SRIWIJAYA JOURNAL OF MEDICINE

Empowering Health Cadres for Early Pregnancy Screening: Changes in Knowledge Following ROSI Bumil Training

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Abstract

Early pregnancy detection is vital for reducing maternal and neonatal mortality, yet first trimester antenatal care (K1) visits at Sukorejo community health center remain low at only 24.66% during January-May 2026, according to the MCH regional report. Passive service delivery models, low health literacy, and persistent socio-cultural myths drive this gap. Roda Sisir Ibu Hamil (ROSI Bumil) innovation was developed to empower health cadres as essential community links for active screening and monitoring. Seventy-three health cadres at Puskesmas Sukorejo participated in structured training on early pregnancy screening using innovative tools: ROSI Bumil, Kasir Bu MiJo, and Buku SAPA Ibu. The health cadres' knowledge was assessed before and after the training, and the results were analyzed using the Wilcoxon signed-rank test. Cadres' knowledge increased significantly following the intervention ($p < 0.001$), rising from 21.9% to 95.9% in the "good knowledge" category. Cadres identified six new pregnant women who had not yet done an early pregnancy visit during the two-week active door-to-door pregnancy screening period. The ROSI Bumil program was associated with a significant improvement in cadres' knowledge and facilitated the identification of a new pregnant woman. The intervention may complement routine pregnancy surveillance through community-based screening and digital reporting.

Keywords: Training Tool, Early Antenatal Visit, Pregnancy Screening, Cadre, Knowledge

1. Introduction

Pregnancy is a critical period that requires comprehensive antenatal monitoring to promote maternal and fetal well-being and facilitate the early identification of potential risks.[1] Despite advances in maternal healthcare, complications during pregnancy and childbirth, particularly obstetric haemorrhage and hypertensive disorders, remain major contributors to maternal morbidity and mortality worldwide.[2] According to the World Health Organization (WHO), approximately 260,000 women died from pregnancy- and childbirth-related causes in 2023, with the majority of these deaths being preventable through timely access to high-quality healthcare services and early identification of pregnancy-related risk factors.[3]

Antenatal care (ANC), particularly the first antenatal care visit (K1), is essential for the early identification of pregnancy-related risk factors, prevention of maternal and fetal complications, comprehensive maternal assessment, provision of health education, and timely planning of appropriate interventions throughout pregnancy.[4] Challenges related to early pregnancy detection remain evident at the primary healthcare level, including within the service area of Sukorejo community health center (Puskesmas Sukorejo) in Jember Regency, East Java, Indonesia. Puskesmas Sukorejo is a primary healthcare facility covering four villages: Sukorejo, Karangsono, Gambirono, and Curahkalong. Health issues related to maternal and child health at Puskesmas Sukorejo include the failure to identify some pregnancies during the early stages of

gestation, potentially delaying access to antenatal care (ANC) services. However, the coverage of the first antenatal care visit within Puskesmas Sukorejo has not yet reached the expected target, indicating that the process of identifying pregnant women and ensuring timely access to early pregnancy care requires further improvement. This condition highlights that challenges in maternal healthcare are not solely related to the availability of health services, but also involve the capacity of primary healthcare systems to actively identify pregnant women and ensure their linkage to healthcare services from the early trimester.[5] Several factors may contribute to this condition, including gaps in pregnancy registration and monitoring systems, limited availability of feasible screening tools for community-based early risk identification, and suboptimal use of educational and communication media to support continuous maternal assistance and follow-up.[6,7] Health cadres play a crucial role in improving maternal health through health education, early detection of pregnancy-related risks, and community-based support.[8] Strengthening the capacity of health cadres is a key strategy for enhancing early pregnancy risk detection and increasing the utilization of antenatal care services at the community level.[9]

To strengthen the role of health cadres in supporting early pregnancy detection, the ROSI Bumil (Roda Sisir Ibu Hamil) intervention was developed as a locally tailored, community-based innovation in Sukorejo. The intervention and its supporting tools were newly developed by the research team based on locally identified needs, the roles of health cadres, and the existing maternal health service process.[5,8] The intervention comprised three complementary media: Roda Sisir Ibu Hamil (ROSI Bumil), Kasir Bu MiJo (Kartu Sisir Bumil Sukorejo), and Buku Sapa Ibu, which were designed to support active pregnancy screening, recording, and monitoring by health cadres.

ROSI Bumil was designed to facilitate systematic pregnancy screening and communication; Kasir Bu MiJo to support standardized recording and reporting; and Buku Sapa Ibu to structure health education and maternal assistance.

However, most previous interventions have primarily focused on maternal health education, while integrated models combining early pregnancy screening, recording systems, and cadre-based assistance within a comprehensive approach remain limited, particularly at the primary healthcare level.[10] Therefore, this study aimed to evaluate the effect of ROSI Bumil on cadres' knowledge and assess its implementation for identifying pregnant women who had not yet initiated their first antenatal care visit at Puskesmas Sukorejo.

2. Method

This study employed a pre-experimental one-group pretest–posttest design to evaluate changes in health cadres' knowledge following the ROSI Bumil training program. The study was conducted from August 21 to September 6, 2026 in the working area of Sukorejo Community Health Center, Bangsalsari District, Jember Regency, East Java, Indonesia, covering four villages: Sukorejo, Karangsono, Gambirono, and Curahkalong. Using total sampling, 73 active health cadres were included in the study. Eligible participants were cadres serving in the four villages who agreed to attend the training and complete both assessments. Cadres who did not complete the training or were unable to read and write were excluded.

The ROSI Bumil program was developed through focus group discussions (FGDs), field observations, interviews, and reviews of routine maternal and child health records. Health program priorities were determined

using a locally modified Hanlon method, in which magnitude, seriousness, effectiveness, and feasibility were each scored from 0 to 10 and multiplied to obtain a priority score. The results identified the low coverage of the first antenatal care visit (K1) as a priority health issue to follow up, and intervention plans were discussed with stakeholders.

The intervention integrated three locally developed educational and screening tools: Roda Sisir Ibu Hamil (ROSI Bumil), Kasir Bu MiJo, and Buku SAPA IBU. ROSI Bumil is a thick circular piece of paper that can be rotated for initial pregnancy screening. The front side lists five possible signs of pregnancy: missed period, nausea or vomiting, sexual activity, frequent urination, and breast tenderness. Each sign is assigned a score of 1 and categorized as low suspicion (0-1), observation (2-3), or referral for further assessment (4-5). The back side displays the gestational age based on the last menstrual period. Kasir Bu MiJo is a card for recording screening results and follow-up information. Buku SAPA Ibu provides training materials and guidelines for cadres on how to conduct screenings. All of these tools are intended only for initial screening, not for diagnosing pregnancy. Confirmation of a pregnancy test result must be performed by a healthcare professional.

Cadres received a two-hour training session including education on early pregnancy identification, antenatal care standards (10T), K1 visits, demonstration of ROSI Bumil and Kasir Bu MiJo, interactive discussions, and screening simulations. Following training, cadres conducted household-based active case-finding door-to-door among women of reproductive age and couples whose pregnancies had not been recorded in routine maternal health registers. Suspected pregnancies were documented and reported through village-specific WhatsApp groups for follow-up by village midwives within 24 hours. Field implementation and monitoring continued during the study period.

The primary outcome was cadres' knowledge, measured immediately before and after training using identical 20-item multiple-choice questionnaires adapted from Putri and Andriani (2026) with additional items addressing the ROSI Bumil program.[11] Each correct answer received one point, yielding a total score of 0–20, categorized as good (≥ 16), moderate (12-15), or poor (≤ 11). The secondary outcome was the number of newly identified pregnancies during the active case-finding period that had not yet been documented as having received a first prenatal care visit, as subsequently verified by a village midwife. Descriptive statistics were used to summarize participant characteristics and program findings. Following normality assessment using the Kolmogorov–Smirnov test, paired knowledge scores were compared using the Wilcoxon signed-rank test and summarized using medians and interquartile ranges, alongside means and standard deviations. Statistical analyses were performed using SPSS version 21, with significance set at $p < 0.05$.

Ethical approval was granted by the Research and Innovation Ethics Committee of Universitas Brawijaya (No. 148/EC/KERIS/01/VIII/2026), issued on 20 August 2026.

Table 1. Distribution of health cadres' knowledge before and after the ROSI Bumil training intervention

Knowledge	Pretest		Posttest	
	N	%	N	%
Good	16	21.9	70	95.9
Moderate	44	60.3	3	4.1
Poor	13	17.8	0	0

3. Result

Table 1 shows an increase in cadres' knowledge regarding K1 antenatal visits for pregnant women. During the pretest, 16 respondents (21.9%) had good knowledge, 44 respondents (60.3%) had sufficient knowledge, and 13 respondents (17.8%) had poor knowledge. Following the ROSI Bumil training intervention, the posttest results showed that respondents' knowledge increased to good knowledge for 70 respondents (95.9%) and sufficient knowledge for 3 respondents (4.1%). The mean knowledge score increased from 13.62 (SD = 2.442) before the intervention to 18.07 (SD = 1.447) after the intervention. This improvement was statistically significant ($p < 0.001$), indicating that the health education intervention effectively enhanced the knowledge of health cadres. Following the training, health cadres conducted door-to-door pregnancy screening in their neighborhoods using ROSI Bumil tools. Cadres reported a woman who was suspected of being pregnant to the village midwife for follow-up initial screening through WhatsApp. Over the two-week active case screening period, six new pregnant women were identified and had not yet done their first prenatal checkup.

4. Discussion

The implementation of the maternal and child health (MCH) program at Puskesmas Sukorejo is aligned with the Cluster 2 (Maternal and Child) approach within the primary health care system. The availability of maternal and neonatal services, including standard antenatal care, ultrasonography, normal delivery assistance, neonatal care, auxiliary health centers, village health posts, integrated antenatal care activities, and prenatal classes, indicates that essential MCH services are available within the local health service network. These findings indicate that the availability of services does not guarantee optimal utilization or coverage. This gap highlights the urgency to strengthen primary health care services in identifying pregnancies early, reaching pregnant women in the community, and facilitating timely access to antenatal care.

Facility-based and reactive approaches dominate the current health care model, as evidenced by low K1 coverage and delays in starting antenatal care.[12] The use of services depends on the initiative of pregnant women to seek out health care facilities on their own. This approach may be less effective in communities facing geographic barriers, limited health literacy, and strong sociocultural influences.[12,13,14] Strengthening MCH services requires a more proactive, community-based approach in which pregnancies are identified and followed up before women independently seek care.

The PRECEDE–PROCEED model is used as a conceptual framework for understanding factors that may influence antenatal care utilization through predisposing, enabling, and reinforcing factors. In the context of early antenatal care, maternal health literacy and sociocultural beliefs may shape perceptions of pregnancy and the perceived benefits of seeking care.[15] For example, concerns that early pregnancy examinations may jeopardize pregnancy continuation, or the perception that healthcare is necessary only when symptoms arise, may influence care-seeking decisions.

These findings indicate that increasing antenatal care coverage cannot rely solely on expanding clinical service availability. Health promotion strategies should also address the cognitive and cultural determinants that influence health-seeking behavior.[16] Health education should therefore extend beyond the provision of general information and focus on addressing locally specific misconceptions through culturally sensitive communication

involving pregnant women, husbands, mothers-in-law, and other influential family members.[17]

Enabling factors indicate that physical accessibility, particularly proximity to health facilities and availability of transportation, remains an important determinant of maternal health service utilization.[14,18,19] For example, poor road conditions and difficult terrain may increase the practical burden of accessing health facilities. This illustrates that geographic accessibility and service availability do not necessarily correspond. Access to comprehensive services remains limited if transportation, distance, and road conditions are inadequate.[20] The lack of a community-based pregnancy monitoring system is an organizational barrier that can delay the detection of pregnancy until women take initiative to seek care at health facilities.

Support from family and the social environment also influences decision-making regarding the use of maternal health services. Reinforcing factors highlight the role of family and the social environment in decisions regarding maternal health services.[21] The influence of husbands and mothers-in-law indicates that antenatal care utilization is not always an individual decision made by the pregnant woman.[22] Interventions focused only on pregnant women may be less effective if influential family members hold beliefs that discourage early antenatal care.

The Hanlon method indicates that low K1 coverage is a primary health issue. Delayed pregnancy detection can hinder risk assessment, screening, health education, supplementation, immunization, and referral. Low coverage of the first antenatal care visit (K1) should be viewed not merely as a failure to meet coverage targets, but also as a problem of access to and timeliness of early antenatal care that may affect continuity of care for mothers and newborns.[23,24]

The development of ROSI Bumil (Roda Sisir Ibu Hamil) was designed to address this upstream problem by targeting the identified gap in early pregnancy detection at the community level. The intervention enables community health cadres to actively identify suspected pregnancies, followed by assessment and follow-up by midwives. ROSI Bumil combines symptom-based screening and gestational-age estimation through a two-sided wheel-shaped tool, while the KSB (Kartu Sisir Bumil) provides a practical means of documenting findings during community-based visits.

From a health-system perspective, this approach illustrates that digital communication does not necessarily require complex technology and can make use of widely available platforms when integrated into a clearly defined workflow.[25]

The implementation of ROSI Bumil identified six pregnant women who had not previously been documented as having received their first prenatal visit during the two weeks of active door-to-door screening by health cadres. These findings suggest that active community-based pregnancy identification may complement routine facility-based surveillance, particularly because delayed or inadequate antenatal care remains influenced by individual, social, geographical, and health-system factors.[26] Limited duration of the intervention and the absence of a control group limit the interpretation of the findings, and the six pregnancies identified cannot yet be fully attributed to ROSI Bumil.

Increasing cadres' knowledge from 21.9% to 95.9% following the intervention is consistent with evidence indicating that health cadres interventions can improve maternal health knowledge and facilitate antenatal care utilization when supported by appropriate training and implementation mechanisms.[27] This study assessed knowledge

immediately after the intervention; therefore, the results were not yet able to confirm the sustainability of the health cadres competencies or their contribution to increased utilization of antenatal services.

Integrating pregnancy screening, gestational age estimation, and digital reporting is supported by evidence that mobile health technologies can help cadres improve maternal health service utilization and strengthen health information management.[28] Digital reporting should support existing referral and health service systems without replacing health professional judgement. Timely access to antenatal care is influenced by service accessibility, socioeconomic circumstances, and sociocultural factors.[29] Consequently, future implementation of ROSI Bumil should evaluate referral completion, timing of first antenatal contact, data quality, and sustainability over a longer period.

The limitations of the pre-post design without a comparison group, immediate post-intervention assessment, and limited participant characteristics introduce testing or recall effects, reduce the certainty of causal conclusions, limit the generalizability of the findings, and make it difficult to determine the specific impact of ROSI Bumil. The short implementation and follow-up periods preclude assessment of sustained cadres' knowledge, performance, pregnancy detection, or K1 coverage. Geographic barriers, including poor road conditions, may also limit the intervention's impact.[30] The sustainability of ROSI Bumil may depend on cadres motivation, supervision, and institutional support.[31] Finally, because the intervention was developed within the specific sociocultural and geographic context of Sukorejo, its transferability to other settings should be assessed cautiously.

Future studies should evaluate ROSI Bumil over a longer follow-up period and use stronger evaluation designs, such as quasi-experimental or controlled community-based studies. Outcomes should include not only cadres' knowledge and the number of pregnancies identified but also K1 coverage, timeliness of the first antenatal visit, identification of high-risk pregnancies, successful referrals, and selected neonatal outcomes. Further research should also explore the perspectives of pregnant women, husbands, mothers-in-law, cadres, and midwives to understand how family decision-making and sociocultural beliefs influence intervention effectiveness. Such evidence would help determine whether ROSI Bumil can be adapted and implemented in other primary health care settings with similar challenges.

5. Conclusion

In this one-group pretest-posttest study, health cadres' knowledge classification was higher immediately after a multicomponent training program that included ROSI Bumil and related educational and reporting tools. During the reported active case finding period, six pregnancies were identified, this should be interpreted as a descriptive process finding pending confirmation of screening denominators and follow-up records. The study did not establish the independent effect of ROSI Bumil, screening accuracy, cadres competence, referral effectiveness, or an increase in K1 coverage. Research with a controlled group using validated measurement instruments and a longer follow-up period is needed to evaluate whether the intervention improves community-based pregnancy screening coverage and timely utilization of antenatal care services.

6. Acknowledgement

The authors would like to express their sincere gratitude to the Department of

Midwifery, Faculty of Medicine, Universitas Brawijaya, and Puskesmas Sukorejo, Jember, for their valuable support during the implementation of this study. The authors also extend their appreciation to the village midwives, health cadres, and all participants for their active participation and dedication, which contributed to the successful implementation of the ROSI Bumil program.

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