

The placement of midwives in village areas is an improvement in the quality and distribution of services in reducing the mortality rate of mothers and children under five, reducing the birth rate as well as increasing public awareness of healthy living behavior. Maternal Mortality Rates and Infant Mortality Rates are closely related to the implementation of early detection of risk factors and complications carried out by midwives when pregnant women receive antenatal care.

The incidence of severe preeclampsia in Rehatta Hospital, Jepara, Central Java, from April 2023 to April 2024 was 79 cases, resulting in 3 maternal deaths due to preeclampsia complications such as hemorrhagic stroke. Additionally, 18 cases of preeclampsia and related complications such as hypertensive urgency, hypertensive emergency, or eclampsia seizures were treated in the ICU in April 2023 to April 2024.

The purpose of the study is to assess the impact of an educational program on midwives' knowledge, attitudes, and the incidence of severe preeclampsia. In May 2024, certified seminars, approved by the Ministry of Health, were conducted for midwives in five districts to renew their practice permits. A pretest and post-test questionnaire, consisting of 10 questions related to preeclampsia screening, was administered through a Google form during the seminar. In addition, implementation towards documenting preeclampsia screening in the maternal and child health book for severe preeclampsia cases from April 2023 to April 2024 were evaluated. After the seminar intervention from May 2024 to August 2024, a subsequent assessment of implementation and the incidence of preeclampsia was carried out.

METHOD

Experimental study of pre-post-test one group design at primary health facilities and Rehatta Regional Hospital, Jepara Regency between April 2023 - August 2024. The subjects in this study were midwives and pregnant women. The number of samples was obtained using the whole sampling method, namely all subjects who met the inclusion criteria and did not have exclusion criteria would be used as research subjects. The inclusion criteria of the study included 1) midwives and pregnant women from 5 health centers under the auspices of Rehatta Regional Hospital, namely Bangsri Health Center, Donorejo Health Center, Keling I Health Center, Keling II Health Center, and Kembang Health Center, 2) pregnant women diagnosed with severe preeclampsia. The exclusion criteria of the study were hypertension in pregnancy other than severe preeclampsia.

Educational interventions were carried out for 68 midwives at first-level health facilities. The effectiveness of education was assessed based on differences in midwives' knowledge levels, preeclampsia screening activities at primary health facilities, the number of pregnant women requiring ICU/HCU care and maternal mortality rates. The data were analyzed using the SPSS statistical tool edition 29 using the Wlicoxon and Fisher Exact tests. Results are significant if p <0.05.

RESULT

The study was conducted by providing educational interventions to 68 midwives to assess the effectiveness of education on the implementation of preeclampsia screening by involving 79 data on pregnant women pre-midwife education between April 2023 - April 2024 and 11 data on pregnant women post-midwife education between May 2024 - August 2024 obtained the following results.

Table 1. Demographics of midwives

Variable	n (%)	Mean ± SD; Median (min-max)
Education level		-
● D3 Midwifery	31 (45.6)	
● D4 Midwifery	28 (41.2)	
● S1 Midwifery	7 (10.3)	
● S2 Midwifery	2 (2.9)	
Age	-	43.74 ± 7.68; 44 (29-58)
Length of work experience	-	21.46 ± 9.06; 22 (1-34)

Midwives have a level of education dominated by D3 midwifery (45.6), followed by D4 midwifery (41.2%), S1 midwifery (10.3%) and S2 midwifery (2.9%). Midwives have an average age of 43.74 years with a standard deviation of 7.68 years, a median value of 44 years with the youngest age of 29 years and the oldest age of 58 years. The length of work experience reported by midwives has an average of 21.46 years with a standard deviation of 9.06 years, a median value of 22 years with the fastest work experience of 1 year and the longest 34 years.

Table 2. Level of knowledge of midwives before and after education

Knowledge Level Pre	Knowledge Level Post	*p*
53.68 ± 12.20; 50 (30-80)	85.15 ± 6.8; 80 (80-100)	**<0.001**

Wilcoxon; significant p<0.05

Evaluation of midwives' knowledge level was conducted to assess the effectiveness of educational interventions. Evaluation of the initial knowledge level obtained an average of 53.68 with a standard deviation of 12.20, a median value of 50 with the smallest value of 30 and the largest value of

80. Evaluation of the final knowledge level obtained an average of 85.15 with a standard deviation of 6.8, a median value of 80 with the smallest value of 80 and the largest value of 100. There was a significant difference in the initial and final knowledge levels ($p<0.001$), where there was a significant increase in the level of knowledge after the educational intervention in midwives.

Table 3. Demographics of pregnant women

Variable	Midwife Pre-Education Phase (n=79)		Midwife Post-Education Phase (n=11)	
	n (%)	Mean ± SD; Median (min-max)	n (%)	Mean ± SD; Median (min-max)
Pregnant woman's age	-	29.73 ± 7.02; 29 (15-47)	-	29 ± 9.37; 25 (17-41)
Gravida		-		-
● 1	29 (36.7)		3 (27.3)	
● 2	20 (25.3)		2 (18.2)	
● 3	17 (21.5)		2 (18.2)	
● 4	8 (10.1)		4 (36.4)	
● 5	5 (6.3)		0 (0)	
Parity		-		-
● 0	36 (45.6)		3 (27.3)	
● 1	30 (38)		3 (27.3)	
● 2	8 (10.1)		3 (27.3)	
● 3	3 (3.8)		2 (18.2)	
● 4	2 (2.5)		0 (0)	
Abortus		-		-
● 0	55 (69.6)		7 (63.6)	
● 1	16 (20.3)		3 (27.3)	
● 2	5 (6.3)		1 (9.1)	
● 3	3 (3.8)		0 (0)	
Number of marriages		-		-
● 1	69 (87.3)		8 (72.7)	
● 2	9 (11.4)		3 (27.3)	
● 3	1 (1.3)		0 (0)	
Education level		-		-
● Elementary school/equivalent	17 (21.5)		4 (36.4)	
● Middle school/equivalent	27 (34.2)		5 (45.5)	
● High school/equivalent	29 (36.7)		2 (18.2)	
● College	6 (7.6)		0 (0)	

The age of pregnant women in both groups was found to be almost the same, namely 29 years. History of gravida, in the pre-midwife education group was dominated by gravida 1 (36.7%), while in the post-midwife education group was dominated by gravida 4 (36.4%). In both study groups, parity history was dominated by parity 0 and 1, abortion history was dominated by abortion 0, number of marriages

was dominated by 1 marriage. The level of education in the pre-midwife education group was dominated by high school/equivalent while in the post-midwife education group was dominated by junior high school/equivalent.

Table 4. Effectiveness of midwife education on preeclampsia screening activities

Variable	Preeclampsia Screening		*p*	RR (CI95%)
	Yes	No		
Midwife education phase			**<0.001**	4.30 (2.52-7.35)
● Post-education	9 (81.8)	2 (18.2)		
● Pre-education	15 (18.9)	64 (81.1)		

Fisher exact; significant p<0.05

In the pre-education phase of midwives, there were 15 pregnant women (18.9%) who underwent preeclampsia screening and 64 pregnant women (81.1%) who did not undergo preeclampsia screening. In the post-education phase of midwives, there were 9 pregnant women (81.8%) who underwent preeclampsia screening and 2 pregnant women (18.2%) who did not undergo preeclampsia screening. There was a significant difference in the distribution of preeclampsia screening actions between the pre-education and post-education phases (p<0.001). Providing education to midwives increased the likelihood 4.30x (RR 4.30; CI95% 2.52-7.35) higher for the implementation of preeclampsia screening.

Table 5. Effectiveness of midwife education on maternal outcomes

Variable	Midwife Education Phase		*p*	RR (CI95%)
	Post-Education	Pre-Education		
Referral			**0.002**	7.41 (1.70-32.29)
● Planned	9 (81.8)	25 (31.6)		
● Unplanned	2 (18.2)	54 (68.4)		
Labour			0.452	-
● Spontaneous	1 (9.1)	8 (10.1)		
● Induction	0 (0)	11 (13.9)		
● Caesarean Section	10 (90.9)	60 (75.9)		
ICU/HCU Care			0.446	2.67 (0.36-19.62)
● No	10 (90.9)	61 (77.2)		
● Yes	1 (9.1)	18 (22.8)		
ICU/HCU Indication			0.900	-
● No	10 (90.9)	61 (77.2)		
● Eclampsia	0 (0)	2 (2.5)		
● Hypertensive emergency	1 (9.1)	7 (8.9)		
● Hypertensive urgency	0 (0)	7 (8.9)		
● Haemorrhagic stroke, Eclampsia	0 (0)	1 (1.3)		
● Haemorrhagic stroke, IUFD, HELLP syndrome	0 (0)	1 (1.3)		
Mortality			1.000	-
● Alive	11 (100)	76 (96.2)		

● Death	0 (0)	3 (3.8)

Fisher exact; significant p<0.05

Referral, in the post-education phase, 9 pregnant women (81.8%) received planned referrals and 2 pregnant women (18.2%) did not receive planned referrals. In the pre-education phase, 25 pregnant women (31.6%) received planned referrals and 54 pregnant women (68.4%) received unplanned referrals. There was a significant difference in the distribution of referrals between study groups (p=0.002) where planned referrals were significantly more common in the post-education phase. Providing education to midwives increased the likelihood of planned referrals by 7.41x (RR 7.41; CI95% 1.70-32.29).

The evaluation did not find any relationship between the implementation of midwife education on the type of delivery (p=0.452), the number of patients admitted to the ICU/HCU (p=0.446), indications for patients admitted to the ICU/HCU (p=0.900) and the mortality rate (p=1.000). Although there was no significant difference, providing education to midwives was able to reduce the number of patients requiring ICU/HCU care (22.8% to 9.1%) and the mortality rate (3.8% to 0%).

DISCUSSION

Bardosono S, et al., who assessed the level of knowledge after providing education to midwives in Indonesia, found that there was an immediate increase in the level of knowledge of a good degree after providing education (39.5% vs 68.2%; p<0.001). Sutaji S, et al., who assessed the influence of education level and length of service on motivation to achieve, found that based on multiple logistic regression analysis, education level (p = 0.034; Exp (B) = 6.366) and length of service (p = 0.007; Exp (B) = 9.138) have a strong influence on motivation to achieve, namely the encouragement for someone to carry out an activity as well as possible.

In general, education is a form of learning that transfers habits, beliefs, values, skills, and knowledge of a person from one group to another through discussion, teaching, modeling, and training. The informal transmission of information from one person to another can also be included in the education process. Education is a general term that encompasses the process of acquiring general knowledge, personal awareness, and skills training. Knowledge alone is not enough to change behavior. It is important to explain why behavior change is necessary. The recommendations highlight the importance of education, indicating that through education knowledge can be improved.

Midwives have a strategic role in maternal-child care in contributing to survival, health, and well-being. Therefore, improving the knowledge and quality of midwife care through special skills training is urgently needed. Training programs should be designed to evaluate and demonstrate changes in midwife knowledge, and hopefully also improve skills.

Various studies have evaluated the influence of education on behavioral change patterns in various types of community groups. Claudia V, et al. who assessed the influence of education on behavioral changes in high school students found that based on the linear logistic regression test, there was a significant influence between education and behavioral change ($p < 0.001$). Luthfiani L, et al., who conducted research related to the effects of peer group education on changes in health behavior, found that there was an effect of providing education using the peer group education method on changes in behavior ($p<0.001$). Research by Lehang FMD et al., which specifically assessed midwives, found that midwives' perceptions of preeclampsia screening in antenatal care (ANC) services were significantly influenced by internal and external factors, including level of knowledge and work experience.

A significant increase in preeclampsia screening activities conducted by midwives after education was provided indicates the influence of education on behavioral change patterns. Health education serves as a foundation for increasing positive health behavior change, realizing a dynamic process that empowers individuals with the knowledge and skills to make informed decisions about well-being. Based on behavioral change theories such as the Health Belief Model, Social Cognitive Theory, and Transtheoretical Model, health education interventions aim to change attitudes, beliefs, and behaviors related to health. These interventions are based on the premise that individual health behaviors are not only influenced by personal factors but are also shaped by environmental and social determinants. By providing education about the consequences of certain health behaviors and fostering an understanding of preventive measures, health education interventions are able to bridge the gap between awareness and behavior.

To reduce the incidence of preeclampsia, screening is very important for all pregnant women during ANC by following the guidelines stated in the Maternal and Child Health Book (KIA) or the Poedji Rochjati Score Card (KSPR) as a general risk detection tool. Although preeclampsia screening is important in health facilities based on the KIA Book, there are still many health facilities and independent midwife practices that have not implemented mean arterial pressure (MAP) and body mass index (BMI) measurements in preeclampsia screening.

Preeclampsia screening is mandatory for all pregnant women undergoing ANC examinations, with primary health care facilities conducting simple screening through anamnesis and physical examination. This is in line with the guidelines recommended by FIGO which outline global standards for preeclampsia screening in the first trimester, targeting health care workers such as doctors, midwives, and nurses.

Efforts to reduce preeclampsia morbidity and mortality can be achieved through active screening for risk factors. However, a qualitative study conducted by Ansari et al. found a significant gap between midwives' perceptions and clinical practices in detecting and managing preeclampsia in various health

facilities, thus increasing the risk of maternal and perinatal mortality. In this study, it was also observed that a large number of midwives did not comply with preeclampsia screening guidelines for various reasons. These reasons included very heavy workload with repeated recording and screening activities that caused fatigue, which ultimately led to non-compliance with the established procedures. Some midwives avoided using the preeclampsia screening guidelines because they felt that the assessment items were confusing and time-consuming to assess overall. In addition, the repetition of the SOAP format further prolonged the process, and the overall busyness of village midwives hampered consistent implementation.

Training plays a key role in influencing preeclampsia screening, where comprehensive and in-depth training helps healthcare professionals, such as midwives and doctors, gain a better understanding of the symptoms, signs and risk factors of preeclampsia. This enables them to perform and interpret the results of the tests they have performed, following official guidelines and protocols for preeclampsia screening, including the recommended frequency of screening during pregnancy.

In addition, through training, health workers can also determine the actions needed if preeclampsia is detected, such as closer monitoring, treatment, or pregnancy management. This also includes effective communication skills to explain screening results to patients, provide advice, and help them understand the importance of closer monitoring if preeclampsia is suspected.

Increased planned referrals by midwives are associated with increased awareness of midwives regarding signs and symptoms of preeclampsia during preeclampsia screening and routine ANC. Alnuaimi K, et al in an RCT study related to the effect of preeclampsia education programs on patient awareness levels found significant differences in the mean score of preeclampsia awareness in the intervention group compared to the control group after implementing the education program.

Midwives and nurses play a vital role in improving clinical outcomes of patient health and disease prevention. Nurses and midwives provide a range of care services to pregnant women including assessing the progress of pregnancy, educating about breastfeeding and contraception, assisting with labor and delivery, and providing childcare and immunizations. Therefore, providing education during pregnancy can improve the quality of care and minimize pregnancy complications. Educational programs about preeclampsia have been found to be highly effective in increasing awareness of conditions associated with preeclampsia. Two studies have reported an increase in knowledge levels following planned health education programs. The increase in the level of knowledge and awareness of health workers regarding the signs and symptoms of preeclampsia is the underlying reason for the increase in planned referrals in this study.

Sriwandoko H, et al., who assessed the effect of referral and management of severe preeclampsia on maternal mortality, found that the risk of maternal death increased, one of which was

caused by incompetent referral (OR=21.80; CI95% 2.70-175.60; p=0.004), and late treatment (OR=13.62; CI95%=2.25-82.45; p=0.004).25 The decrease in the need for ICU/HCU care and the decrease in maternal mortality rates in this study were thought to be mediated by planned referrals which significantly increased after educational intervention was carried out on the research subjects.

CONCLUSION

The provision of education to midwives at primary health facilities significantly increased the level of knowledge, preeclampsia screening measures and planned referrals. All of these improvements are thought to have an effect on reducing the number of maternal ICU/HCU care needs and maternal mortality rates.

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