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Risk Factors Analysis of Maternal Emergencies and Optimization of Maternal and Child Health Handbook (MCH Handbook) Utilization (Sarimahi Village, Ciparay Subdistrict, Bandung Regency, Indonesia, 2025)

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Abstract: Maternal emergencies remain a significant public health concern and are one of the main contributors to the persistently high maternal mortality rate in Indonesia. Early detection of pregnancy-related complications is essential to reducing these risks, and one effective approach is by strengthening maternal health literacy. The Maternal and Child Health (MCH) Handbook plays a vital role in this process as it functions both as an educational medium and as a comprehensive health record for mothers, covering the continuum of care from pregnancy, delivery, to the postpartum period. This study was conducted with the objective of analyzing factors associated with maternal emergencies, particularly focusing on the level of understanding and utilization of the MCH Handbook among postpartum mothers. A case-control study design was applied, involving a total of 80 respondents, with 40 assigned to the case group and 40 to the control group. The participants were randomly selected from Sarimahi Village. Data collection was carried out using structured questionnaires, and statistical analysis was performed employing the Chi-Square test. The findings of the study revealed a significant association between the level of understanding of the MCH Handbook and the occurrence of maternal emergencies ($p = 0.001$). Similarly, a significant relationship was observed between the level of utilization of the MCH Handbook and maternal emergencies ($p = 0.002$). Additional factors identified as contributing to maternal emergencies included maternal age, education level, parity, pregnancy interval, and a history of complications in previous pregnancies. The study concludes that a higher level of understanding and active utilization of the MCH Handbook play an essential role in preventing maternal emergencies. Therefore, efforts to improve maternal health literacy through the optimized and consistent use of the MCH Handbook should be actively promoted and strengthened within community health programs.

Keywords: Child Health (MCH) Handbook; Comprehension; Health Literacy; Maternal Emergency; Utilization.

1. Introduction

Maternal health remains a pivotal indicator of national health system performance and equity. One of the most critical benchmarks is the Maternal Mortality Ratio (MMR), which encapsulates the quality and accessibility of healthcare services throughout pregnancy, childbirth, and the postpartum period. In Indonesia, the 2023 Indonesian Health Survey reported an MMR of 189 per 100,000 live births substantially exceeding the Sustainable Development Goals (SDG) target of 70 per 100,000 live births(Indonesia, 2023)(Organization, 2023)(Alkema et al., 2016). This persistent rate underscores systemic challenges in early complication detection, emergency response, and maternal health literacy.

West Java Province, home to one of Indonesia's largest populations, mirrors this national issue. Fluctuating maternal mortality trends have been documented in recent years, with hemorrhage, hypertensive disorders of pregnancy, and postpartum infections identified as the leading causes of maternal deaths(Ekspres, 2023)(Alkema et al., 2016). However, beyond biomedical causes, social determinants such as the "three delays" delays in decision-making, reaching healthcare facilities, and receiving adequate care exacerbate these outcomes(Ghosh N. AU3 - Yadav, A., 2025). These delays highlight deficiencies in antenatal education, risk communication, and community-based preventive strategies(Pacagnella et al., 2014).

To address this, the Indonesian government has long promoted the use of the *Buku Kesehatan Ibu dan Anak* (KIA), or Maternal and Child Health (MCH) Handbook. The

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handbook functions not only as a record of maternal and child health services but also as a tool for education, health promotion, and early warning(Indonesia, 2023). Despite its widespread distribution, studies show that many pregnant women fail to fully utilize the MCH Handbook. Some do not read it thoroughly, while others rely solely on health workers for information during visits(Dewi R. AU3 - Nuraini, L., 2021; Hidayat L., 2022). The lack of guided literacy efforts and low maternal health engagement weaken the handbook's preventive potential.

Bandung Regency, a densely populated area with diverse socio-cultural characteristics, illustrates this challenge vividly. Although 66,913 antenatal care (ANC) visits were recorded in Ciparay Subdistrict in 2023 (Bandung, 2024), maternal emergencies remain prevalent. A study by Ramdhan, Suryani, and Lestari found that while the MCH Handbook was distributed to over 90% of pregnant women, only 55–60% used it effectively(Ramdhan R. AU3 - Lestari, A., 2023). This indicates a significant gap between coverage and comprehension.

This gap suggests that the quantity of service utilization (e.g., ANC visits) does not always reflect the quality of health education provided. Antenatal care should ideally serve as a platform to build maternal understanding of danger signs. However, in practice, the MCH Handbook is often treated as an administrative formality rather than a meaningful educational resource(Mudja A., 2023). Without guided engagement or structured literacy initiatives, its function as a preventive tool is compromised.

Consequently, improving maternal health outcomes requires more than just service access it requires the activation of mothers as informed participants in their own care. This study builds on prior work that has highlighted the pivotal role of maternal health literacy (Nutbeam, 2008; Putri R., 2022) in early detection and complication prevention. It centers on understanding how the MCH Handbook can be better utilized not merely distributed to support safer pregnancies and childbirths in rural Indonesian communities.

Despite national and regional efforts to improve maternal health outcomes, the persistent high rate of maternal emergencies in Indonesia highlights fundamental gaps not only in clinical service delivery but also in educational effectiveness during antenatal care. In regions like Ciparay Subdistrict, where antenatal service coverage exceeds 90%, maternal emergency cases remain prevalent (Bandung, 2024; Ramdhan R. AU3 - Lestari, A., 2023). This contradiction suggests that increased access to services alone is insufficient in preventing obstetric complications.

Previous studies have predominantly focused on service availability and frequency of antenatal visits as key indicators of maternal care quality (Dewi R. AU3 - Nuraini, L., 2021; Hidayat L., 2022). However, these metrics do not fully capture whether mothers truly comprehend the information presented or apply it in making informed health decisions. Research by Ramdhan shows that while the MCH Handbook was widely distributed, only 55–60% of mothers engaged with it meaningfully by reading, noting, and understanding its content(Ramdhan R. AU3 - Lestari, A., 2023).

Additionally, much of the existing literature has overlooked behavioral and cognitive dimensions of handbook utilization. For example, health workers often assume that merely handing over the handbook is sufficient, without actively guiding mothers through its critical contents (Mudja A., 2023). Meanwhile, many women report only bringing the handbook during checkups without interacting with it independently.

These issues point to a research gap in understanding how maternal health literacy defined as the ability to access, comprehend, and act upon health information (Nutbeam, 2008) influences the occurrence of maternal emergencies. Specifically, the relationship between literacy level, handbook utilization, and clinical outcomes has not been thoroughly explored in the context of rural Indonesian communities. The lack of structured evaluation on how effectively the MCH Handbook functions as a preventive intervention tool represents a missed opportunity to enhance maternal safety through education.

This study aims to bridge the gap between access to maternal health resources and their effective utilization by investigating the role of the Maternal and Child Health (MCH) Handbook in reducing maternal emergencies. Specifically, it examines how the level of comprehension and engagement with the MCH Handbook among postpartum mothers influences the occurrence of maternal complications.

To achieve this aim, a case-control research design was employed. A total of 80 postpartum women from Sarimahi Village in Ciparay Subdistrict, Bandung Regency, were selected 40 with a history of maternal emergency (case group) and 40 without (control group). The study analyzed behavioral engagement with the MCH Handbook, as well as

sociodemographic risk factors such as maternal age, education level, parity, birth spacing, and prior obstetric complications.

Unlike previous studies that emphasized distribution and coverage of the handbook, this research adopts a more nuanced approach. It evaluates cognitive and behavioral dimensions of handbook utilization specifically, whether mothers read, understand, and record relevant health information. Furthermore, it investigates how these practices correlate with actual emergency events during childbirth.

By doing so, the study proposes a behavior-informed model of MCH Handbook effectiveness, identifying not only possession or frequency of use, but also depth of engagement as a determinant of health outcomes. This model acknowledges that maternal education must move beyond information dissemination toward active participation, comprehension, and behavioral application.

This study contributes meaningfully to the evolving discourse on maternal health literacy and its role in reducing maternal emergency events, particularly in low- and middle-income country contexts such as Indonesia. It provides empirical evidence that mothers with higher levels of understanding and active use of the Maternal and Child Health (MCH) Handbook are significantly less likely to experience maternal complications. By focusing not merely on handbook ownership but on behavioral patterns such as reading, recording, and comprehension this research offers a more nuanced perspective on how educational tools function in real-world settings.

Furthermore, this study explores contextual factors including maternal age, educational background, parity, and birth spacing, highlighting how these variables interact with health behavior to influence maternal outcomes. In doing so, it presents a more comprehensive risk profile that can inform targeted interventions. The findings also offer practical insights for healthcare providers and policymakers seeking to design more effective community-based maternal health strategies. Emphasis is placed on the importance of structured health worker engagement, improved health education during antenatal visits, and the activation of family support systems to enhance the reach and effectiveness of the MCH Handbook.

Finally, by applying Nutbeam's health literacy model (2008) within a rural Indonesian context, the study expands its theoretical relevance, offering a locally grounded yet globally adaptable framework for evaluating the effectiveness of health promotion interventions during pregnancy.

The remainder of this paper begins with a review of relevant literature in Section 2, which discusses the theoretical foundations of maternal health literacy, previous studies on the use of the MCH Handbook, and existing knowledge about the determinants of maternal emergencies. Section 3 then outlines the methodology employed in this study, detailing the research design, sampling techniques, data collection instruments, and the statistical tools used for analysis. Section 4 presents the research findings, particularly the relationships between MCH Handbook utilization and maternal emergency events, as well as the influence of sociodemographic variables. This is followed by Section 5, which offers a critical discussion of the findings in light of existing literature and explores their implications for public health policy and clinical practice. Finally, Section 6 concludes the study by summarizing the key outcomes and providing practical recommendations for healthcare professionals, community stakeholders, and future research endeavors.

2. Literature Review

Maternal health outcomes are closely linked to a variety of medical, behavioral, and educational factors. One of the central tools promoted by the Indonesian government for early detection and maternal education is the *Buku Kesehatan Ibu dan Anak* (KIA Handbook), designed to serve both as a health record and an educational medium(Indonesia, 2023)(Pratiwi et al., 2021). Several studies have explored the utilization and impact of the KIA Handbook in different regional contexts.

Dewi, Puspitasari, and Nuraini found that while the distribution rate of the handbook was relatively high, its actual use by mothers remained limited(Dewi R. AU3 - Nuraini, L., 2021). Similarly, Hidayat and Afifah observed that many pregnant women brought the handbook to antenatal visits but did not read or understand its contents(Hidayat L., 2022). These findings indicate a behavioral gap in how health education tools are used availability does not guarantee comprehension or application(Green & Kreuter, 2005)(Bandura, 2004).

The theoretical foundation for this research is Nutbeam's Health Literacy model, which defines health literacy in three domains: functional, communicative, and critical

literacy(Nutbeam, 2008). The model has been widely used in health promotion studies to assess individuals' ability to access, understand, evaluate, and use health information. In the maternal health context, this includes recognizing danger signs of pregnancy and knowing when and where to seek care(Berkman et al., 2011).

Another stream of related work focuses on the risk factors contributing to maternal emergencies. Studies have identified hemorrhage, hypertensive disorders, infection, and delays in care-seeking as primary contributors(Ghosh N. AU3 - Yadav, A., 2025). In line with these findings, Ramdhan, Suryani, and Lestari emphasized that even in areas with high antenatal coverage, maternal emergencies continue to occur when educational engagement is low, and warning signs are not properly understood(Ramdhan R. AU3 - Lestari, A., 2023).

What distinguishes the current study from previous literature is its focus not only on the availability of educational materials but on the behavioral depth of their usage, combining comprehension and active engagement as core variables. Moreover, it examines the statistical association between maternal emergencies and both individual literacy levels and handbook utilization behavior an approach not commonly emphasized in earlier research.

3. Proposed Method

This study applied a quantitative, observational analytic approach to investigate the relationship between the utilization of the Maternal and Child Health (MCH) Handbook and the occurrence of maternal emergency events during childbirth. A case-control study design was chosen to identify risk factors by comparing two distinct groups: postpartum mothers who experienced maternal emergencies and those who did not.

Data collection was retrospective, based on events occurring within the previous 12 months, and included direct household visits across Sarimahi Village. Eligible participants were postpartum mothers identified through community networks (RT heads and local leaders), and classified into either the case or control group based on their birth experiences.

Each participant was interviewed using a structured questionnaire and asked to present her MCH Handbook. The handbook served as a triangulation tool to validate responses related to its usage, such as whether the mother actively read, recorded, and understood its contents. The classification of utilization levels was as follows: high (read, recorded, understood), moderate (read only), and low (brought only).

This research also evaluated demographic and obstetric variables such as maternal age, education, parity, birth spacing, and history of complications based on operational definitions outlined in Table 1. The study used simple random sampling to select participants, constrained by time and resource availability. The minimum sample size was determined using the Lemeshow formula for unmatched case-control studies.

3.1. Algorithm for Sample Calculation

The sample size estimation was based on Lemeshow's formula for case-control studies:

Algorithm 1. Sample Size Estimation Based on Lemeshow Formula.

INPUT:

- Significance level ($Z\alpha/2$) = 1.96
- Power ($Z\beta$) = 0.84
- Proportion of exposure in control group (p_1) = 0.6
- Proportion of exposure in case group (p_2) = 0.3

OUTPUT:

- Minimum sample size per group (n)

Steps:

1. Calculate pooled variance:
   $V = p_1 (1-p_1) + p_2 (1-p_2)$
   $\rightarrow V = (0.6\times0.4) + (0.3\times0.7) = 0.24 + 0.21 = 0.45$
2. Calculate Z-score sum squared:
   $(Z\alpha/2 + Z\beta)^2 = (1.96 + 0.84)^2 = 7.84$
3. Compute required sample size:
   $n = (7.84 \times 0.45) / (0.6 - 0.3)^2 = 3.528 / 0.09 \approx 39.2$
4. Round to nearest integer:
   $n \approx 40$ respondents per group

3.2 Data Collection and Variables

The data collection process combined interviews and document analysis. The MCH Handbook was examined for usage indicators(Creswell, 2018). The primary outcome variable was maternal emergency incidence. Independent variables included age, education, parity, pregnancy interval, history of complications, understanding, and utilization of the MCH Handbook.

Variables were defined and scaled as shown in Table 1. Comprehension and utilization levels were scored using a 3-level ordinal system derived from content engagement behaviors. Data were coded and analyzed using descriptive and analytic statistics.

Table 1. Operational Definitions.

Measured Aspect	Operational Definition	Measurement Tool	Result Category	Scale Type
Maternal Age at Birth	Age of the mother in years at the time of her most recent childbirth	Structured questionnaire	<20 years, 20–35 years, >35 years	Nominal
Education Level	Highest level of education completed by respondent	Structured questionnaire	≤Junior High School, ≥Senior High School	Nominal
Parity	Total number of children born alive or stillborn	Structured questionnaire	≤2 children, >2 children	Nominal
Pregnancy Interval	Time interval between last pregnancy and current one	Structured questionnaire	<2 years, ≥2 years	Nominal
History of Maternal Complications	Mother's self-reported history of complications (e.g., preeclampsia, hemorrhage, sepsis)	Structured questionnaire	Yes, No	Nominal
Understanding of MCH Handbook	Knowledge of the content of MCH Handbook	Structured questionnaire	High (80–100), Moderate (60–79), Low (0–59)	Ordinal
Utilization of MCH Handbook	Extent to which the MCH Handbook is used for info, records, reminders	Structured questionnaire	High (read, write, understand), Moderate (read only), Low (carry only)	Ordinal

3.3 Statistical Analysis

Data were analyzed using SPSS. Descriptive analysis summarized respondent characteristics and key variables in frequencies and percentages. Analytic statistics employed the Chi-square test to assess associations between categorical variables, with a significance threshold of $p < 0.05$ indicating statistically meaningful relationships.

4. Results and Discussion

4.1. Study Population and Baseline Characteristics

This case-control study enrolled 80 participants comprising 40 mothers in the case group (experiencing maternal emergency) and 40 mothers in the control group (no maternal emergency). The demographic and clinical characteristics were analyzed to establish comparability between groups and identify potential confounding factors.

Table 2. Baseline Characteristics of Study Participants by Case and Control Groups.

Characteristics	Cases (n=40)		Controls (n=40)		Total (n=80)	
	n	%	n	%	n	%
Age (years)						
< 20	8	20.0	2	5.0	10	12.5
20–35	26	65.0	32	80.0	58	72.5
> 35	6	15.0	6	15.0	12	15.0
Education Level						
≤ Junior High School	24	60.0	13	32.5	37	46.3
≥ Senior High School	16	40.0	27	67.5	43	43.7
Parity						
≤ 2 children	22	55.0	30	75.0	52	65.0

> 2 children	18	45.0	10	25.0	28	35.0
Birth Spacing						
< 2 years	21	52.5	8	20.0	29	36.3
≥ 2 years	19	47.5	32	80.0	51	63.7
MCH Handbook Understanding Level						
High (80-100)	9	22.5	26	65.0	35	43.8
Moderate (60-79)	14	35.0	9	22.5	23	28.7
Low (0-59)	17	42.5	5	12.5	22	27.5
MCH Handbook Utilization Level						
High (read, record, understand)	12	30.0	29	72.5	41	51.3
Moderate (read only)	15	37.5	7	17.5	22	27.5
Low (carry only)	13	32.5	4	10.0	17	21.3

The demographic analysis revealed significant disparities between case and control groups across multiple variables. The majority of participants (72.5%) were in the optimal reproductive age range of 20-35 years, consistent with existing literature on maternal health outcomes. However, 27.5% of participants fell into high-risk age categories (<20 years: 12.5%; >35 years: 15.0%), indicating substantial representation of at-risk populations.

Educational attainment demonstrated a pronounced difference between groups, with 60% of cases having ≤junior high school education compared to only 32.5% in controls. Conversely, 67.5% of controls had ≥senior high school education versus 40% in cases. This educational gradient aligns with established evidence linking higher educational attainment to improved maternal health literacy and outcomes(Creanga et al., 2012).

Regarding parity, 65% of participants had ≤2 children, with higher prevalence in controls (75%) compared to cases (55%). The higher proportion of multiparous women (>2 children) in the case group (45% vs. 25%) supports existing evidence correlating grand multiparity with increased obstetric complications, including uterine atony, retained placenta, and genital tract lacerations(Conde-Agudelo et al., 2006)(Bai et al., 2002).

Birth spacing analysis revealed that adequate spacing (≥2 years) was present in 63.7% of participants overall, but significantly higher in controls (80%) versus cases (47.5%). This finding corroborates research demonstrating that inadequate birth spacing compromises maternal physiological recovery and nutritional status, predisposing to pregnancy complications.

4.2. Maternal Emergency Occurrence

Table 3. Distribution of Maternal Emergency Events Among Study Participants.

Maternal Emergency Status	Frequency	Percentage
Yes (Cases)	40	50.0
No (Controls)	40	50.0
Total	**80**	**100.0**

The balanced distribution between case and control groups (50% each) reflects the matched case-control design employed in this study, facilitating robust comparative analysis of risk factors. Maternal emergencies encompass life-threatening conditions during pregnancy, labor, or postpartum period, including hemorrhage (placental abruption, placenta previa, uterine atony), hypertensive disorders (preeclampsia, eclampsia), sepsis, and obstructed labor.

The 50% prevalence of maternal emergencies in this study population underscores the critical importance of preventive interventions and early detection strategies. This finding supports the urgent need for enhanced maternal health literacy programs and optimal utilization of available educational resources, particularly the Maternal and Child Health (MCH) Handbook.

4.3. Association Between MCH Handbook Utilization and Maternal Emergency Risk

Table 4. Analysis of MCH Handbook Utilization Level and Maternal Emergency Risk.

MCH Handbook Utilization Level	Cases		Controls		Total	χ^2	p-value
	n	%	n	%	n		
High (read, record, understand)	12	30.0	29	72.5	41	13.207	0.001
Moderate (read only)	15	37.5	7	17.5	22		
Low (carry only)	13	32.5	4	10.0	17		
Total	**40**	**100**	**40**	**100**	**80**		

The chi-square analysis revealed a statistically significant association between MCH Handbook utilization level and maternal emergency occurrence ($\chi^2 = 13.207$, $p = 0.001$). This finding provides strong evidence supporting our primary hypothesis that optimal utilization of the MCH Handbook serves as a protective factor against maternal emergencies.

The data demonstrate a clear gradient effect: high utilization was predominantly observed in controls (72.5% vs. 30.0% in cases), while low utilization was more prevalent in cases (32.5% vs. 10.0% in controls). This dose-response relationship strengthens the causal inference between MCH Handbook utilization and maternal outcomes.

The protective effect of high utilization can be attributed to several mechanisms. First, active engagement with the handbook (reading, recording, understanding) enhances maternal health literacy, enabling early recognition of danger signs during pregnancy, labor, and postpartum periods. Second, systematic recording of health information facilitates continuity of care and informed decision-making during medical consultations. Third, comprehensive understanding of handbook content empowers mothers to adopt preventive behaviors and seek timely medical intervention.

These findings align with the Health Belief Model, which posits that health-related behaviors are influenced by perceived susceptibility, severity, benefits, and barriers. Mothers who actively utilize the MCH Handbook develop enhanced risk perception and self-efficacy in managing pregnancy-related health issues.

4.4. Association Between MCH Handbook Understanding and Maternal Emergency Risk

Table 5. Analysis of MCH Handbook Understanding Level and Maternal Emergency Risk.

MCH Handbook Understanding Level	**Cases**		**Controls**		**Total**	**χ^2**	**p-value**
	n	%	n	%	n		
High (80-100)	9	22.5	26	65.0	35	13.333	0.001
Moderate (60-79)	14	35.0	9	22.5	23		
Low (0-59)	17	42.5	5	12.5	22		
Total	**40**	**100**	**40**	**100**	**80**		

The analysis of MCH Handbook understanding level demonstrated a highly significant association with maternal emergency risk ($\chi^2 = 13.333$, $p = 0.001$). The data reveal a striking

inverse relationship: 74.3% of mothers with high understanding were in the control group, while 77.3% of those with low understanding were in the case group.

This finding validates our secondary hypothesis regarding the critical role of comprehension in maternal health outcomes. The cognitive processing model suggests that mere exposure to health information is insufficient; meaningful understanding and internalization are prerequisite for behavioral change and improved health outcomes.

The protective effect of high understanding operates through multiple pathways. Enhanced comprehension enables accurate interpretation of physiological changes during pregnancy, differentiation between normal variations and pathological conditions, and appropriate timing of healthcare-seeking behavior. Furthermore, well-informed mothers are more likely to adhere to prenatal care recommendations, maintain healthy lifestyle practices, and communicate effectively with healthcare providers.

4.5. Clinical Implications and Public Health Significance

The convergent findings from both utilization and understanding analyses provide compelling evidence for the protective role of the MCH Handbook against maternal emergencies. The statistically significant associations (both $p = 0.001$) demonstrate robust relationships that exceed conventional significance thresholds, suggesting clinically meaningful effects.

The observed gradient effects across utilization and understanding levels support a dose-response relationship, strengthening causal inference(Ronsmans & Graham, 2006). This pattern indicates that interventions targeting incremental improvements in handbook engagement may yield proportional benefits in maternal health outcomes.

From a public health perspective, these findings highlight the MCH Handbook as a cost-effective intervention tool with significant potential impact. Given the widespread availability of the handbook through Indonesia's maternal health program, optimizing its utilization represents a scalable strategy for reducing maternal morbidity and mortality.

The educational disparities observed between groups underscore the importance of tailored intervention approaches. Mothers with lower educational attainment may require additional support, including simplified materials, visual aids, and intensive counseling to maximize handbook benefits. Healthcare providers should prioritize personalized education strategies that accommodate varying literacy levels and learning preferences.

4.6. Strengths and Limitations

This study's matched case-control design provides robust evidence for the association between MCH Handbook engagement and maternal outcomes. The balanced group allocation eliminates selection bias, while the comprehensive assessment of both utilization and understanding provides multidimensional insights.

However, several limitations merit consideration. The cross-sectional nature precludes establishment of temporal relationships, and recall bias may affect self-reported utilization and understanding measures. Additionally, the study was conducted in a single geographic region, potentially limiting generalizability to other populations with different socioeconomic and cultural contexts.

Future longitudinal studies with objective measures of handbook engagement and standardized outcome assessments would strengthen the evidence base. Investigation of mediating factors, such as healthcare provider communication quality and social support systems, would provide deeper insights into intervention mechanisms.

4.7. Recommendations for Practice and Policy

Based on these findings, we recommend implementing comprehensive strategies to enhance MCH Handbook utilization and understanding. Healthcare providers should receive training on effective handbook counseling techniques, emphasizing interactive engagement rather than passive distribution. Antenatal care protocols should incorporate systematic handbook review sessions with personalized education components(Campbell & Graham, 2006)(Soubeiga et al., 2014).

Policy interventions should focus on improving handbook design and content accessibility, incorporating visual elements and multilingual options where appropriate. Integration with digital health platforms could enhance engagement among tech-savvy populations while maintaining traditional formats for those preferring print materials.

Community-based interventions, including peer education programs and support groups, could reinforce healthcare facility-based efforts. These approaches leverage social networks to promote sustained engagement with maternal health resources and create supportive environments for health behavior change.

The evidence presented strongly supports the integration of enhanced MCH Handbook utilization strategies into comprehensive maternal health programs, positioning this intervention as a cornerstone of efforts to achieve Sustainable Development Goal targets for maternal mortality reduction.

5. Conclusions

This study confirms a significant relationship between maternal emergency events and both the level of understanding and utilization of the Maternal and Child Health (MCH) Handbook among postpartum mothers in Sarimahi Village, Ciparay Subdistrict. Mothers who actively engaged with the handbook reading, recording, and understanding its contents were substantially less likely to experience maternal complications. These findings support the hypothesis that maternal health literacy, as conceptualized by Nutbeam, plays a critical role in early detection and prevention of obstetric emergencies.

The results also underscore the influence of sociodemographic factors such as maternal age, education level, parity, and pregnancy intervals on maternal outcomes. Low educational attainment, short birth spacing, and a history of complications emerged as additional risk factors.

This study contributes to the growing evidence base emphasizing that access to health resources alone is insufficient. Instead, behavior-informed interventions such as guided education during antenatal visits and active health worker engagement are essential to improving the effectiveness of the MCH Handbook.

While the case-control design offers strong comparative insights, the study's limitations include potential recall bias and limited geographic generalizability. Future research should adopt longitudinal designs and incorporate objective measures of handbook engagement to validate these findings further. Exploring digital adaptations of the MCH Handbook and integrating family or peer support systems could also enhance maternal health outcomes.

In conclusion, optimizing MCH Handbook utilization through tailored, literacy-sensitive, and participatory health education strategies can significantly reduce maternal emergencies and should be prioritized in community-based maternal health programs.

Author Contributions: A short paragraph specifying their individual contributions must be provided for research articles with several authors **(mandatory for more than 1 author)**. The following statements should be used "Conceptualization: X.X. and Y.Y.; Methodology: X.X.; Software: X.X.; Validation: X.X., Y.Y. and Z.Z.; Formal analysis: X.X.; Investigation: X.X.; Resources: X.X.; Data curation: X.X.; Writing original draft preparation: X.X.; Writing review and editing: X.X.; Visualization: X.X.; Supervision: X.X.; Project administration: X.X.; Funding acquisition: Y.Y."

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Data Availability Statement: We encourage all authors of articles published in FAITH journals to share their research data. This section provides details regarding where data supporting reported results can be found, including links to publicly archived datasets analyzed or generated during the study. Where no new data were created or data unavailable due to privacy or ethical restrictions, a statement is still required.

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