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STRENGTHENING COMMUNITY HEALTH CADRES IN FETAL MOVEMENT MONITORING: A CAPACITY-BUILDING PROGRAM TO IMPROVE MATERNAL EARLY DETECTION OF FETAL WELL-BEING

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Abstract **Background:** Maternal perception of fetal movement is an important early indicator of fetal well-being, and reduced fetal movement (RFM) is often associated with fetal compromise. However, awareness and adherence to fetal movement monitoring remain low in many communities due to limited knowledge and insufficiently trained support personnel. Objective: This study aimed to evaluate the effectiveness of a capacity-building program designed to strengthen community health cadres in educating pregnant women to monitor fetal movements using the Cardiff Count-to-Ten method, and to assess improvements in maternal accuracy and consistency in daily monitoring
Methods: Ten cadres were trained to educate twenty-five pregnant women to perform daily fetal movement counting using the Cardiff Count-to-Ten method.
Results:
Cadre demonstration skills increased significantly from 55.2 to 88.3. Maternal counting accuracy improved from 28% to 88%, and consistency from 36% to 84%. Three cases of reduced fetal movement were successfully identified and referred to midwives for timely clinical evaluation. Discussion: The findings show that skill-based training and mentoring effectively enhance cadres' communication and demonstration abilities, which in turn improve maternal understanding and adherence to monitoring. These results align with existing evidence indicating that fetal movement awareness promotes earlier care seeking, though its impact depends on strong referral pathways and responsive clinical follow-up.
Conclusion: Strengthening cadre capacity effectively improved maternal ability to detect fetal movement changes, supporting early identification of fetal distress.

Keywords: Fetal Movement Monitoring; Maternal Early Detection.

BACKGROUND

Maternal and perinatal health remains a critical public health concern globally, particularly in low- and middle-income countries where maternal and neonatal mortality rates are disproportionately high[1]. One of the important clinical indicators associated with fetal well-being is the perception of fetal movements felt by the mother. Decreased or altered fetal movement is often one of the earliest signs of fetal compromise, including uteroplacental insufficiency, intrauterine growth restriction, and intrauterine fetal demise[2]. Monitoring fetal movement is therefore an essential component of antenatal care and contributes to the timely identification of at-risk pregnancies, enabling earlier intervention and improved fetal outcomes[3]. Despite its importance, awareness and implementation of fetal movement monitoring in many communities remains low due to limited knowledge, inadequate counseling, and lack of trained support personnel[4].
The Cardiff “Count-to-Ten” method is one of the most widely used approaches for fetal movement monitoring and is recognized for its simplicity, low cost, and practicality in community settings[5]. In this method, pregnant women are instructed to record the time it takes to feel ten fetal movements within a given day, with delays or reductions triggering clinical evaluation[6]. Studies indicate that structured fetal movement counting can improve maternal vigilance and prompt timely healthcare-seeking behavior when abnormalities occur[7]. However, inconsistent training, unclear messaging, and variability in counseling approaches have resulted in mixed levels of maternal adherence and understanding[8]. Therefore, strengthening education strategies and support systems is necessary to optimize the practical benefits of fetal movement monitoring.

In Indonesia, community health cadres play a pivotal role in supporting maternal and child health, particularly in primary care and community-based health programs[9]. Cadres serve as intermediaries between healthcare providers and mothers, delivering essential health education, promoting healthy behaviors, and facilitating access to antenatal care[10]. However, many cadres lack standardized training on specific maternal monitoring techniques, including fetal movement assessment. Without adequate guidance, cadres may provide inconsistent or incomplete information, reducing the effectiveness of maternal health promotion strategies[11]. Capacity-building programs that focus on strengthening cadre competencies have demonstrated effectiveness in improving maternal health literacy, early detection practices, and community-level health outcomes[12].

Educational interventions targeting cadres must emphasize not only the knowledge aspect, but also practical counseling skills, such as how to explain procedures in simple language, demonstrate techniques effectively, and build rapport to encourage maternal adherence[13]. Research shows that adult learning approaches that include demonstration, repetition, and mentoring yield greater retention and skill application compared to lecture-based teaching alone[14]. Furthermore, strengthening cadres’ confidence and communication skills has been associated with improved maternal trust and willingness to perform self-monitoring practices[15]. Therefore, structured training and

supportive supervision are essential elements of programs designed to enhance cadre performance in maternal health education.

Given the significance of fetal movement monitoring in preventing adverse perinatal outcomes and the strategic role of cadres in community health systems, it is essential to develop and evaluate capacity-building programs that improve cadre competence in counseling pregnant women[16]. This study was conducted to assess the effectiveness of an educational and mentoring intervention aimed at improving the ability of community health cadres to teach pregnant women how to monitor fetal movements using the Cardiff method. The program also sought to measure improvements in maternal understanding, accuracy, and consistency in daily fetal movement monitoring. The findings provide insight into how structured community-based capacity development can support early detection of fetal distress and contribute to safer pregnancy outcomes[17].

METHODS

The capacity-building program for community health cadres in educating pregnant women about fetal movement monitoring was carried out in three main stages: theoretical strengthening, field practice, and monitoring and evaluation. First, cadres received foundational knowledge regarding the importance of fetal movements as an indicator of fetal well-being and the correct technique for counting fetal movements. Second, cadres participated in supervised field practice involving simulation and direct demonstration to ensure they were able to apply and teach the method accurately. Third, ongoing monitoring and evaluation were conducted to assess the effectiveness of the training, identify challenges, and provide continuous feedback for improvement.

The program implementation followed a structured sequence of activities. The initial phase involved detailed program planning, including identifying objectives, target groups, required resources, and implementation locations. A program socialization phase was conducted with the local health center, community leaders, and cadre organizations to secure support and coordination. Cadres were then selected and trained to enhance their knowledge and skills related to pregnancy, fetal development, fetal movement counting techniques, and effective communication strategies. Educational materials were developed to be accurate, culturally relevant, and easily understood, and interactive teaching methods were selected to improve learning engagement.

Once preparation was completed, the program was implemented according to schedule. Trained cadres delivered education to pregnant women through group sessions, community health posts, or home visits. During this phase, the implementation process was continuously monitored through direct observation, interviews, and assessment of mothers' understanding and behavior in monitoring fetal movements. Cadres were also provided with ongoing support to guide pregnant women in performing daily fetal movement counting.

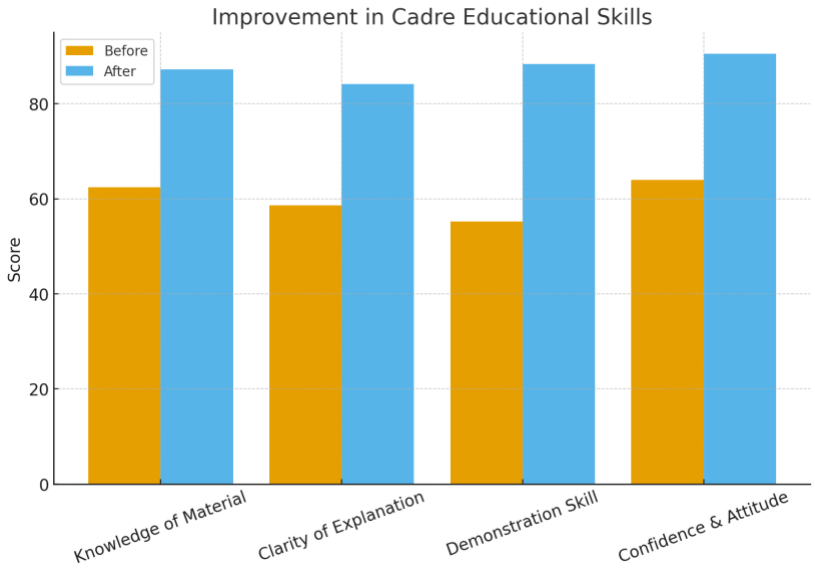
Evaluation was carried out to measure improvements in cadre knowledge and skills as well as behavioral changes among pregnant women. This included pre- and post-

training assessments, observation of practical performance, and assessment of the consistency and accuracy of fetal movement monitoring among mothers. Additionally, sustainability was evaluated by examining whether cadres continued educating mothers after the program ended and whether support mechanisms were in place to maintain program continuity. Feedback from cadres, mothers, and stakeholders was collected to identify strengths, challenges, and suggestions for improvement.

The participation of community health cadres played a central role in the success of this program. Cadres actively attended training sessions, delivered fetal movement monitoring education to pregnant women in their assigned areas, and assessed mothers' ability to perform the technique correctly. This approach not only improved maternal awareness and early detection of fetal risk but also strengthened cadre skills and empowered the community in safeguarding maternal and fetal health. Ultimately, the program is expected to contribute to early detection of pregnancy complications, improved maternal and infant well-being, and the long-term empowerment of community health cadres.

RESULTS

Cadres demonstrated improvements across all competency domains, with the greatest improvement observed in demonstration skills (55.2 to 88.3, $p < 0.01$). Pregnant women showed increased understanding, improved accuracy in fetal movement counting (28% to 88%), and enhanced consistency in daily monitoring (36% to 84%). Three cases of reduced fetal movement were detected and referred to midwives for further evaluation.
Figure 1. Improvement in Cadre Educational Skills

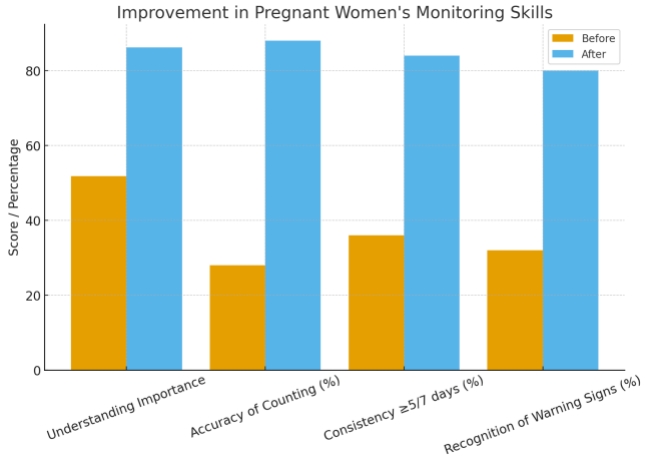


The cadres demonstrated a significant improvement in skill performance, particularly in the ability to correctly demonstrate the fetal movement counting technique (increase of 33.1 points, $p < 0.01$). This finding indicates that the training not only increased

knowledge, but effectively strengthened practical competencies that are essential for community-level maternal support.

The evaluation of pregnant women's skills in fetal movement monitoring was assessed based on two key indicators: Accuracy in performing the fetal movement counting technique, and Consistency in recording daily fetal movement counts over a seven-day period. These measures provided an objective assessment of both procedural understanding and adherence to routine monitoring practices.

Figure 2. Improvement in Pregnant Women's Monitoring Skills



The majority of pregnant women were able to independently monitor fetal movements correctly and consistently following the educational sessions and mentoring. Cadres demonstrated a significant improvement in their educational skills, particularly in the ability to provide clear demonstrations and communicate effectively during fetal movement monitoring counseling.

Pregnant women showed a marked increase in their ability to count and record fetal movements independently, with an 88% success rate in accurate and consistent monitoring by Day 7. The program contributed to earlier detection of potential fetal complications, as evidenced by timely referrals made when decreased fetal movement was identified.

DISCUSSION

Improving the demonstration and communication skills of community health cadres is essential, as maternal perception of fetal movements is often the earliest trigger for further fetal assessment. Changes in the mother's perception of fetal activity are recognized as early warning signs of fetal compromise and must be followed by clinical evaluation [18]. When cadres are able to correctly demonstrate the Cardiff Count-to-Ten method, the likelihood that pregnant women will understand the technique and report

decreases in fetal movement increases. This is consistent with the improved cadre performance scores observed in this program, suggesting that skill-based education enhances both comprehension and teaching capacity.

The program also showed a significant effect on maternal adherence, reflected in the increase in accuracy of fetal movement recording from 28% to 88%, and consistency reaching 84%. Such improvements indicate a meaningful behavioral change. Previous research has noted that structured fetal movement monitoring encourages maternal awareness, fosters stronger maternal–fetal attachment, and increases timely care seeking, although evidence on reduction in perinatal mortality remains mixed [18]. The Cardiff Count-to-Ten method, which instructs mothers to count ten fetal movements and record the time taken (normal ≤ 12 hours), has been widely used in community-based screening due to its simplicity and ease of instruction [19]. While several clinical observations support its usefulness as an early detection tool, systematic evidence on its effectiveness in preventing perinatal mortality is inconclusive. A major systematic review reported that while fetal movement counting increases maternal vigilance and leads to earlier diagnostic evaluation, its independent effect on reducing perinatal mortality remains uncertain 20. This highlights that fetal movement monitoring must be linked with strong referral pathways and responsive clinical follow-up.

Maternal perception, although subjective, has strong clinical relevance when combined with objective assessments such as cardiotocography and ultrasound. Trained cadres enable more reliable reporting from mothers, allowing midwives and health facilities to perform evaluations more efficiently. Modern clinical guidance emphasizes the importance of responding to maternal concern promptly, rather than relying solely on numerical thresholds [18]. Therefore, this program's approach aligns with current recommendations: maternal report of decreased fetal movement should always prompt timely assessment.

Based on the findings and supporting literature, several practical recommendations can be made. First, standardized education modules should be maintained using demonstrations and role-play to ensure cadres retain practical skills. Second, a clear local response protocol is needed so that every report of reduced fetal movement leads to immediate clinical evaluation, consistent with RFM and RCOG-based guidance [18]. Third, the Cardiff method should continue to be used for community education while objective fetal assessments are conducted at health facilities when abnormalities are suspected. Fourth, continued monitoring and data reporting—using tools such as fetal movement recording sheets or digital logs—should be performed regularly to assess long-term outcomes and improve program implementation 21. Finally, involving family members is recommended to strengthen adherence, as household support has been shown to improve maternal compliance with health instructions [22].

However, interpretation of the program's outcomes must take into account several limitations. The sample size was small and observation time limited, which may not reflect long-term behavioral or clinical outcomes. Some measures, such as maternal understanding and motivation, relied on subjective assement scales that may introduce response bias. Additionally, results from this community may not directly generalize to areas with different cultural or healthcare access conditions. Future research could

include larger cohort follow-up through delivery to evaluate whether improved adherence translates into reduced emergency interventions or adverse perinatal outcomes. Cost-effectiveness analysis and the exploration of digital fetal movement tracking tools—particularly those usable offline—are also potential areas for development [19].

In summary, the educational and mentoring intervention demonstrated measurable improvements in cadre competency and maternal fetal movement monitoring behavior. While fetal movement counting alone may not directly reduce perinatal mortality, when integrated into a responsive maternal care system with clear referral procedures, it contributes to earlier detection of fetal compromise and supports safer pregnancy outcomes [21, 23.]

CONCLUSION

Strengthening cadre capacity in fetal movement education is an effective strategy to enhance maternal monitoring practices and promote early detection of fetal distress at the community level. The fetal movement education and monitoring program using the Cardiff method is designed to continue beyond the completion of the community engagement activities. Therefore, sustainability efforts will be implemented through capacity strengthening of partner cadres, multi-level coordination, and integration into existing community-based maternal health services.

1. Integration into Routine Posyandu and Antenatal Class Education Activities

   Fetal movement monitoring will be included as a regular component of monthly Pregnant Women's Classes and Posyandu maternal health sessions. Cadres and partner facilitators will allocate dedicated time to review fetal movement monitoring records using the Cardiff Count-to-Ten sheet (manual or digital). Purpose: To ensure that fetal movement monitoring becomes a consistent part of routine maternal health care, rather than a temporary intervention limited to the duration of the program.

2. Empowerment and Self-Reliance of Local Partners

   Trained partners will continue to serve as local facilitators and points of reference for pregnant women in their communities. They will take an active role in training new cadres in the event of personnel changes or expansion of coverage areas. This ensures continuity of skills and minimizes dependence on external trainers.

3. Utilization of Digital Record-Keeping Systems

   The digital fetal movement monitoring format (e.g., Google Sheets) will continue to be used to simplify data recording, remote supervision, and progress tracking. This system supports real-time monitoring, enabling early detection of potential concerns.

4. Strengthening Collaboration with Village Midwives and Local Health Centers (Puskesmas).
   Coordination will be maintained through established communication channels, such as WhatsApp groups linking partners, cadres, and midwives. If reduced fetal

movement is detected, midwives will receive immediate notification to ensure prompt clinical assessment and intervention.

5. Downstream Adoption of Community Educational Materials
   Educational resources, including instructional videos and booklets, will be distributed to support ongoing fetal movement monitoring education during Pregnant Women's Classes. These materials ensure consistency of messages and serve as practical tools for cadres in the field.

By implementing these sustainability strategies, the program is designed to remain ongoing, independent, and impactful. The continuation of training, digital monitoring, collaborative referral pathways, and standardized educational materials will support long-term improvements in maternal awareness and fetal health outcomes at the community level.

REFERENCES

1. WHO. Maternal Mortality: Key Facts. World Health Organization; 2023.
2. Royal College of Obstetricians and Gynaecologists (RCOG). Reduced Fetal Movements Guideline. 2021.
3. Frøen JF, et al. Fetal movement monitoring: Value and limitations. BJOG. 2018.
4. Smith V, et al. Barriers to maternal fetal awareness programs. Midwifery. 2022.
5. Grant A, et al. Cardiff "Count-to-Ten" method development and evaluation. Lancet. 1978.
6. Mangesi L, Hofmeyr GJ. Fetal movement counting for assessment of fetal wellbeing. Cochrane Database Syst Rev. 2015.
7. Saastad E, et al. Maternal perception and timely response. PLoS One. 2011.
8. Hayes DJ, et al. Maternal education inconsistency and monitoring outcomes. BMC Pregnancy Childbirth. 2023.
9. Kementerian Kesehatan RI. Buku Pedoman Kader Posyandu. 2021.
10. Rifiani U, et al. Cadre roles in maternal health promotion. Jurnal Kebidanan. 2022.
11. Dewi R, et al. Variability in cadre training and maternal outcomes. Kesmas. 2023.
12. Nugrahaeni D, et al. Capacity strengthening and community health outcomes. Global Health Action. 2021.
13. Bastable S. Nurse as Educator: Principles of Teaching and Learning. 2020.
14. Kolb DA. Experiential Learning Theory. Prentice-Hall; 2014.
15. Chapman J, et al. Communication confidence improves maternal engagement. Patient Educ Couns. 2019.
16. IOG. National Guideline on Reduced Fetal Movements. 2024.
17. McCarthy CM, et al. Community-based maternal surveillance models. Lancet Global Health. 2022.
18. Royal College of Obstetricians and Gynaecologists (RCOG). Reduced Fetal Movements Guideline. 2021.
19. Mangesi L, Hofmeyr GJ. Fetal movement counting for assessment of fetal wellbeing. Cochrane Database Syst Rev. 2015.

20. Grant A, et al. Cardiff Count-to-Ten method. Lancet. 1978.
21. Frøen JF, et al. Fetal movement monitoring: Value and limitations. BJOG. 2018.
22. Saastad E, et al. Maternal perception and timely response. PLoS One. 2011.
23. Kementerian Kesehatan RI. Buku KIA. Jakarta: Kemenkes RI; 2020.