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THE RELATIONSHIP BETWEEN MATERNAL ATTENTION TO FOETAL MOVEMENT AND ENHANCED MOTHER-FETUS BONDING: A SCOPING REVIEW

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ABSTRACT
Fetal movement is an early sign that the fetus can interact with its environment, signaling to the mother that an emotional bond is being established, known as maternal-fetal attachment. Several studies have shown that observing fetal movement has a positive relationship and increases maternal-fetal attachment, resulting in improved and more tangible fetal development. This study was to discribe The relationship between maternal attention to foetal movement and enhanced mother-fetus bonding: A scoping review. The PRISMA-ScR standards were followed in the structuring of this descriptive observational study using a scoping review technique. A literature search covering the years 2015–2025 was carried out in a number of worldwide databases, including PubMed, ScienceDirect, Wiley Online Library, Google Scholar, and EBSCO. Maternal attention, foetal mobility, and maternal-fetal bonding were the terms used in a Boolean search to find articles. Identification, screening, eligibility evaluation, and full-text review were all part of the selection procedure. Six articles that met the inclusion criteria were analyzed and synthesized thematically. After synthesis, the review results were grouped into three main themes: 1. Impact of Fetal Movement Awareness and Education During Pregnancy, 2. Utilization of Health Services and Clinical Behavior, and 3. Obstetric and Neonatal Outcomes. Maternal attention to fetal movements plays a significant role in strengthening maternal–fetal attachment.

Keywords: attention; fetal movement; mother-foetus bond; pregnant women; scouping review

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INTRODUCTION

Pregnancy occurs when a foetus begins to develop in a woman's womb. In early pregnancy, a relationship is formed between the mother and the foetus (Bhandari et al., 2025). The maternal-fetal tie is a specific and emotional bond formed between a woman and her foetus (Chemouny & Wendland, 2024). Foetal mobility is responsible for the strong maternal-fetal relationship. Early mothers have greater maternal-fetal relationship scores and more positive opinions of foetal development (Chemouny & Wendland, 2024). Maternal-Fetal Attachment Is an emotional, intellectual, and behavioral bond between a mother and her fetus, such as affection and care. Monitoring fetal development involves self-care because she wants her fetus to be healthy (Suryaningsih & Gau, 2020). A bond that is loving, emotional, closer, and special between the mother and fetus will be more responsive in fulfilling her child's needs. This well-established bond will influence the development of the baby's personality, curiosity, social skills, independence, and so on, and will have a positive impact in the future and already exists before birth (Mackness et al., 2021). Observations on fetal movement can be made at 16 to 20 weeks of pregnancy. At that time, the movement in the baby varies, felt by the mother, there are periods of active movement and there are periods of less active movement. If there is a decrease in abnormal movement, it is a sign of a problem in the woman's womb (Salehi et al., 2017).

The stage of becoming a mother and the existence of a bond between the mother and foetus to create a unique, significant, and valued relationship are related to the maternal-fetal bond. Comprehending maternal-fetal attachment (MFA) leads to the creation of prenatal therapies and

initiatives to avoid weak mother-child bonding. According to Salehi (Salehi et al., 2019), the mother-fetal bonding model can be altered by parents' willingness to intervene, such as by stroking the stomach, observing foetal movements, and encouraging singing and storytelling.

Even when examined objectively with an actocardiograph, several studies have demonstrated a positive correlation between increasing MFA values and maternal attentiveness to foetal movement. According to (Suryaningsih & Gau, 2020), counting foetal movement is an educational exercise that encourages pregnant women to concentrate on foetal movement and increases during pregnancy. The study's findings support the theory that pregnant women's attentive attention to their fetus's movements serves as a conduit for strengthening the relationship between the mother and the foetus during pregnancy. Therefore, this scoping review aims to map and synthesize the available evidence on how maternal attention to foetal movement contributes to the development and enhancement of mother–fetus bonding during pregnancy.

METHOD

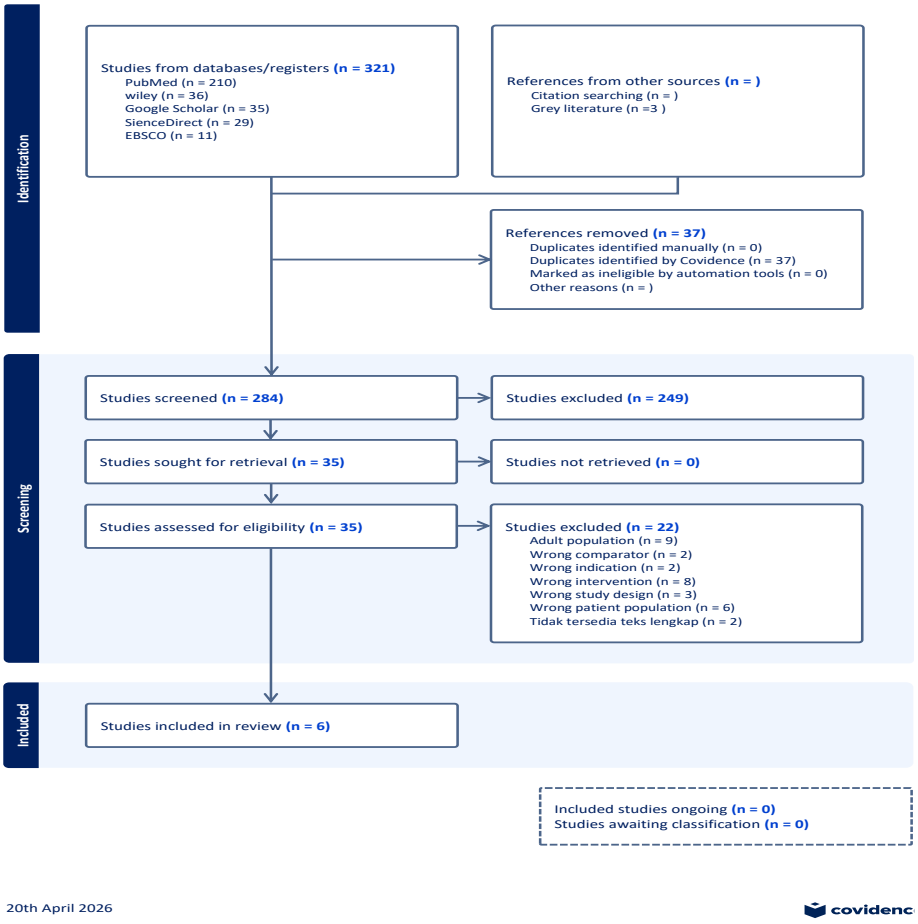

Figure1. Flowchart Diagram

This research method uses a descriptive observational research type with a scoping review approach compiled following the PRISMA-ScR guidelines. This scoping review complies with the framework of Arksey and O'Malley (2005) and is presented based on the PRISMA-ScR guidelines, the steps of which are: 1. Identifying research questions; 2. Identifying relevant studies; 3. Selecting studies; 4. Mapping and data extraction; and 5. summarizing and reporting the results. The literature search was conducted on the Pubmed, ScienceDirect, Wiley, and Google Scholar databases. Keywords included a combination of maternal attention, fetal activity, maternal-fetal attachment, and prenatal attachment. The inclusion and exclusion criteria were as follows: 1)Articles discussing

maternal-fetal attachment (MFA) in pregnant women. 2)Articles with quantitative, qualitative, and mixed methods research designs. 3)Articles published within the last 10 years (2015-2025). 4)Articles in English or Indonesian. Exclusion criteria were: 1)Articles with an inappropriate population, i.e., non-pregnant women or postpartum women. 2)Articles without full text. Study selection was based on the title, abstract, and standard full-text selection criteria. Reasons for exclusion were inconsistent results, inappropriate interventions, incorrect study design, or irrelevant populations.

RESULT

Evidence Source Selection

The search yielded 321 articles from the PubMed databases (210), Wiley (36), Google Scholar (35), ScienceDirect (29), and EBSCO (11). During the identification process, 37 references were removed, and 37 duplicates were identified by covidence. After filtering, 284 were excluded. 249 were excluded. Afterward, 35 studies were searched for and 35 were excluded. Nine studies were then filtered based on title and abstract. Nine articles were excluded due to population differences, 2 incorrect comparisons, 2 incorrect indications, 3 differences in interventions, and 2 incomplete texts. The final number of studies included in the review was 6 articles. After six articles satisfy the inclusion requirements, a theme analysis and synthesis are conducted. This table provides the description.

Table1.
Article data extraction

Title / Author / Year / Grade	Country	Aim	Type of Research	Data Collection	Participants/ Sample Size	Result
A decrease in cesarean sections and labor inductions among Swedish women by awareness of fetal movements with the Mindfetalness method/ Akselsson 2020	Swedia	To investigate whether cesarean section and labor induction rates increase by increasing women's awareness of fetal movement through Mindfetalness. Furthermore, we aimed to study perinatal health after implementing Mindfetalness in maternity care.	cluster randomized controlled trial	Intervention procedures included preparation and distribution of leaflets about fetal movement and the Mindfetalness method which were given to women with singleton pregnancies, registered at the clinic randomized to Mindfetalness.	7 maternity clinics	The Mindfetalness group consisted of 13,029 women and the Routine Care group consisted of 13,456 women. Women randomized to the Mindfetalness group had fewer cesarean deliveries (18.4% vs. 20.0%, RR 0.92, CI 0.87–0.97) and labor inductions (19.2% vs. 20.3%, RR 0.95, CI 0.90–0.99) compared with women in the Routine Care group. Fewer babies were born small for gestational age (8.5% vs. 9.3%, RR 0.91, CI 0.85–0.99) in the Mindfetalness group. Women in the Mindfetalness group were more likely to contact healthcare providers for decreased fetal movement compared with women in the Routine Care group (7.8% vs. 4.3%, RR 1.79, CI 1.62–1.97). These differences

Title / Author / Year / Grade	Country	Aim	Type of Research	Data Collection	Participants/ Sample Size	Result
						remained after adjustment for potential confounding factors.
Effect of performing daily fetal movement count on maternal-fetal attachment level among low risk primigravida - A randomised controlled trial/ Bhandari 2025	India	To determine the effect of daily fetal movement counter on the level of maternal-fetal attachment in low-risk primigravida women and to find the relationship between obstetric variables and post-maternal antenatal attachment scores.	Randomised controlled trial	A randomization trial was conducted among low-risk primigravids (40 in experimental and 40 in control groups) in the antenatal outpatient department. The low-risk primigravids who were in 28–32 weeks of gestation were asked to count and mark the number of fetal movements perceived by them in a daily fetal movement count chart for consecutive two weeks in the intervention group whereas only routine antenatal care was been provided to the control group.	low-risk primigravids (40 in experimental and 40 in control groups) in the antenatal outpatient department. The low-risk primigravids	The results showed that in the intervention group of primigravida, about 20 (50%) had very positive feelings towards the baby in their womb, 30 (75%) considered the developing baby as a small figure with special characteristics, 24 (60%) babies depended on them for their well-being, 16 (40%) primigravida in the intervention group after doing daily fetal movement counts obtained high scores on the post-assessment indicating that they had a very clear picture of their baby. The difference in the scores of the initial assessment and the post-assessment was found to be highly statistically significant (P=<0.001)
My Baby's Movements: A stepped wedge cluster randomised controlled trial to raise maternal awareness of fetal movements during pregnancy study protocol/ Flenady 2019	Australia	to evaluate a package of interventions for maternity services including a mobile phone application for women and clinician education (MBM intervention) in reducing stillbirth rates in late pregnancy.	stepped wedge cluster randomised controlled	delivery of evidence-based information that is tailored appropriately. The My Baby's Movement mobile phone program (MBM phone program) consists of a mobile phone application	26 maternity services in Australia and New Zealand.	The primary outcome is fetal death from 28 weeks of gestation. Secondary outcomes include: a) neonatal morbidity and mortality; b) maternal psychosocial outcomes and health-seeking behavior; c) health-care utilization; d) women's and healthcare providers' knowledge of fetal movement; and e) costs. A total of 256,700 births (average 3,170 per hospital) will detect a 30% reduction in the infant mortality rate from 3/1000 births to 2/1000 births, assuming a 5% significance level. The analysis will use a generalized linear

Title / Author / Year / Grade	Country	Aim	Type of Research	Data Collection	Participants/ Sample Size	Result
						mixed model.
The effect of education of fetal movement counting on maternal-fetal attachment in the pregnant women: A randomized controlled clinical trial/ Salehi 2017	Iran	evaluate and enhance the mother's attachment to her fetus.	Randomised controlled trial	simple sampling and then randomly allocated into the control group (n=29) and the intervention group (n=23).	A total of 52 pregnant women	The mean MFA scale score in the intervention group was 86.63±11.62 and in the control group was 87.48±10.31 (total score 120). There was no significant difference between the two groups. After the intervention, the mean MFA score increased to 96.30±10.81 in the intervention group and 88.64±10.31 in the control group. This difference was statistically significant between the two groups (P<0.001). Only the mean MFA score in the intervention group showed a significant change before and after the intervention (P<0.001).
The Effects of Fetal Movements Counting on Maternal-Fetal Attachment: A Randomised Controlled Trial	Iran	To determine the effect of fetal movement counting on maternal-fetal attachment.	randomised, controlled trial	Mothers completed questionnaires and recorded fetal movements during pregnancy. The questionnaires used included the Prenatal Attachment Inventory to measure maternal-fetal bonding, and mothers were also asked to record fetal movements regularly using a provided chart for a specific period (between 28 and 37 weeks of pregnancy).	250 nulliparous women with singleton pregnancies and no history of mental disorders participated in the study. Of these, 38 did not return the baseline questionnaire, leaving 208 women who were randomly divided into two groups.	No differences were found between the groups regarding individual characteristics. At 28 weeks of gestation, the mean scores given on the Prenatal Attachment Inventory items were 90.23±9.64 in the intervention group and 90.00±10.04 in the control group and the difference was not significant (Mean difference=0.230, p=0.866). Furthermore, no significant differences were found at 37 weeks of gestation between the two groups (93.75±7.59 vs. 92.78±9.90 respectively, mean difference=0.961, p=0.433).
Pengaruh Edukasi Gerakan Janin	Indonesia	To determine the effect of fetal movement	quantitative with a quasi-experimental design, which	This study used the Indonesian version of the Prenatal Attachment	All pregnant women in their third trimester who underwent	There is an effect of providing fetal movement education on maternal-fetal

Title / Author / Year / Grade	Country	Aim	Type of Research	Data Collection	Participants/ Sample Size	Result
Terhadap Maternal Fetal Attachment Di Griya Airlangga Purbalingga		education on maternal-fetal attachment.	uses pre-test and post-test on the intervention and control groups	Inventory (PAI), which has been tested for validity. Data were obtained by measuring maternal-fetal attachment scores before and after fetal movement education was provided, using pre-test and post-test methods in the intervention and control groups.	ANC at Griya Airlangga Purbalingga, a total of 30 people, were selected using a non-probability sampling technique	attachment at Griya Airlangga Purbalingga after being given an intervention with a p value = 0.029<0.05.

Based on Table 1, which shows the six articles analyzed and synthesized in this scoping review, three main themes were found. 1. Impact of Fetal Movement Awareness and Education During Pregnancy, 2. Utilization of Health Services and Clinical Behavior, and 3. Obstetric and Neonatal Outcomes.

DISCUSSION

Theme 1: The Impact of Fetal Movement Awareness and Education During Pregnancy

One measure of the health of the foetus in the womb is counting its movements; even this computation is intimately linked to pregnancy issues that the mother must be aware of. One attempt to increase maternal knowledge about maternal and foetal health, particularly regarding counting foetal movements, is to provide education. The idea of counting foetal movements is very rational because it is simple, does not require sophisticated tools, and can be done by all women (Wardhana et al., 2021). Every pregnant woman should count her baby's movements every day to determine whether there is a problem with her foetus. The baby's movements will start to be felt when the mother enters the 16th to 20th week of pregnancy, and the certificate of movement felt will be very different and varied. Sometimes the movement will be very active and sometimes it can be less active, but if there is a sudden decrease in foetal movement, it is a sign of a problem with the foetus (Bhandari et al., 2025).

The bond that is formed between the mother and fetus is a very beautiful phenomenon and is formed before the baby is born, which is the basis for the formation of a bond when the mother knows she is pregnant and a relationship is formed that will have an impact on cognitive, affective and emotional development in the baby, therefore prenatal care is needed (Salehi et al., 2017) but there are several limitations, namely limited access to information, education, and self-awareness to come to health facilities regularly due to various factors such as work, traffic jams, or lack of family support (Kendari et al., 2025). the purpose of calculating fetal movements is to increase the bond between the mother and fetus and can report in a timely manner if there is a decrease in fetal movement which can reduce fetal death in addition, several studies also say that there is a strong psychological bond between the mother and her fetus (Delaram et al., 2018).

Theme 2: Utilization of Health Services and Clinical Behavior

Utilization of health services will occur if the mother experiences decreased fetal movement, which is the reason for visiting a health facility (Hayes et al., 2023). However, many members of the public, pregnant women, and their families do not yet know how to monitor and determine whether the fetus is well-being. They assume that the fetus is moving, but without realizing it, they lack knowledge about strong or weak fetal movement and how many normal fetal movements are in a 24-hour period. This lack of knowledge and awareness in monitoring fetal movement can have negative consequences and can lead to emergencies or even fetal death (Gaúcha, 2021). Therefore,

pregnant women need to monitor fetal movement to prevent or manage complications more effectively(Pohárnok et al., 2022).

In addition to medical results, there are also changes in behavior or attitudes in pregnant women as the core findings in increasing concern for fetal movement in increasing contributions to health services and faster responses shown by mothers if they experience a decrease in fetal movement along with an increase in maternal-fetal bonding, so that attention to fetal movement not only affects the physical aspects of pregnant women but the bond will be stronger through feelings between mother and fetus and maternal alertness to fetal activity and timely reporting to health care providers when experiencing a decrease can prevent perinatal morbidity and mortality (Trial et al., 2011).

This theme, the role of health workers such as midwives is seen in this theme, namely using educational media leaflets such as mindfetalness leaflets that can increase midwives' knowledge and have an impact on the quality of services provided to pregnant women (Akselsson et al., 2020), however, a number of articles also show obstacles encountered when implementing service systems, costs and ensuring that routine records by health workers are more complete and accurate every time they provide services. This is a sign that the success of interventions does not always depend on the mother but health workers must also be ready when providing services(Pulliainen & Ekholm, 2022)(Rådestad et al., 2021).

Theme 3: Obstetric and Neonatal Outcomes

Decreased fetal movement is an early warning sign in obstetric and neonatal outcomes. The mother's perception of decreased fetal movement is not subjective, but rather medically significant, and can lead to a problematic pregnancy (Mccarthy et al., 2016). Furthermore, mothers experiencing stillbirth initially perceive a decrease in fetal movement. There is a time lag between the mother's decision to seek medical attention, and this lag is crucial in determining whether the pregnancy can be saved or not(Pulliainen & Ekholm, 2022).

Several factors that influence the decision-making process in seeking help include the mother's ability to recognize danger signs and normal fetal movements, cultural factors that assume that the lack of fetal movement is due to the fetus resting or perhaps the time of birth is getting closer, and mothers who feel worried but are not taken seriously by health workers. Some of these factors play an active role in poor obstetric outcomes, as well as increasing the risk of stillbirth, neonatal asphyxia, fetal growth restriction (FGR) and other morbidities (Chemouny & Wendland, 2024).

Health workers also have a role in identifying determinant factors thoroughly to prevent adverse outcomes. (Ali et al., 2024) Emphasizes that risk factors for decreased fetal movement are divided into two categories, namely: Modifiable risk factors, namely maternal obesity, smoking habits, alcohol consumption, reduced physical activity, poor glycemic control, mothers with a history of gestational diabetes, Actions from several of these factors that can directly potentially improve uteroplacental perfusion and fetal condition, the next factor is the unmodifiable factor, including mothers with a risk age, primipara or grande multipara, a history of stillbirth/fetus death in the womb, twin pregnancies and fetuses with congenital abnormalities, although unmodifiable, health workers need to group risks and monitor during the pregnancy period more closely. The skills of health workers in identifying these two factors thoroughly will have an impact on reducing complications in pregnancy and childbirth, fetal death, or neonatal morbidity and mortality (Rådestad et al., 2021). Therefore, education carried out during antenatal care and fetal movement monitoring requires clear guidance and responses for mothers and health workers in managing normal fetal movement calculations and complications that need to be explained well in order to improve obstetric and neonatal outcomes (Ali et al., 2024)

Analysis of each source of evidence's findings

This study finds that six studies were carried out between 2015 and 2025 in a number of nations, including Sweden, India, Australia, Iran, and Indonesia, to assess the efficacy of education through foetal movement monitoring and maternal-fetal bonding. According to a number of studies, interventions including teaching pregnant women about foetal movement monitoring improved connection and may help avoid difficulties like caesarean birth, labour induction, and even mortality. However, one of the six articles stated that there was no effectiveness of this intervention due to methodology, population characteristics that differ, and educational levels. The results found that education during prenatal care or non-invasive strategies will impact maternal awareness, bonding attachment, and fetal well-being. However, further research with more diverse designs and a larger scale is needed to strengthen the existing evidence for more comprehensive clinical recommendations.

Maternal-fetal connection will rise and pregnancy outcomes will improve, according to the findings of six articles. The majority of the techniques employed were Randomised Controlled Trial (RCT) designs, which had better results and more evidence. Maternal awareness can be raised by employing the MindFetalness approach to educate mothers about foetal movement. It may also lessen labour induction, small-for-gestational-age newborns, and caesarean sections, according to a number of studies. The emotional connection between a mother and her unborn child will therefore be strengthened by moms keeping an eye on their fetus's movements (Pulliainen & Ekholm, 2022). Though not every study from the six publications had the same findings, simple actions have a big impact. Due to sample size, methodology, and sample characteristics, one study discovered a substantial difference between the intervention and control groups. On the other hand, technology-based research—specifically, mobile applications to track foetal movement—has the potential to be useful in education, but further study is required to validate the current findings.

Evidence Limitations

Maternal-infant connection was found to be improved by education and foetal movement monitoring, according to the six publications that were reviewed. According to this data, these therapies may lessen a number of issues, including lower incidence of caesarean sections, induced labour, and better maternal-fetal bonding. Nevertheless, conclusive findings are hampered by variations in measurement tools and research designs, particularly small sample sizes. Thus, to guarantee the application of foetal movement monitoring therapies in clinical practice, more research with more stringent methodological designs, representative sample sizes, and more standardised techniques and instruments is required.

CONCLUSION

This scoping review highlights that maternal attention to fetal movements plays a significant role in strengthening maternal–fetal attachment. Increased awareness and monitoring of fetal movements not only serve as an important indicator of fetal well-being but also foster emotional connection, responsiveness, and bonding between the mother and the fetus. These findings form the theoretical basis for developing evidence-based antenatal care service policies.

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