INTEREST: Jurnal Ilmu Kesehatan
Vol. 14, No. 2, November 2025
https://doi.org/10.37341/interest.v14i2.618

Original Research

Identification of Innovation Needs for Fetal Well-Being Monitoring: A Phenomenological Research

Yuni Purwati[1*], Evi Wahyuntari[2], Arsyad Cahya Subrata[3], Diah Nur Anisa[4]

[1,4]Nursing Study Program, Faculty of Health Sciences, Universitas Aisyiyah Yogyakarta, Indonesia
[2]Midwifery Study Program, Faculty of Health Sciences, Universitas Aisyiyah Yogyakarta, Indonesia
[3]Department of Electrical Engineering, Faculty of Industrial Technology, Universitas Ahmad Dahlan Ahmad Yogyakarta, Indonesia

ABSTRACT

Background: *Counting fetal movements is a vital assessment to determine the well-being of the fetus that can be carried out independently by pregnant women. Pregnant women need to be provided with tools that are easy, practical, safe and economical so they can get accurate results. Objective: To develop a fetal movement counting tool that can be used independently by pregnant women.*

Methods: *Qualitative phenomenological research, carried out 1 June-31 Juli 2024. Research using a focus group discussion approach on 8 participants, pregnant women's health workers at Bantul Regional Health Centers, Yogyakarta, Indonesia. Sample criteria: willing to be a participant, actively serving in the maternal health unit, working at a Community Health Center with the highest Infant Mortality Rate. The sample was selected using purposive sampling, analysis techniques using compression, presentation and drawing conclusions NVivo 12 Pro International software.*

Results: *A total of 246 codes were generated, 7 categories, 4 themes, namely: (1) previous behavioral experience; (2) perception of the benefits of calculating fetal movements; (3) experience of techniques for calculating fetal movements; and (4) expectations of the tools needed. There was main topic is need for monitoring fetal movementsaya*

Conclusion: *The themes obtained are the basis for formulating a design to develop a fetal movement monitoring tool that can be carried out independently by pregnant women. The themes obtained imply that health workers need to encourage the use of simple and easy-to-operate foetal movement monitors that can be used independently to improve pregnancy monitoring based on maternal empowerment.*

ARTICLE HISTORY
Received: February 27th, 2025
Accepted: December 9th, 2025

KEYWORDS
fetal movement count, fetal well-being, pregnant women;

CONTACT
Yuni Purwati
✉
yunipurwati@unisayogya.ac.id
Nursing Study Program, Faculty of Health Sciences, Universitas Aisyiyah Yogyakarta. Jl. Siliwangi No. 63, Sawah Area, Nogotirto, Gamping District, Sleman Regency, Special Region of Yogyakarta 55292 Indonesia.

Cite this as: Identification of Innovation Needs for Fetal Well-Being Monitoring: A Phenomenological Research. (2025). *Interest : Jurnal Ilmu Kesehatan*, *14*(2), 153-165. https://jurnalinterest.com/index.php/int/article/view/618

INTRODUCTION

Pregnancy is a vulnerable situation for the woman and the fetus she is carrying. The United Nations Children's Fund (UNICEF), data shows that there are 2.8 million

newborn n deaths every year or 1 death every 11 seconds (*Neonatal Mortality Rate*, 2023). Due to the high infant mortality rate, the Sustainable Development Goals (SDGs) have a target of reducing the infant mortality rate to less than 12 per 1.000 live births by 2030. In Indonesia the infant mortality rate has decreased over the last few decades, but the figure is still high, namely 32 children per 1.000 live births, but has not been able to reach the National-Medium Term Development target of 19.5 per 1.000 live births.

The government has made efforts to reduce Infant Mortality Rate (IMR), including providing antenatal care services with a minimum of 4 visits, childbirth and postpartum, improving the referral system and maternal class programs (Permenkes, 2020). To date, these efforts have not achieved the expected targets, so efforts are needed to improve services from the time of pregnancy. This indicates the need for a more comprehensive approach focused on early detection of risks during pregnancy in order to reduce infant mortality more effectively.

Fetal well-being is a parameter of fetal health that can be determined through the heart rate and fetal movements. Fetal movements are the baby's kicks in the womb which can be felt by the mother due to pressure on the abdominal wall when the fetus moves or kicks. The mother can feel fetal movements from 20 weeks of gestation, becoming clearer and stronger as the gestational age increases. Monitoring fetal movements is a simple, cheap and low-tech method. Maternal perception of reduced fetal movement is the most important marker of decreased fetal activity (Güney & Uçar, 2020 ; Nazia Al-Amri & Smith, 2022).

The mother can control fetal movements carefully and report any decrease in fetal movement to the health care provider. This method can prevent perinatal morbidity and mortality. Increase the mother's ability to recognize warning signs, so that the mother is timely in seeking help if there are abnormalities in signs of fetal movement(Smith et al., 2021).

Fetal movements can be measured using the Cardiff count of ten technique, namely the fetus is said to be healthy and prosperous showing 10 series of movements in less than 12 hours. If within 12 hours you have not received 10 series of fetal movements, you must immediately report it to a health facility for further monitoring and treatment of risks to the welfare of the fetus (Smith et al., 2021). Decreased fetal movement is a sign of fetal health problems, starting with a lack of placental perfusion originating from the mother's oxygenation, causing hypoxia (Al-Amri & Smith, 2022). Prolonged hypoxia carries the risk of acidosis which disrupts metabolism, fetal growth, tissue damage, organ failure and even fetal death (Owens & Libertus, 2022; Heaxell; Holland; Wilkinson, 2023).

Monitoring fetal movements is an action that pregnant women can take independently to determine the well-being and signs of danger to the fetus. Besides that, counting fetal movements can trigger caring behavior, the mother's attention to the fetus (Mohapatra et al., 2021b; Ranjbar et al., 2021). The fetal movements that are felt give the mother confidence that the fetus is there and alive, instinctively it will stimulate the mother to move to stroke, invite her to talk so that the fetus responds with further movements.

This emotional relationship between mother and fetus has a positive impact on uteroplacental circulation so that the fetus is kept healthy (Akselsson, 2020; Venkateswara, 2020). The results of a study were also reported which stated that counting fetal movements influences the mother's attitudes and actions to pay more

attention to the fetus which has an impact on the development of the fetus until the baby (Yudianti et al., 2022).

Current fetal welfare monitoring tools are not easy for pregnant women to access independently, so pregnant women lack awareness of the number of fetal movements during pregnancy. Pregnant women who have the opportunity to count movements often get inconsistent results because they say they forgot to count or forgot to count because they were busy. If you count fetal movements during rest hours, you often fall asleep before getting the count at the specified time. With these conditions, there is a need for a fetal movement monitoring tool that is practical and easy for pregnant women in Indonesia to access. The aim of this research is to identify the need to develop a tool for calculating fetal movements that can be used independently by pregnant women.

MATERIALS AND METHOD

The research design is qualitative phenomenological research. Qualitative phenomenological research This research is a qualitative study with an exploratory descriptive approach, it is research carried out to find out completely about the phenomenon of the research object and the conclusions drawn are the phenomena that occur in the research object (Creswell, 2023). The research used the Focus Group Discussion (FGD) method among health workers providing maternal and child health services.

The participants were health workers in maternal and child health services at 27 Regional Health Centers of the Bantul Yogyakarta Health Service, Indonesia. The sampling technique is purposive sampling (Verma & Verma, 2020). The inclusion criteria for participants are health workers who work in pregnant women's health services at the Regional Health Center of the Health Service Bantul Yogyakarta, Indonesia, with the highest incidence of newborn deaths in the first to eighth order in 2021 and agree to become participants as proven by signing an informed consent. The participant exclusion criteria were that they were not sick or on leave. This FGD research involved eight participants.

Focus group discussions were carried out on eight health worker participants who had been selected based on inclusion and exclusion criteria. The distribution of FGD assignments consists of moderator, note taker, time keeper and documentation. The officers are researchers and teams who have been recruited and follow a common perception in carrying out their duties. The instrument used was a focus group discussion question guide (Table 2). The FGD was held for 120 minutes on August 2, 2024, the place of implementation was in the Medika room at the Bantul District Health Service, Yogyakarta, Indonesia. The FGD implementation was recorded and videoed, saved in mp3 and mp4 format and transcribed in a Microsoft Word document.

Table 1. Guide to Focus Group Discussion Questions

Question
Do you think pregnant women need to be taught to count fetal movements independently?
What are the benefits for pregnant women and health workers of calculating fetal movements independently?
Explain the class program for pregnant women and the material on calculating fetal movements?
When will education on counting fetal movements be implemented?

Question
What method of calculating fetal movements is taught?
What equipment is needed to count fetal movements?
How do you follow up on performing independent fetal movement counts at home?
How are the method, implementation and accuracy of the results evaluated regarding the practice of calculating fetal movements?
What are your views on a practical method for calculating fetal movements independently?
How do you describe the expectations of this tool?
What are the efforts to create this innovation?
What are the future expectations if the innovation can be realized?

Analysis of FGD data using NVivo 12 Pro International software from Burlington, MA, USA. The data analysis stage consists of three stages, namely: data compression, data presentation, and drawing conclusions. Data validity is used to ensure the correctness of the data presentation. The validity criteria are transferability, dependability and confirmability, namely credibility. Data compression includes condensing the meaning expressed by FGD participants into short and concise formulations, as an effort to capture the diversity of participant perspectives and synthesize data for maintaining the diversity of experiences communicated (Taneichi & Rokkaku, 2020).

Data presentations are carried out by coding analysis, categorizing and defining. Coding is done by formulating the transcript into words with the same meaning and is used to create a code. Number of coding in this study is 7 coding. Re-checking is carried out to ensure all codes have been condensed properly. Based on the similarity of the codes obtained, appropriate categories were then formulated, then grouped into themes (Noell-Boix et al., 2022).

The results of the analysis are presented in a diagram consisting of codes, categories and themes. The results are then reviewed by experts and their appearance is clarified according to the results of the review provided. The data analysis process was carried out with the help of NVivo 12 Pro International software. Done checking and adjusting transcripts, coding, categories to conclude themes repeatedly.

To ensure the quality and credibility of the findings, this study applied the principle of trustworthiness, which covers four main aspects, namely credibility, transferability, dependability, and confirmability. Credibility was maintained through triangulation of sources, researcher team discussions, member checking, and review of the results by experts. Transferability is achieved by providing detailed descriptions of the research context, participant characteristics, and FGD process, enabling readers to assess the transferability of findings to similar contexts. Dependability is maintained through systematic recording of the research process, consistent use of FGD guidelines, and an audit trail containing the stages of analysis from transcription, coding, and categorisation to themes. Confirmability is ensured by minimising researcher bias through the documentation of analytical decisions, the recording of reflexive notes, and the use of NVivo 12 Pro to maintain the objectivity and traceability of data from the analysis results.

This study has gone through an ethical review from the Ethics Committee of Universitas Aisyiyah Yogyakarta Indonesia and was declared passed with number 3095/KEP-UNISA/VII/2023. Apart from that, it has obtained a research permit from the

Bantul Yogyakarta Indonesia Health Service, number: B/000.9.2/00179. This research has applied basic ethical principles, namely respecting the dignity of others, doing no harm and the principle of justice.

All data in this research is kept confidential and is only used for research purposes. Participants have also been informed that during the FGD process documentation will be carried out by recording, video shooting and photo documentation. Consent to become a participant in this qualitative study was given voluntarily by the research subjects, demonstrated by signing their agreement on the informed consent.

RESULTS

The FGD participants were senior midwife coordinators in maternal and child health services at the Regional Health Center of the Bantul Yogyakarta Health Service, Indonesia.

Table 1. Characteristics of Focus Group Discussion Participants (n = 80

Participants	Age	Length of working	Education	Community Health Center
P1	43	19	Applied Bachelor	Piyungan
P2	51	24	Applied Bachelor	Banguntapan 2
P3	47	21	Applied Bachelor	Imogiri 1
P4	52	23	Applied Bachelor	Sewon 2
P5	41	13	Applied Bachelor	Kasihan 2
P6	39	15	Applied Bachelor	Kasihan 1
P7	35	12	Applied Bachelor	Bantul 2
P8	42	16	Applied Bachelor	Sedayu 2

This health worker has served for more than ten years as a maternal and child health service worker, with the latest education being applied midwifery and comes from eight health centers with the highest incidence of newborn deaths up to eighth in the Bantul Yogyakarta Indonesia health service area in 2021. Analysis of data from a qualitative FGD study on eight health workers in the mother and child unit at the Bantul Regional Health Center, Yogyakarta, Indonesia, based on keywords expressed by participants, resulted in 246 codes, seven categories and four themes. The results of the four themes are presented as follows:

Theme 1: Previous behavioral experience

This theme was generated based on the findings of two categories. The first category is the perception of health workers regarding the methods applied to pregnant women. This category emerged from the following keywords expressed by participants:

"Pregnant women are taught how to count and report methods and results of calculating fetal movements when at home" (P8).

The second category, experience counting fetal movements. Categories are generated from participant expressions:

"It is very important to teach pregnant women how to count fetal movements, in 12 hours at least 10 movements, in 24 hours 20 movements" (P1)

"It is very necessary, especially for pregnant women at risk, primi usually lack concern" (P2).

Theme 2: Perceived benefits of counting fetal movements.
This second theme is built from one category, namely perceived benefits. The keywords obtained come from the expression:
"The benefits can increase concern for the fetus, reduce the risk of IUFD and reduce pregnancy" (P2)
"Reducing stressors in pregnant women, especially in their first pregnancy, if movement slows down it can cause stress" (P4).

Theme 3: Experience in techniques for calculating fetal movements
The third theme resulted from two categories. First category: education on counting fetal movements, based on participant expressions:

"It needs to be taught and this can be controlled through routine ANC or integrated ANC and education can also be written in the KIA book on the danger signs of pregnant women(P1)
"The class program for pregnant women has been running for a long time, material on fetal movements is included in the material on danger signs in pregnancy, direct practice is carried out with pregnant women" (P6).

Second category: techniques for calculating fetal movements, key words from the participant's expression:

"*Teach counting fetal movements with a rubber bracelet, or counting sticks, evaluation is carried out at every ANC visit*" (P4)
"Coins put in a jar" (P7)
"You can use paper and a pen and write like a stick, or write one or two, or if you're in the fields you can use a stone" (P8).

Theme 4: Expected methods/tools required
The fourth theme is built from two categories. First category: criteria for calculating fetal movement, resulting from the expression:

"Equipment that is easy to carry, such as a watch, can be carried on your feet or in your hands" (P8)
"It can be done by all pregnant women in all conditions with various activities. So it includes sleeping, dodolan, and the hope is that the results that emerge are valid, the price is affordable. Even pregnant women from lower economic backgrounds can have it and it's not complicated" (P2)

Second category: suggestions in tool development,mentioned from the participant's expression:

"Research it first before being free to use it by the mother pregnant, a valid and absolutely safe tool, does not cause concern for pregnant women when used" (P7).

The discovery of these themes can be described in the derivation of themes as follows (Figure 1):

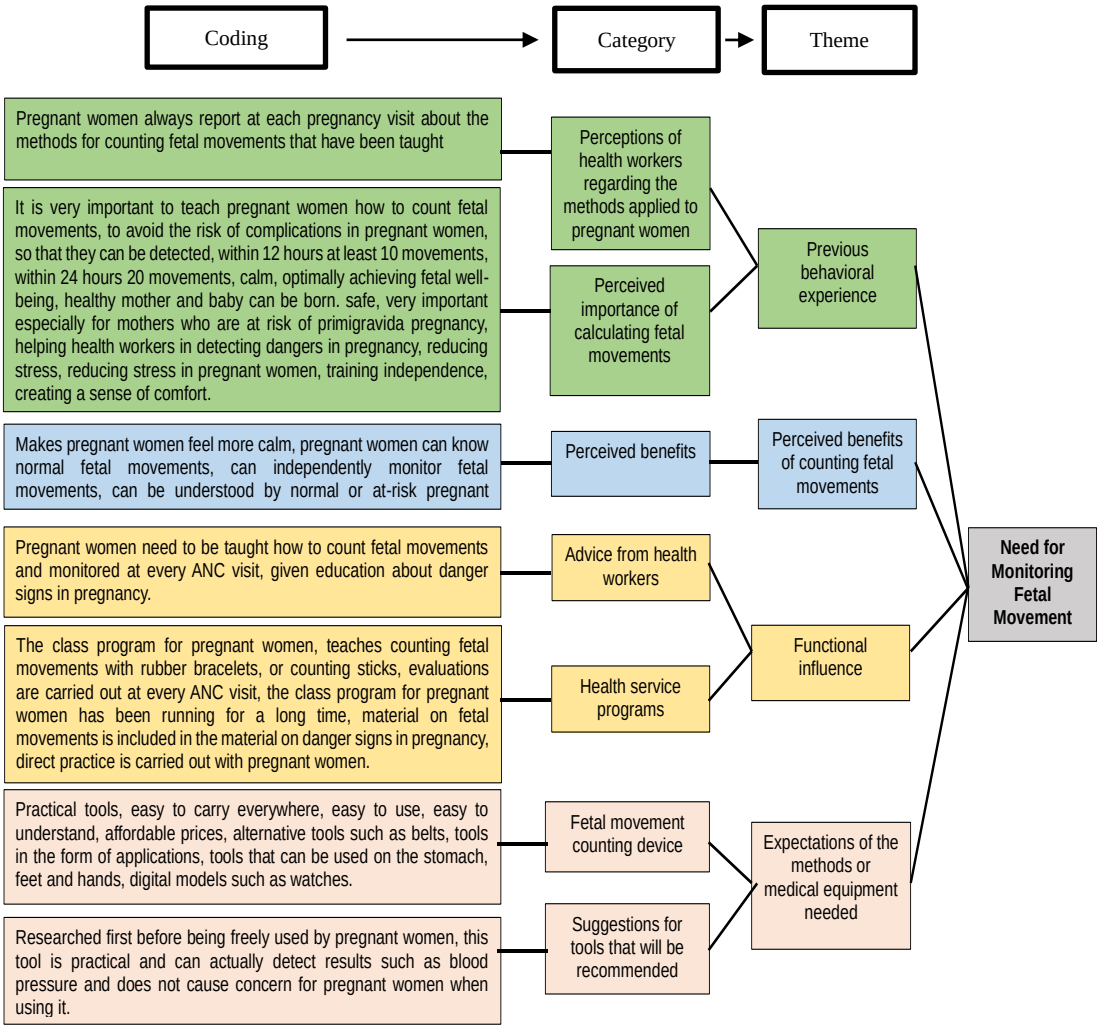

Figure 1. Derivation of the Theme of the Need for Monitoring Fetal Movements (FGD of Health Workers)

DISCUSSION

This qualitative research was carried out using a FGD method on eight health workers who worked at eight Regional Health Centers of the Bantul Yogyakarta Health Service, Indonesia. These health worker participants have applied midwife education and all have worked for more than ten years. This proves that the health workers involved in the FGD have experience providing good education to pregnant women.

Previous studies state that a period of work will tend to make someone feel at home, comfortable and master their field of work well (Noell-Boix et al., 2022). This can confirm that the information provided by participants is based on perceived experience. Supported by a bachelor's level of education so that it can provide good ideas for improving health services. The results of the FGD theme analysis among health workers are an important basis for identifying the need to develop a tool for calculating fetal movements that can be used independently by pregnant women. Below is a discussion of the four resulting themes.

Theme 1. are previous experience and behavior. The result is that education on calculating fetal movements specifically has never been done. Pregnant women are often advised, if they feel weak movements or do not move for a long time, to immediately go to a health facility. There is also information from health workers to calculate fetal movements at a certain time by moving the rubber band from the left hand to the right if you feel movement. However, when follow-up was carried out, pregnant women carried out it inconsistently (Noell-Boix et al., 2022).

The education obtained provides understanding and stimulates behavior to carry out activities to count fetal movements with the right technique. Previous studies showed that pregnant women who received education using the health belief model approach for 3 months produced better health behavior, pretest 45 ± 9.2, posttest after 3 months 77 ± 9.7, p value <0/001. Other research shows that health promotion has a significant relationship with lifestyle and health care behavior in pregnancy (Noell-Boix et al., 2022). The results of this research provide insight that education and training can provide understanding to pregnant women which can change their health behavior for the better.

Efforts to make it easier to calculate fetal movements often require equipment or instruments. The tool that has been used can be used to evaluate its function and effectiveness in helping to get easy and precise calculations. The results of research on 1057 health workers prove that 73.8% of subjects stated that the use of tools that assist with examinations is useful for obtaining better examination results (Noell-Boix et al., 2022).

At 28 weeks of gestation and above, the mother can feel fetal activity every day, such as the part of the stomach where the baby kicks more often, whenever the fetus is actively kicking or moving. The theory states that at 28 weeks fetal movements can be felt clearly by the mother. The fetus can move approximately 30 times per hour in the form of gentle movements up to movements that can be seen protruding in the mother's abdomen. The fetus moves more at night, but during the day movement will be identified more often after eating (Rosalinna, 2021; Purwati et al., 2023).

Pregnant women who have been taught the technique of counting fetal movements can report the count results at each visit, but if the count results are less than 10 within 12 hours, they can immediately report it to a health worker. In practice, pregnant women report the number of counts via WhatsApp, either in strengthening counting techniques, correlating the results obtained or because of errors in calculating fetal movements. This experience proves the importance of being taught techniques for calculating fetal movements and the importance of tools that are easy and safe to use. Research in Indonesia has developed educational media on techniques for calculating fetal movements via Android, proven to increase pregnant women's knowledge and interest in calculating fetal movements, $p < 0.05$ (Purwati & Sari, 2024).

Theme 2 are perceived benefits of counting fetal movements. Based on participants' expressions, the benefits of calculating fetal movements are important in knowing the well-being of the pregnancy. Pregnant women need to know early precautions that can be identified by a decrease in the number of fetal movements. Studies state that the benefit of monitoring fetal movements is to assess the health of the fetus. Counting daily fetal movements can increase the mother's ability to recognize danger signs as early as possible. Monitoring fetal movements normally requires at least ten movements over a 12 hour period each day (Purwati & Sari, 2024).

Decreased fetal movement can pose a risk of complications such as fetal growth restriction and stillbirth. When the mother knows the benefits of counting fetal movements, the mother can understand and report if there is a decrease in fetal movement to the health provider, so that immediate treatment can be taken to prevent infant morbidity and mortality. The study findings stated that 99.9% of pregnant women said that feeling the baby move every day was important (Purwati & Sari, 2024).

Knowing the number of normal fetal movements, which is indicated by 10 fetal movements in 12 hours, makes pregnant women feel calm because the fetus is healthy. The happiness of a pregnant woman is proven by expressions of affection, the emotional bond between mother and fetus becomes stronger, when she feels the movement of the fetus, the mother strokes it, gently inviting communication. Monitoring fetal well-being is a competency that pregnant women must know and be able to practice in order to monitor fetal well-being which is linked to perinatal outcomes (Purwati et al., 2023).

Monitoring fetal movements is an important thing for pregnant women to know and carry out independently to determine the condition of the fetus, determine immediate treatment steps or the need for health facilities when fetal movement problems are discovered so as to prevent fetal death. There are findings from studies that good quality MFA has a significant impact on the growth and development of babies after birth until they are 3 months old (Purwati et al., 2023).

Theme 3 are educational experience in fetal movement counting techniques. These results show that education about counting fetal movements has not been implemented specifically but has been included in education about danger signs of pregnancy. The techniques taught to pregnant women are still conventional, and are only conveyed verbally and implicitly, so there is little motivation for pregnant women to carry them out. Based on research findings, training pregnant women in techniques for calculating fetal movements can increase maternal fetal attachment and reduce pregnant women's anxiety.

The study was conducted using a randomized control trial technique on n= 1,013 pregnant women who reported low worry and high calm. Likewise, in a small scale study of n= 208 pregnant women reported that after participating in training in counting fetal movements and applying it in carrying out fetal movement counts at home (Mangesi et al., 2020; Samutri & Endriyani, 2020). The method for calculating fetal movements that is applied is the Cardiff count of ten technique, which is counting fetal movements to get 10 movements within 12 hours, but more often uses a modified version, namely getting 10 fetal movements within 2 hours (Jagadeeswari & Prasanth, 2020).

Theme 3 are expectations regarding methods/tools for calculating fetal movements. Themes were obtained from categories generated from keywords: it is important that there is a tool used to calculate fetal movements in basic care units or that pregnant women can own it themselves. Participants hope for tools that are economical and affordable, can be used effectively and are flexible. The tool can read the results of fetal kick counts automatically, can be used during mobility, has a precise and practical count time.

The expectations of participants, pregnant women and the results of literature studies are the main keys needed in developing a fetal kick count. Technological developments are increasingly rapid and rapid, technological developments are increasingly advanced (Renzo et al., 2020). This is confirmed by the findings that Android-based educational media for calculating fetal movements influences the level

of knowledge and behavior of pregnant women in calculating fetal movements better (Yani et al., 2021).

Based on the findings of this theme, it can be concluded that there is a need for fetal kick count design innovation in the form of a tool that can be used to calculate fetal movements that can be used independently.The basis used is the ten kick movement method, that is, if the fetus moves to a count of ten within 12 hours, it can be said that the fetus is in a healthy condition (Yani et al., 2021). In Norway, Japan, UK, tools and techniques for calculating fetal movements have been developed. In Norway, the development of a technique for calculating fetal movements using fetal movement monitoring cards was produced.

The weakness is that it requires high concentration in applying the calculation method (Winje et al., 2020; Yani et al., 2021). In Japan, software was developed to automatically calculate fetal movements, but it can only be applied when the pregnant woman is sleeping (Nishihara et al., 2021). The UK has developed optical fiber sensor technology which has proven to be effective and economical compared to ultrasound, but this tool can only be used by trained health workers (Nishihara et al., 2021).

In Indonesia, there has been no evidence of utilizing and applying findings from abroad, however, with fetal movement monitoring cards there is evidence of implementation on a small scale. In Indonesia, development has been carried out in fetal movement monitoring tools, namely information-based tools on techniques for calculating fetal movement using Android-based media, but it is still aimed at education by achieving the knowledge and interest of pregnant women in calculating fetal movement (Nishihara et al., 2021).

Based on these findings, a special tool is needed that can be used to calculate fetal movements. Having a tool to calculate fetal movements can be applied while maintaining the affectionate interaction between the mother and fetus. The mother can still feel the fetus' movements, stroke the fetus and communicate with the fetus. The calculation results obtained will increase the mother's happiness and further increase the affectionate mother-fetus interaction.

This bond will affect the welfare and health of the fetus until birth. Adopting the results of qualitative research, both sourced from FGDs, requires innovative formulations for developing fetal movement monitoring tools. The development of this tool also takes into account the results of previous development and the weaknesses found so that it can be improved in further development and can be applied more easily, practically, automatically and economically.

The device that will be developed is designed to be attached to the abdominal wall of pregnant women. The F-Kico (Fetal-Kick Count) device is designed to be attached to the human body, so F-KiCo is designed taking into account safety, minimal risk, comfort when used and ease of installing and removing the device. F-KiCo is designed to automatically count fetal kicks in the stomach. In designing this tool, it is also necessary to consider the economic value that is affordable for the lower middle class. Detection of fetal kicks is obtained through textile strain sensor readings which are sent to the data processing microcontroller. Pregnant women can use it at any time practically and safely and get accurate results. Further research recommendations for testing the prototype on pregnant women to obtain an optimal user experience.

CONCLUSION

The results of the FGD with eight health workers to identify the need for developing fetal movement counting tools, obtained four themes. These themes are: (1) previous experience and behavior; (2) perception of the benefits of calculating fetal movements; (3) educational experience of fetal movement counting techniques; and (4) expectations regarding methods/tools for calculating fetal movements. The theme findings serve as a basis for developing a fetal movement counting tool that is practical, effective and efficient for pregnant women to use independently. The implications of this research for the development of innovative tools for fetal movement monitoring aimed at monitoring maternal and fetal well-being. Suggestions for developing a fetal movement counting tool are in accordance with the initial concept found and can be tested on pregnant women.

ACKNOWLEDGEMENT

The authors would like to thank Ministry of Higher Education, Science, And Technology of the Republic Indonesia 2023 for funding this research

REFERENCES

Al-Amri, N., & Smith, V. (2022). The effect of formal fetal movement counting on maternal psychological outcomes: A systematic review and meta-analysis. *European Journal of Midwifery*, *6*(March). https://doi.org/10.18332/ejm/145789

Alexander E.P.Heaxell; Fiona Holland; Jack Wilkinson. (2023). Information about fetal movement and stillbirtds trends:Analysis of time series data. *An International Journal of Obstetrics and Gynecology*, 1–10. https://doi.org/10.111111/0471-0528.17426

Akselsson, A. (2020). *Awareness of fetal movements and pregnancy outcomes*. Thesis Karolinska Institutet. Retrieved 03 December from file:///C:/Users/user/Downloads/Thesis_Anna%20Akselsson.pdf

Carlo Di Renzo, G., Maulik, D., Berghella, V., Facchinetti, F., Hod, M., Jovanovic, L., de Leiva, A., & Langer, O. (2020). *Series in maternal-fetal medicine* (Second edi). Informa Healthcare.

Creswell, V. L. P. C. & J. W. (2023). *Mixed methods research* (Third Edit). SAGE Publication.

Endriyani, Sumantri.(2020). Fetal movement counting and maternal anxiety: a systematic literature review. *Jurnal Ners & Kebidanan Indonesia (Indonesian Journal of Nursing & Midwifery*, *8*(Sup 2), 8–9.

Güney, E., & Uçar, T. (2020). Effect of the fetal movement count on maternal–fetal attachment. *Japan Journal of Nursing Science*, *16*(1), 71–79. https://doi.org/10.1111/jjns.12214

Yudianti, Amelia, Aristina, & Primasari. (2022). Pregnant women empowerment in monitoring fetal wellbeing through fetal movement count mobile application.

SEAJOM: The Southeast Asia Journal of Midwifery, *8*(2), 45–54. https://doi.org/10.36749/seajom.v8i2.184

Jagadeeswari, J., & Prasanth, K. (2020). Effectiveness of dfmc chart versus caardiff ten count chart on mother's perception among antenatal mothers. *International Journal of Research in Pharmaceutical Sciences*, *11*(4), 5496–5500. https://doi.org/10.26452/ijrps.v11i4.3183

Mangesi, L., Hofmeyr, G. J., Smith, V., & Smyth, R. M. D. (2020). Fetal movement counting for assessment of fetal wellbeing. *Cochrane Database of Systematic Reviews*, *2020*(10). https://doi.org/10.1002/14651858.CD004909.pub3

Mohapatra, S., Gomathi, B., & Nayak, D. (2021). Effect of fetal movement count training (FMCT) on prenatal bonding and maternal anxiety among primigravida women. *International Journal of Nursing Education*, *13*(3), 119–125. https://doi.org/10.37506/ijone.v13i3.16322

Nishihara, K., Ohki, N., Kamata, H., Ryo, E., & Horiuchi, S. (2023). Automated software analysis of fetal movement recorded during a pregnant woman ' s sleep at home. *Plos One*, 1–15. https://doi.org/10.1371/journal.pone.0130503

Noell-Boix, R., Ochandorena-Acha, M., Reig-Garcia, G., Moreno-Casbas, M. T., & Casas-Baroy, J. C. (2022). Identification of the needs of informal caregivers: an exploratory study. *Enfermeria Global*, *21*(4), 86–99. https://doi.org/10.6018/eglobal.512191

Owens, B., & Libertus, K. (2022). Are There Postnatal Benefits to Prenatal Kick Counting? A Quasi-Experimental Longitudinal Study. *Frontiers in Psychology*, *13*(January), 1–11. https://doi.org/10.3389/fpsyg.2022.712562

Permenkes. (2020). Standart Teknis Pemenuhan Mutu Pelayanan Dasar Pada Standar Pelayanan Minimal Bidang kesehatan. In *Permenkes RI*, 4 (1), 1–5.

Perwitasari. (2021). The effect of maternal-fetal attachment education on maternal mental health. *Journal of Health Technologogy Assesment*, *2*(1), 50–58.

Purwati, Y., & Sari, A. D. (2024). Audiovisual effectiveness of independent fetal well-being monitoring on mother-fetus attachment and birth outcomes. *Enfermeria Global*, *73*(January), 82–94. https://doi.org/https://doi.org/10.6018/eglobal.568371

Purwati, Y., Wahyuntari, E., Subrata, A. C., Program, N. S., Yogyakarta, U. A., Yogyakarta, U. A., Ahmad, U., Istimewa, D., Program, N. S., Aisyiyah, U., & Aisyiyah, U. (2023). F-Kico (Fetal-Kick Count) innovation need analysis for monitoring fetal well-being. *Jurnal Aisyah: Jurnal Ilmu Kesehatan*, *8*(4), 1486–1497.

Ranjbar, F., Warmelink, J. C., Mousavi, R., & Gharacheh, M. (2021). Maternal-fetal

attachment and anxiety in pregnant women who conceived through assisted reproductive technology. *International Journal of Reproductive Biomedicine*, *19*(12), 1075–1084.

Rosalinna, R. (2021). Differences in pregnancy care service visits before and during covid 19 pandemic in midwifery independent practice. *Interest : Jurnal Ilmu Kesehatan*, *10*(1), 118–127. https://doi.org/10.37341/interest.v0i0.296

Smith, K. E., Mason, T. B., Reilly, E. E., Hazzard, V. M., Borg, S. L., Dvorak, R., Crosby, R. D., & Wonderlich, S. A. (2021). Examining prospective mediational relationships between momentary rumination, negative affect, and binge eating using ecological momentary assessment. *Journal of Affective Disorders Reports*, *5*, 100138. https://doi.org/https://doi.org/10.1016/j.jadr.2021.100138

Taneichi, H., & Rokkaku, R. (2020). A qualitative focus group discussion study on the experiences of certified nurses in dementia nursing related to effective staff education. *Nursing Open*, *7*(2), 547–555. https://doi.org/10.1002/nop2.419

UNICEF Global Databases. (2023). *Neonatal mortality rate*. Retrieved 3 December 2025 from https://repositorio.ufsc.br/xmlui/bitstream/handle/123456789/167638/341506.pdf?sequence=1&isAllowed=y%0Ahttps://repositorio.ufsm.br/bitstream/handle/1/8314/LOEBLEIN%2C LUCINEIA CARLA.pdf?sequence=1&isAllowed=y%0Ahttps://antigo.mdr.gov.br/saneamento/proees

Venkateswara, Lalitha, U. K. (2020). A Comparative Study on DFMC Chart Assesment Count Ten on Assesment of Fetal Movements Among Antenatal Mothers at Comprehensive Emergency Obstetrical and Neonatal Care. *International Journal of Creative Research Thought (IJCRT)*, *8*(11), 1401–1412.

Verma, J. P., & Verma, P. (2020). Introduction to Sample Size Determination. In *Determining Sample Size and Power in Research Studies*. https://doi.org/10.1007/978-981-15-5204-5_1

Winje, B. A., Røislien, J., & Frøen, J. F. (2022). Temporal patterns in count-to-ten fetal movement charts and their associations with pregnancy characteristics: A prospective cohort study. *BMC Pregnancy and Childbirth*, *12*, 1–12. https://doi.org/10.1186/1471-2393-12-124

Yani, F., Adila, D. R., & Roslita, R. (2021). Mother's level of knowledge about movement monitoring. *Jurnal Cakrawala Promkes*, *3*(1), 33–41. https://doi.org/10.12928/promkes.v3i1.2848