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Knowing the signs, changing the outcome: educational impact of the mother and child health handbook on high-risk mothers

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ABSTRACT

Maternal mortality remains a pressing global health issue, particularly in low- and middle-income countries. One contributing factor is the lack of maternal awareness regarding pregnancy danger signs. Although the Mother and Child Health (MCH) handbook has been widely distributed in Indonesia to support maternal education, its utilization remains suboptimal. This study aims to assess the effectiveness of a structured educational intervention using the MCH handbook on improving the knowledge of high-risk pregnant women regarding pregnancy danger signs. This pre-experimental study employed a one-group pretest-posttest design involving 58 high-risk pregnant women at Cibeureum Public Health Center, Tasikmalaya, Indonesia. Participants' knowledge was measured before and after an educational intervention using the MCH handbook. A paired t-test was conducted to analyze the statistical significance of changes in knowledge scores. The normality of the data was confirmed using the Shapiro-Wilk test. The mean knowledge score significantly increased from 19.00 (SD = 3.10) before the intervention to 24.91 (SD = 0.28) after the intervention (mean difference = 5.91, $p < 0.001$). Prior to the intervention, 74.14% of participants had high knowledge, 17.24% moderate, and 8.62% low. After the intervention, 100% of participants attained high knowledge levels. The findings suggest that structured health education using the MCH handbook is highly effective in enhancing maternal knowledge, especially among high-risk pregnant women. This reinforces the importance of integrating systematic MCH handbook-based education into routine antenatal care. Utilizing the MCH handbook as a structured educational tool significantly improves maternal awareness of pregnancy danger signs. Strengthening health worker capacity to deliver MCH handbook-based education and promoting its use during ANC visits may contribute to earlier risk detection and reduction of maternal mortality.

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INTRODUCTION

Educating pregnant women about the danger signs of pregnancy is a crucial strategy in reducing maternal mortality, particularly among high-risk populations. Timely recognition of these signs can lead to early care-seeking behavior and appropriate medical intervention, thereby preventing life-threatening complications.(1) Globally, maternal mortality remains a

Jurnal Kesehatan Ibu dan Anak Vol.18, No.1, July 2024, pp. 84~94
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significant public health challenge. According to the World Health Organization (WHO), an estimated 287,000 maternal deaths occurred worldwide in 2020, with 94% of these deaths taking place in low- and middle-income countries, where access to quality antenatal and emergency obstetric care is often limited.(2) In Indonesia, maternal mortality remains a pressing concern. The Ministry of Health reported 3,572 maternal deaths in 2022(3), with West Java Province contributing 571 of these cases between 2021 and 2022.(4) These figures underscore persistent challenges in improving maternal health outcomes at the subnational level. At the district level, Tasikmalaya City reported 20 maternal deaths in 2022, distributed across several Public Health Centers (PHC/ Puskesmas), including the Mangkubumi (3 cases), Cibeureum (2 cases), Cibeureung (2 cases), Urug (2 cases), and Kawalu (1 case) Health Centers. Specifically, the Cibeureum Health Center reported a decline in maternal mortality from 5 cases in 2021 to 2 cases in 2022 based on the Maternal and Child Health (MCH) program report.(5) Although this decline is encouraging, the continued occurrence of preventable deaths highlights the urgent need to strengthen maternal education, especially regarding early recognition of pregnancy complications.

High-risk pregnancy is a pregnancy that can have an impact on the pregnant mother and baby becoming sick and even dying before birth occurs.(5) Death during childbirth can be due to bleeding, too young, too old, too close and also too much or 4T.(6) The impact of delaying in recognizing the signs of high-risk pregnancy is being late to go to the service center and being late in getting help so that it can result in the death of the mother and baby. High-risk pregnancies can have an impact on the mother and her baby such as abortion, LBW, premature, anemia. Therefore, prevention efforts are needed to reduce the high maternal mortality rate. The need for early detection of pregnancy can be one effort to increase the mother's knowledge about her pregnancy.(7) Based on data from the Cibeureum PHC, the number of pregnant women in 2023 was 666 with a high-risk detection achievement of 108 people, the number of pregnant women in 2024 was 664 with the achievement from January to June 2024 only reaching 51 high-risk pregnant women.

The Mother and Child Health (MCH) book is a strategic communication tool designed to support maternal and child health services across Indonesia. Introduced in 1993 through a collaboration between the Indonesian Ministry of Health and the Japan International Cooperation Agency (JICA), the MCH handbook integrates key health information such as pregnancy and immunization records, child development tracking, nutrition guidelines, and family planning services. Intended for use by health professionals and families alike, the MCH handbook is meant to empower mothers, fathers, and caregivers with essential knowledge to improve maternal and child health outcomes.(8) Despite its comprehensive content and near-universal distribution, the actual utilization and comprehension of the MCH handbook remain limited.(9) A preliminary study conducted at the Cibeureum PHC in 2023 revealed 100% MCH handbook ownership among pregnant women. However, interviews with 10 pregnant women attending the antenatal polyclinic found that only 4 (40%) had ever read the book, while 6 (60%) admitted to never engaging with its content. Furthermore, among 20 high-risk pregnant women, only 2 (10%) could identify pregnancy danger signs, with the remaining 90% unaware of such critical information.

This gap between access and effective use may be attributed to several factors. The absence of systematic educational interventions limits opportunities for mothers to meaningfully engage with the material. Health education is often delivered orally and informally, without the aid of visual or interactive media, which has been shown to reduce information retention.(10) Additionally, many health workers have not received adequate training on how to leverage the MCH handbook as an effective educational tool, resulting in suboptimal facilitation.(11) Studies also note that communication strategies in maternal health settings are frequently unidirectional and lack engagement, failing to stimulate maternal curiosity or motivation to use the book.(12) Finally, the design and language of the

Jurnal Kesehatan Ibu dan Anak Vol.18, No.1, July 2024, pp. 84~94
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MCH handbook may be too technical or text-heavy, making it less accessible for women with lower literacy levels.(13) Addressing these barriers is essential if the MCH handbook is to fulfill its intended role in enhancing maternal knowledge particularly among high-risk pregnant women about the signs of pregnancy complications that may lead to maternal mortality.

The Mother and Child Health (MCH) Handbook, or *Buku MCH*, has been widely acknowledged as an important tool in maternal and child health promotion efforts. Previous studies have demonstrated its effectiveness in improving maternal knowledge and health behaviors when used as part of structured educational interventions. For instance, Ainiyah et al. (2017) found that health education using the MCH handbook significantly increased pregnant women's understanding of antenatal care schedules and nutritional needs.(14) Similarly, Kumalasari (2024) showed improvements in maternal knowledge about postpartum care when the MCH handbook was accompanied by audiovisual support and trained facilitators.(15) However, most existing studies focus primarily on general pregnancy education or on specific topics like nutrition, immunization, or postnatal care, with limited emphasis on the recognition of pregnancy danger signs as critical component for preventing maternal complications and mortality.(9,14,15) Moreover, these studies often target low-risk or general populations, while high-risk pregnant women, who are the most vulnerable to poor outcomes, remain understudied. Another limitation of prior research is the lack of evaluation on how well the MCH handbook is integrated into routine antenatal education without additional media or reinforcement strategies.(8) Studies tend to rely on multimedia or digital enhancements, which may not be feasible in low-resource settings.(10) This creates a gap in understanding the MCH handbook's standalone educational value when delivered through traditional, structured health education sessions.

This research addresses these gaps by focusing specifically on high-risk pregnant women and evaluating the direct impact of structured, health worker-led educational sessions using only the standard MCH handbook on their knowledge of pregnancy danger signs. Unlike previous studies, this research emphasizes a low-tech, scalable intervention model that leverages existing health system tools without requiring digital infrastructure. This is particularly relevant for rural or under-resourced regions, where maternal mortality remains high and digital health tools are inaccessible. Furthermore, this study contributes novel evidence by combining pre–post experimental design with a focus on high-risk populations, a subgroup often neglected in previous literature. The findings are expected to inform policy and practice on how to optimize the use of existing materials such as the MCH handbook in a more targeted and impactful manner, especially in community-based antenatal care. This study aims to fill that gap by evaluating the effectiveness of structured education using the MCH handbook in increasing high-risk pregnant women's knowledge of pregnancy danger signs.

METHOD

This study employed a quantitative, pre-experimental design using a one-group pretest-posttest approach without a control group. The study was conducted in the Working Area of Cibeureum Public Health Center, Tasikmalaya City, Indonesia in October 2024. The design aimed to measure the effect of educational intervention using the Maternal and Child Health Handbook (*MCH handbook*) on participants' knowledge regarding danger signs of pregnancy. The study population consisted of all high-risk pregnant women in the Cibeureum Health Center working area. A total of 58 participants were recruited using purposive sampling, based on the following inclusion and exclusion criteria. Inclusion criteria: pregnant women classified as high-risk based on maternal age (<20 or >35 years), parity, pregnancy spacing, or comorbidities; gestational age ≥ 20 weeks; able to read and communicate in *Bahasa Indonesia*; and willing to participate and provide informed consent. Exclusion criteria: Pregnant women with severe complications requiring immediate referral;

Jurnal Kesehatan Ibu dan Anak Vol.18, No.1, July 2024, pp. 84~94
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those who did not attend both the pretest and posttest sessions. Participants received an educational session using the MCH handbook, focusing on identifying danger signs during pregnancy (e.g., severe abdominal pain, vaginal bleeding, high fever, blurred vision). The session lasted approximately 45–60 minutes and was delivered in a face-to-face group format by trained midwives. Materials used included the MCH handbook, flipcharts, and illustrative posters. The educational content was based on the standard guidelines issued by the Indonesian Ministry of Health. During the session, participants were guided through relevant sections of the MCH handbook, followed by a Q&A segment to enhance understanding. The posttest was conducted one week after the intervention to allow retention of the information provided. Knowledge of danger signs of pregnancy was assessed using a structured questionnaire developed by the research team based on the content of the MCH handbook and validated references. The questionnaire consisted of 25 multiple-choice questions covering key signs of obstetric emergencies. Validity: The instrument underwent content validation by three experts in maternal health. Reliability: A pilot test was conducted on 20 respondents outside the study sample, yielding a Cronbach's alpha of 0.81, indicating good internal consistency. Scores ranged from 0 to 25, with higher scores indicating better knowledge (High = knowledge score ≥ 21; Moderate = 17–20; Low ≤ 16). The same questionnaire was used for both pretest and posttest assessments. Data were analyzed using IBM SPSS version 29. Descriptive statistics (frequency and percentage) were used to describe participant characteristics and knowledge levels. The difference in knowledge scores between pretest and posttest was assessed using the paired t-test for normally distributed data or Wilcoxon signed-rank test if the data were not normally distributed. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1 presents the distribution of knowledge levels among high-risk pregnant women regarding the danger signs of pregnancy before and after the educational intervention using the Mother and Child Health (MCH) Book. Before the intervention, the majority of participants (74.14%) demonstrated a high level of knowledge, 17.24% had a moderate level, and 8.62% showed a low level of knowledge. After the intervention, all participants (100%) achieved a high level of knowledge. This finding indicates a clear improvement in maternal understanding following the structured educational activity using the MCH handbook.

Table 1. Frequency Distribution of Knowledge Levels of High-Risk Pregnant Women Regarding Pregnancy Danger Signs Before and After Intervention

Knowledge Category	Before Intervention		After Intervention	
	n	%	n	%
High	43	74.14	58	100
Moderate	10	17.24	0	0
Low	5	8.62	0	0
Total	**58**	**100**	**58**	**100**

Before conducting inferential analysis, the normality of the knowledge score data was tested using the Shapiro–Wilk test (appropriate for n < 100). The results showed a p-value of 0.000 (<0.05), indicating that the data were not normally distributed. Given this result, the data were analyzed using the Wilcoxon Signed Rank Test, a non-parametric alternative to the paired t-test.

Jurnal Kesehatan Ibu dan Anak Vol.18, No.1, July 2024, pp. 84~94
ISSN: 2599-3224 (Online), ISSN: 2302-6014 (Print)

Table 2. Test of Normality for Knowledge Scores of High-Risk Pregnant Women

Variable	Kolmogorov–Smirnov Statistic	Sig.	Shapiro–Wilk Statistic	Sig.	Interpretation
Pretest	0.447	0.000	0.581	0.000	Not normally distributed
Posttest	0.431	0.000	0.612	0.000	Not normally distributed

The Wilcoxon Signed Rank Test revealed a significant improvement in maternal knowledge following the educational intervention. The mean knowledge score increased from 19.00 (SD = 3.10) before the intervention to 24.91 (SD = 0.28) afterward, with a mean difference of 5.91 points (Z = –6.626, p < 0.001) (Table 3). The median score also increased from 20 to 25, demonstrating that nearly all participants reached near-perfect knowledge levels after the intervention. This result indicates that structured education using the MCH handbook effectively enhances high-risk pregnant women's understanding of pregnancy danger signs.

Table 3. Comparison of Knowledge Scores Before and After Education Using the MCH handbook

Variable	Mean	Median	SD	Min	Max	n	Z-value	p-value
Before intervention	19.00	20	3.10	10	23	58	–6.626	<0.001
After intervention	24.91	25	0.28	24	25	58		

The findings demonstrate a statistically significant improvement in the knowledge of high-risk pregnant women regarding pregnancy danger signs after being provided with education using the MCH handbook. Before the intervention, 25.86% of participants had moderate-to-low knowledge, which completely shifted to 100% high knowledge post-intervention. The substantial increase in mean scores and the perfect posttest performance underscore the MCH handbook's effectiveness as an educational tool in improving maternal health literacy and supporting early detection of pregnancy risks.

DISCUSSION

This study demonstrated a statistically significant improvement in the knowledge of high-risk pregnant women regarding pregnancy danger signs following structured education using the Mother and Child Health (MCH) Book. The mean knowledge score increased from **19.00 (SD = 3.10)** before the intervention to **24.91 (SD = 0.28)** after the intervention, with a **p-value < 0.001** based on the Wilcoxon Signed Rank Test. The magnitude of this change indicates not only statistical significance but also strong practical relevance, reflecting an almost universal enhancement of maternal understanding after the educational session.

The significant increase in maternal knowledge observed in this study after the educational use of the Mother and Child Health (MCH) Book aligns with findings from prior research that support the effectiveness of print-based health education media in improving maternal knowledge. The findings of this study, which demonstrate a significant improvement in knowledge of danger signs among high-risk pregnant women after receiving education using the MCH (MCH) Book, are consistent with several previous studies. Nationally, research by Sudarmi (2021) in South Lampung also showed a statistically significant increase in maternal knowledge after the implementation of structured education using the MCH handbook. This study found that the MCH handbook served not only as a record-keeping tool but also as an effective medium for delivering maternal health education, especially when accompanied by counseling by trained health workers.(16) Similarly, a study by Bangga et al. (2025) in Gorontalo reported that mothers who actively read and engaged with the MCH handbook had better antenatal health practices and awareness compared to those who merely possessed the book without utilizing its content. This finding supports our conclusion that possession alone is not sufficient; utilization through structured education is critical to impact.(17)

Jurnal Kesehatan Ibu dan Anak Vol.18, No.1, July 2024, pp. 84~94
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At the international level, this study aligns with findings from a quasi-experimental study in Egypt by El-shrqawy et al. (2024), which demonstrated that printed maternal education materials significantly improved women's knowledge and health behaviors related to antenatal care.(18) Likewise, research in Ethiopia by Yoseph et al. (2024) found that community-based maternal health education using print-based media led to significant increases in recognition of obstetric danger signs and better care-seeking behavior during pregnancy.(19) These findings collectively reinforce the effectiveness of print-based health education media when integrated into antenatal care programs and delivered with systematic support. However, some studies have suggested that digital or multimedia tools may have a greater impact among younger or urban populations.(20,21) Nevertheless, in contexts where digital access remains limited, like rural Indonesia, the MCH handbook remains a valuable and practical educational intervention.

A study conducted by Susanti and Noviyana (2025) in Indonesia demonstrated that pregnant women who received structured education using the MCH handbook experienced a statistically significant improvement in their knowledge about pregnancy danger signs.(22) Similarly, Prihatin et al. (2025) reported that although most pregnant women in their study owned the MCH handbook, only those who received guided explanations from midwives during antenatal visits showed notable increases in understanding and behavioral change.(23) These findings support the current study's conclusion that mere ownership of the MCH handbook is insufficient; it is the systematic educational intervention supported by healthcare workers that activates the book's full potential. At the international level, similar results have been reported. A study in Nepal by Toolan et al. (2022) found that the use of printed maternal health booklets, distributed during antenatal care, significantly increased knowledge and preparedness for birth among expectant mothers.(24) In Uganda, Alinaitwe et al. (2025) found that the "Mother's Handbook," a tool modeled after Japan's MCH Handbook, led to higher knowledge of neonatal care and danger signs when used in conjunction with verbal counseling.(25) These studies corroborate the idea that print-based tools, when supported by structured engagement, are effective in promoting maternal health literacy across diverse settings.

Improved knowledge and awareness of danger signs in pregnancy have been associated with reduced physiological stress responses, better adherence to antenatal care, and timely health-seeking behaviors, all of which are critical to maternal and fetal well-being. When a pregnant woman is well-informed, the body's stress regulation mediated by the hypothalamic-pituitary-adrenal (HPA) axis can function more adaptively, leading to lower levels of stress hormones such as cortisol.(26) This, in turn, can reduce the risk of preterm labor, hypertension, and other stress-related obstetric complications. Furthermore, knowledge enables early recognition of abnormal signs and prompts early care-seeking behavior, which can prevent delays in receiving emergency obstetric care, one of the leading contributors to maternal mortality.(27) Therefore, the structured use of the MCH handbook not only promotes cognitive understanding but can also indirectly contribute to biological readiness and risk reduction, enhancing maternal and fetal outcomes. However, the current study makes a distinct contribution by focusing on high-risk pregnant women as a group often underrepresented in such interventions.

While most prior studies assessed general populations of pregnant women, this study specifically demonstrates that targeted education using the MCH handbook is highly effective even among those most vulnerable to adverse outcomes. Additionally, the magnitude of change in knowledge scores (from a mean of 19 to 24.91) and the extremely low post-intervention standard deviation (0.28) suggest a remarkably consistent improvement across participants, underscoring the reliability of the intervention. Moreover, the findings add to the literature by reinforcing the importance of contextual adaptation and structured facilitation. In contrast to studies that rely on passive dissemination of materials, this research provides empirical evidence for an active, media-assisted communication

Jurnal Kesehatan Ibu dan Anak Vol.18, No.1, July 2024, pp. 84~94
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strategy, where the MCH handbook functions not only as an information source but as a dialogical tool that fosters interaction between mothers and health professionals. Conceptually, these findings provide strong empirical support for the theory that structured, media-based antenatal education particularly through standardized tools like the MCH handbook can substantially enhance maternal health literacy. The near-perfect post-intervention score distribution (with a maximum score of 25 in almost all participants) suggests not just an increase in knowledge, but also a high level of content absorption, likely due to the intervention's systematic delivery, contextual relevance, and reinforcement during ANC visits. The results highlight the MCH handbook's educational function beyond its conventional role as a medical record. Although the national coverage of MCH handbook ownership is high, its actual utilization and impact remain suboptimal, often due to lack of systematic education, passive distribution, and limited maternal engagement. This study addresses that gap by showing that targeted educational interventions using the MCH handbook can activate its full potential, especially among high-risk groups. This outcome has several important implications for antenatal care (ANC): (1) Improved Early Risk Detection: Educating mothers to recognize danger signs early increases the likelihood of timely healthcare seeking, which is essential for reducing maternal and perinatal morbidity and mortality; (2) Increased Maternal Engagement: When used actively as an educational medium, the MCH handbook promotes mothers' participation in their own care and enhances communication between mothers and healthcare providers, (3) Strengthened ANC Services: Integrating the MCH handbook into routine counseling during ANC visits transforms it from a passive document to an active health promotion tool, especially when accompanied by visual, interactive, and culturally appropriate guidance; (4) Bridging Literacy and Comprehension Gaps: The MCH handbook simplifies complex clinical information through illustrations and lay-friendly language, making it an effective tool for mothers with low formal education, provided it is coupled with support from trained health personnel. What distinguishes this result from mere ownership of the MCH handbook is the role of intervention and facilitation. The findings underscore that possession alone is insufficient. Only when accompanied by structured, intentional education does the MCH handbook become an instrument that can change behavior and improve outcomes. This reinforces the need for health system strategies that institutionalize educational use of the MCH handbook, particularly for high-risk populations who stand to benefit most from early warning and self-monitoring. In conclusion, this study not only demonstrates the efficacy of the MCH handbook as a maternal education tool but also responds directly to the national challenge of low MCH handbook utilization. By embedding educational practices into ANC protocols, health systems can leverage existing resources to improve maternal outcomes in a cost-effective and scalable manner.

This study provides compelling evidence regarding the effectiveness of the Mother and Child Health (MCH) Book in increasing knowledge among high-risk pregnant women. However, several limitations should be considered when interpreting these findings. First, the use of a pre-experimental design with a one-group pretest-posttest approach limits the internal validity of the study. Without a control group, it is difficult to rule out the influence of external factors such as informal health education, media exposure, or peer support that may have contributed to the observed improvements in knowledge. Second, the study was conducted in a single urban health center, namely the Cibeureum Health Center, thereby limiting the generalizability of the findings. Differences in infrastructure, health literacy, and cultural norms across regions in Indonesia may influence the effectiveness and utilization of the MCH handbook. Consequently, the results may not fully reflect the experiences of pregnant women in rural or underserved areas, where access to health education and supportive services may differ significantly. Third, although the intervention successfully improved knowledge levels, the study did not assess whether this increase translated into behavioral changes or improved clinical outcomes. As knowledge alone does not always

Jurnal Kesehatan Ibu dan Anak Vol.18, No.1, July 2024, pp. 84~94
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lead to action, future research should explore whether increased awareness of pregnancy danger signs leads to more timely antenatal care visits, early detection of complications, and improved maternal health outcomes. Furthermore, the reliance on self-reported questionnaire data introduces the possibility of response bias, particularly social desirability bias, which may overestimate actual understanding or recall. In addition, the post-intervention data collection was conducted shortly after the educational session, making it difficult to assess the sustainability of knowledge retention over time.

Given these limitations, future research is recommended to adopt more rigorous experimental designs, such as randomized controlled trials, to better establish causal relationships. Expanding the research to include diverse geographic and sociodemographic contexts will provide a broader understanding of the MCH handbook's applicability and effectiveness. Moreover, longitudinal studies are needed to evaluate the long-term retention of knowledge and its impact on maternal health behaviors. It is also important to investigate the role of health workers in facilitating the use of the MCH handbook and to explore the potential of integrating multimedia or digital formats to enhance its accessibility and engagement, especially among younger, tech-savvy populations. Addressing these areas in future research will strengthen the evidence base for the use of structured, print-based educational tools like the MCH handbook and inform policy and programmatic efforts aimed at reducing maternal mortality through improved maternal health literacy.

CONCLUSION

This study concludes that structured educational interventions using the Mother and Child Health (MCH) Book significantly improve the knowledge of high-risk pregnant women regarding the danger signs of pregnancy. The findings demonstrate a statistically significant increase in knowledge scores following the intervention, with all participants reaching a high level of understanding. This highlights the MCH handbook's effectiveness as a practical and accessible media-based tool to enhance maternal health literacy. Beyond mere ownership, the study reinforces that systematic and guided utilization of the MCH handbook integrated within antenatal care services can empower women to recognize early warning signs, seek timely medical attention, and potentially reduce maternal morbidity and mortality.

These findings have important implications for maternal health policy and practice. Health workers should be trained not only to distribute the MCH handbook, but also to incorporate its content actively into ANC education sessions. Policymakers are encouraged to standardize media-based education as part of routine ANC visits, particularly for high-risk populations. Future efforts should explore the impact of MCH handbook education on behavioral outcomes and maternal health indicators over time. Further research using controlled and multicenter designs is also recommended to validate these findings across diverse contexts and assess the long-term sustainability of knowledge retention and behavior change.

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NFA: Conceptualization, Methodology, Data Collection, Formal Analysis, Writing – Original Draft, Writing – Review & Editing, Visualization; **WMP, LPS**: Supervision, Validation.

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DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Jurnal Kesehatan Ibu dan Anak Vol.18, No.1, July 2024, pp. 84~94
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