Healthy Antenatal Risk-monitoring (HARMONY) Effectiveness of Volunteer Assistance Using a Booklet on Improving Risk Detection During Pregnancy

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ABSTRACT

Early identification of pregnancy risk factors using the Maternal and Child Health (MCH) handbook and the Poedji Rochyati Score Card can be carried out by pregnant women or community health volunteers (cadres). Supporting cadres in identifying high-risk pregnancies facilitates timely detection and appropriate intervention. This study aimed to develop a pregnancy risk detection booklet based on the MCH handbook. A cluster randomized controlled trial with a pretest-posttest control group design was conducted in eight villages, involving 30 selected cadres recommended by local midwives based on their active participation. The intervention group received training and assistance using the developed booklet. The results demonstrated that cadres in the intervention group had significantly greater improvement in pregnancy risk detection skills compared to the control group, with a mean difference of 18.7 (95% CI: 15.2–22.2, p=0.001). In addition, cadre performance in antenatal care using the 10T approach improved by 15.7% (95% CI: 11.3–20.1, p=0.001) in the intervention group relative to the control. These findings suggest that the booklet is an effective tool for enhancing cadres' competencies in early pregnancy risk screening and service delivery. Further development of the booklet with more engaging and culturally relevant content may enhance its utility and adoption in community health settings.

Keywords: community health volunteer; booklet; pregnancy risk detection; antenatal care; community health

Background

Maternal health remains a pressing concern in developing countries, where complications during pregnancy, childbirth, and the postpartum period continue to contribute significantly to maternal and neonatal morbidity and mortality (1,2). Many of these complications are preventable if early warning signs are recognized and addressed in a timely manner. However, limited knowledge among pregnant women and their families about the danger signs of pregnancy often results in delayed healthcare-seeking behavior (3). Early detection of pregnancy risk, ideally initiated during the first trimester, is crucial for optimizing the implementation of Birth Preparedness and Complication Readiness (BPCR) programs (4–6). These efforts are essential in accelerating the reduction of maternal mortality, which in Indonesia remains high at 305 deaths per 100,000 live births.

The primary direct causes of maternal mortality in Indonesia include postpartum hemorrhage (27%), hypertensive disorders of pregnancy (14%), and sepsis (11%). Indirect

causes such as unsafe abortion (8%), embolism (3%), HIV-related complications (5%), and other obstetric complications like prolonged labor or obstructed delivery also significantly contribute to the maternal mortality burden (7). Despite efforts to improve maternal health services, early detection at the community level is still suboptimal due to insufficient public understanding of symptoms such as preeclampsia, ectopic pregnancy, premature rupture of membranes, and non-labor-related bleeding (8,9).

In the current healthcare landscape, hypertension during pregnancy, which accounts for a considerable proportion of maternal deaths, requires screening procedures conducted by healthcare professionals. However, these screenings demand the ability to identify health problems at asymptomatic stages, using tools that are accessible, accurate, and efficient—criteria often unmet at the village level (10). Furthermore, clinical assessments involving laboratory analysis for preeclampsia biomarkers, such as triglycerides, LDL, and HDL cholesterol, are not feasible in many community settings due to limitations in personnel and laboratory infrastructure (11,12).

Public health initiatives have increasingly acknowledged the potential of community health volunteers locally known as caders to support early detection and intervention for high-risk pregnancies (13,14). Nevertheless, the effectiveness of cadres hinges on their capacity and tools to accurately identify maternal health risks. Enhancing their knowledge and skills requires more than training; it necessitates appropriate, accessible, and user-friendly educational media (15,16). Previous studies have shown that printed educational tools such as booklets and leaflets can improve health knowledge, promote behavioral change, and support decision-making in maternal care (17).

The development and use of such media in Indonesia have typically relied on the Maternal and Child Health (MCH) handbook. While this resource is mandated for all pregnant women, it is often underutilized due to its technical complexity (18). Therefore, supplementary media that simplify key messages especially for cadres are needed. A well-designed booklet focused on pregnancy risk detection has the potential to serve as a practical decision-making aid, enabling cadres to conduct timely screening, provide appropriate referrals, and increase community awareness of pregnancy complications. In doing so, this approach could help improve the quality of antenatal care and contribute meaningfully to the ongoing efforts to reduce maternal mortality in Indonesia.

Methods

Schema 2.1 Research design
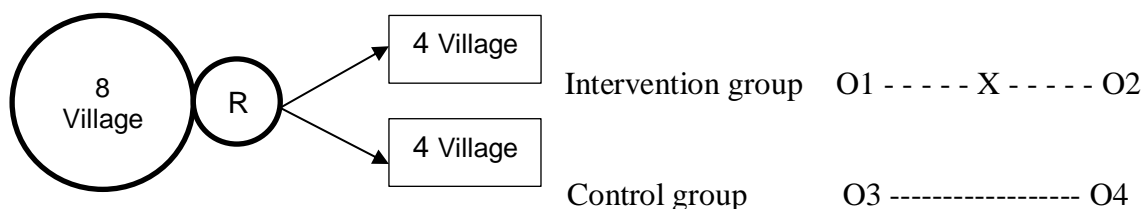
This study employs a pretest-posttest control group design, which allows for the evaluation of caders in detecting pregnancy risk factors before and after the intervention. Observations of pregnancy risk detection skills were conducted at four time points: O1 (pre-intervention observation of pregnancy risk detection skills in the intervention group), O2 (post-intervention observation of pregnancy risk detection skills in the intervention group), O3 (pre-intervention observation of pregnancy risk detection skills in the control group), and O4 (post-

intervention observation of pregnancy risk detection skills in the control group). The intervention involved the provision of a pregnancy risk detection booklet (X), and the questionnaire used for pretest measurements (O1 and O3) was the same as the one used for posttest measurements (O2 and O4).

This research utilized a cluster randomized controlled trial design with a pretest-posttest control group approach, allowing the researchers to assess the change in community health workers' skills in detecting pregnancy risk factors following the intervention (19,21). The intervention group received the pregnancy risk detection booklet and facilitation, while the control group underwent the same observation sequence without receiving the intervention (22, 25).

The study population consisted of caders in the Simo Health Center area, Tulungagung Regency. The unit of analysis was the village. Of the ten villages in the area, eight met the inclusion criteria, which included having more than two active posyandu and an average of at least ten community-based pregnancy risk detection cases per year. Four villages were randomly assigned to the intervention group (Gendingan, Boro, Majan, and Simo), while the remaining four villages (Tawangsari, Ngujang, Plandaan, and Mangunsari) were assigned to the control group. A total of 30 caders participated in the clinical trial, with proportional distribution between the two groups.

Participant selection was based on inclusion criteria, which included caders who had been active for at least two years, were willing to participate in all phases of the study, and were involved in pregnancy risk detection activities for pregnant women in the first, second, or third trimester. Additionally, the caders villages needed to have more than two active posyandu, an average of 47 births annually, and a minimum of 11 pregnancy risk detection cases per year. Exclusion criteria included caders who could not attend or participate in all intervention activities or those from villages with fewer than two active posyandu (26,27).

Data collection was carried out using a standardized questionnaire designed to gather quantitative data on caders skills in detecting pregnancy risks. The questionnaire was developed with the involvement of three experts in community-based midwifery care. Quantitative analysis was used to describe various variables, including participant characteristics and their skill levels, which were presented as means, medians, and tables. A comparative analysis of baseline conditions between the intervention and control groups was conducted using the Fisher Exact test for categorical data with expected frequencies less than five but more than 20%. If significant differences were found at baseline, multivariate analysis using linear regression was performed to control for confounding variables.

As this study involves human subjects, ethical considerations were of utmost importance to protect participants' rights. Ethical procedures included obtaining informed consent from all participants, with the consent form providing complete information regarding the study's objectives, benefits, procedures, and potential risks. Participants who agreed to participate signed the consent form voluntarily. To maintain anonymity, participants' names were not included in data collection forms and were replaced with unique codes. Additionally, the confidentiality of all data collected was fully ensured by the researchers.

Results
Characteristics of participants

Table 3.1. Baseline characteristics of participants in the intervention and control groups

Characteristic	Intervention Group (n=15)		Control Group (n=15)		
	n	%	n	%	*p value*
Age					

Young adult (20–45 years)	9	60	7	47	0,133*
Older adult (46–65 years)	6	40	8	53	
Volunteer Education					
Primary education	0	0	4	27	
Secondary education	14	93	11	73	0,002**
Higher education	1	7	0	0	
Occupation					
Unemployed	8	53	9	60	
Employed	7	47	6	40	0,526
Duration as a health cadre					
<2 years	2	13	3	20	
>2 years	13	87	12	80	0,245

*Fisher's exact test was used for the variables age (p = 0.133), occupation (p = 0.526), and duration as a health cadre (p = 0.245).

**The Mann–Whitney U test was used for the education variable (p = 0.002).

The characteristics of the participants in this study consisted of 30 health cadres evenly divided between the intervention and control groups. In terms of age, the majority of cadres in the intervention group were in the young adult category (20–45 years), accounting for 60% (9 individuals), while in the control group, most participants were in the older adult category (46–65 years), comprising 53% (8 individuals). Regarding educational background, the vast majority of participants in the intervention group had completed secondary education (93%), whereas in the control group, 73% had a secondary education and 27% had only primary education. With respect to employment status, more than half of the intervention group (53%) were unemployed, and similarly, 60% of the control group reported being unemployed. In terms of experience as a health cadre, most participants in both groups had served for two years or more—87% in the intervention group and 80% in the control group. These baseline characteristics indicate a comparable profile between the two groups, which supports the validity of subsequent comparisons between the intervention and control groups.

Analysis Bivariate

Table 3.2. Mean scores of pre-test and post-test for facilitation skills in 10T maternal care services and pregnancy risk detection skills.

Research Variables	Intervention Group Mean+SD	Control Group Mean + SD	p
Facilitation Skills in 10T Maternal Care Services			
Pre test	148.8+18.8	132.7+7.9	0.001*
Post test	172.3+41.7	133.3+7.3	0.001*
Score difference	23.6+22.9	0.6+0.6	
Pregnancy Risk Detection Skills			
Pre test	164.6+11.2	132.6+7.9	0.001*
Post test	211.3+16.8	133+7.2	0.001*
Score difference	46.7+5.6	0.4+0.7	
* Statistical test: Paired sample t-test	significant>0.05		

Based on the results presented in the table, the intervention group demonstrated a 23.6% higher improvement in skills related to 10T antenatal care assistance and a 56.7% higher improvement in pregnancy risk detection skills compared to the control group.

Analysis Multivariate

Table 3.3 The effectiveness of facilitation skills in 10T maternal care services and pregnancy risk detection skills

	Beta	95% CI	p	Beta	95% CI	p
Group						
Control group	0	[0,0]		0	[0,0]	
Intervention group	15.7***	[11.3,20.1]	0.000	18.7***	[15.2,22.2]	0.000
Pre-test Mean Score	-0.028	[-0.37,0.31]	0.864	$-0.75^{=0.48}$	[-1.02,-0.48]	0.000
Volunteer Age						
20–45 years / Young adult	0	[0,0]		0	[0,0]	
46–65 years / Older adult	-0.99	[-3.53,1.54]	0.425	-1.82	[-3.84,0.19]	0.073
Volunteer Education	0	[0,0]		0	[0,0]	
Primary education						
Secondary education	-0.014	[-4.04,4.01]	0.994	-0.0023	[-3.20,3.19]	0.999
Higher education	-4.94	[-11.8,1.92]	0.150	-0.51	[-5.99,4.97]	0.849
Occupation	0	[0,0]		0	[0,0]	
Unemployed						
Employed	1.28	[-1.10,3.65]	0.277	0.93	[-0.96,2.82]	0.317
Duration as a Volunteer	0	[0,0]		0	[0,0]	
< 2 years						
≥ 2 years	1.40	[-1.58,4.38]	0.341	0.91	[-1.47,3.29]	0.437
Constant	0.38	[-15.1,15.8]	0.960	54.0***	[34.9,73.1]	0.000
Pseudo R^2						
aic	152.4			138.7		
df_m	7			7		
Observations	30			30		

95% confidence intervals in brackets

aic= LR Test from Aka iki, df_m= degress of freedom of the model

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

***Linear regression analysis of the post-test score differences, after controlling for confounding variables, showed that the intervention group had significantly higher scores in 10T antenatal care assistance skills by 15.7 points (95% CI: 11.3–20.1) compared to the control group. Similarly, pregnancy risk detection skills were 18.7 points higher (95% CI: 15.2–22.2) in the intervention group. These findings indicate that cadre assistance using a booklet is effective in improving both 10T assistance skills and pregnancy risk detection skills, even after adjusting for confounding factors.

Discussion

The findings of this study indicate that age, educational background, and duration of experience significantly influence caders skills in identifying pregnancy risk factors (28,29). Younger adult caders tended to grasp educational materials more easily compared to older adults, consistent with the theory that age affects cognitive maturity and the capacity to absorb new information (30). Moreover, caders with higher educational attainment were more likely to comprehend information quickly and had greater access to digital media, thus facilitating the adoption of new skills, including pregnancy risk detection (31). Employment status did not show a significant difference between the intervention and control groups, as most participants worked in the informal sector, allowing them flexible schedules to actively participate in maternal health activities (32). Extended experience as a kader was positively associated with higher skill levels. This can be attributed to the caderization process, which involves

community engagement and selection by local leaders and healthcare professionals, contributing to sustained competence (33).

Skill analysis revealed that the intervention accompaniment using a printed booklet had a positive effect, particularly on competencies related to the 10T services and risk detection in pregnancy. The average score for 10T service delivery was 15.7 (95% CI: 11.3–20.1), while the score for pregnancy risk detection was 18.7 (95% CI: 15.2–22.2). These figures suggest that the booklet was effective in enhancing caders competence after adjusting for potential confounding variables. These outcomes support global efforts to achieve the Sustainable Development Goals (SDGs), particularly in improving maternal health through early detection of obstetric risks. Caders play an increasingly strategic role in the early identification of complications such as preeclampsia, a condition with high prevalence and significant impact on maternal and neonatal outcomes. First-trimester screening for preeclampsia which includes mean arterial pressure measurements and maternal biomarkers has shown efficacy, and caders understanding of this process can be improved through structured educational tools like booklets (34).

In terms of media development, booklets were selected for their affordability, ease of use, and accessibility, particularly in areas with limited digital infrastructure (35,36). The booklet served as a decision-support tool, enhancing comprehension through illustrations and expert-reviewed content. Its development involved three key stages: defining educational objectives, visualizing key messages, and designing an evaluative questionnaire. The theoretical framework of Gestalt health promotion underscores that authentic relationships, creative adaptation, and a phenomenological approach can enhance training effectiveness (37,38). Caders who are actively engaged are more likely to understand the sociocultural context of their communities, thereby making their communication strategies more effective and contextually appropriate (39,40).

Previous studies have shown that printed booklets can improve health literacy (38,41). However, their use is limited by the absence of emotional interaction and immediate feedback mechanisms. Compared to digital methods, booklets remain highly relevant for caders in areas where access to technology is restricted. One example is the Celebrating Life booklet, which addresses pregnancy changes, fetal development, and postpartum care (42). It received positive feedback from pregnant women, particularly because it addressed both emotional and informational needs. This reinforces the importance of using culturally and socially adapted health promotion media. Finally, the interpersonal skills of caders in engaging with their communities remain a critical asset in effectively disseminating health information. While pregnant women may rely on doctors, midwives, printed materials, and online sources, the direct involvement of caders allows for timely and tailored responses to individual needs. Thus, using booklets in cader-led interventions has proven effective and is recommended as a sustainable strategy for maternal health services (38,43).

Nevertheless, this study has several limitations. The geographic coverage was relatively narrow, and the short intervention duration may limit the generalizability of the findings to broader contexts. Furthermore, the absence of long-term follow-up restricts the evaluation of the sustainability of the observed skill improvements. Future studies are encouraged to expand the scope and duration of the intervention and to include longitudinal assessments.

Conclusions and Recommendations

Based on the objectives, findings, and discussion, this study concludes that the accompaniment of caders using a printed booklet is effective in improving their skills in detecting pregnancy risk factors. The intervention group demonstrated significantly higher competence in pregnancy risk detection, with a mean score of 18.7 (95% CI: 15.2–22.2; p = 0.001), compared to the control group. Additionally, the booklet intervention significantly enhanced kader skills in delivering antenatal care based on the 10T framework, with a mean

score of 15.7 (95% CI: 11.3–20.1; p = 0.001). These findings suggest that booklets are not only useful as educational tools but also function effectively as decision-support aids in early screening and maternal care, particularly in areas with limited digital access.

For midwifery practice, the implementation of kader accompaniment using printed booklets should be considered as an alternative strategy to strengthen community based pregnancy risk detection. Furthermore, future studies are encouraged to explore the development of more engaging and innovative booklet designs. Incorporating elements such as culturally relevant illustrations or figures of public interest such as celebrities may enhance user motivation and engagement, especially among pregnant women. Long-term studies involving larger populations and diverse settings are also recommended to assess the sustainability and generalizability of the intervention's impact.

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Acknowledgment

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