



The Effect of Health Education Through The Kia Book on Mothers' Knowledge of Developmental Stimulation in Selopampang Village, Temanggung Regency

Yuli Kusriyani^{1*}, Atika Zahria Arisanti², Endang Susilowati³

¹⁻³ Universitas Islam Sultan Agung Semarang, Indonesia

Email: yuliamrita10@gmail.com¹

Article Info :

Received:
05-08-2026
Revised:
28-08-2026
Accepted:
02-09-2026

Abstract

This study examined the effect of health education delivered through the Maternal and Child Health Book (KIA Book) on mothers' knowledge of developmental stimulation in Selopampang Village, Temanggung Regency. A pre-experimental one-group pretest–posttest design was applied to 54 mothers of children aged 12–59 months selected through purposive sampling. Before the intervention, 42 respondents (77.8%) had good knowledge, 8 (14.8%) had moderate knowledge, and 4 (7.4%) had poor knowledge. After the intervention, all 54 respondents (100.0%) were classified as having good knowledge. The Wilcoxon Signed-Rank Test showed 51 positive ranks, 3 ties, no negative ranks, and a statistically significant difference between pretest and posttest scores ($Z = -6.273$; $p < 0.001$). These findings indicate that structured health education using the KIA Book effectively improved mothers' understanding of age-appropriate developmental stimulation. The intervention may strengthen the educational function of the KIA Book within Posyandu, BKB, and primary health care activities. Continued educational reinforcement is recommended to support sustained maternal knowledge, appropriate stimulation practices, and early recognition of developmental problems among young children in community settings and encourage consistent use within the household.

Keywords: health education, KIA Book, maternal knowledge, developmental stimulation, child development.



©2026 Authors.. This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.
(<https://creativecommons.org/licenses/by-nc/4.0/>)

INTRODUCTION

Toddlerhood represents a critical golden period that shapes the foundations of health, learning capacity, and well-being in later stages of life because development progresses rapidly during this phase (Draper et al., 2024). This period is characterized by interconnected physical, motor, cognitive, language, and socio-emotional development that requires adequate environmental support (Cheung et al., 2021). Responsive caregiving, positive child–caregiver interactions, and age-appropriate stimulation contribute substantially to optimal developmental outcomes (Jeong et al., 2021; Bemanalizadeh et al., 2022). Limited parental knowledge regarding developmental stages and appropriate stimulation may hinder the provision of adequate developmental support and delay the early recognition of developmental problems (Alghamdi et al., 2023; Draper et al., 2024).

Developmental disorders remain an important public health concern, with a global prevalence of approximately 7.1%, while a considerably higher burden has been reported in Asia, particularly in South Asia, where the prevalence among children and adolescents is approximately 13.6% (Olusanya et al., 2022). The Global Burden of Disease analysis in Indonesia has identified developmental disabilities as an important contributor to Years Lived with Disability among children, whereas community-based diagnostic findings in Indonesia have reported a prevalence of approximately 9.7% (Mboi et al., 2022; Salim et al., 2020). Data from the 2024 Indonesian Nutrition Status Survey, Survei Status Gizi Indonesia or SSGI, indicated developmental disorder prevalences of 33.7% in South Papua, 30.2% in East Nusa Tenggara, and 29.6% in Papua, while Central Java ranked eighth lowest nationally with a prevalence of 17.1% (Kemenkes RI, 2025). Temanggung Regency also continued to record developmental delays among children under five, with a prevalence of 2.1% in 2024, indicating the continuing need to strengthen promotive interventions, developmental stimulation, monitoring, and early detection (Kemenkes RI, 2025).

The Indonesian government has implemented the Stimulation, Detection, and Early Intervention for Child Growth and Development program, Stimulasi, Deteksi, dan Intervensi Dini Tumbuh Kembang or SDIDTK, to improve developmental monitoring and identify developmental deviations at the earliest possible stage. The program is primarily integrated into primary health care services through community health centers, Puskesmas, and integrated health posts, Posyandu, where age-appropriate stimulation, periodic developmental screening, and follow-up for suspected developmental problems are routinely provided (Kemenkes RI, 2023; Kim, 2022). The Maternal and Child Health Book, Buku Kesehatan Ibu dan Anak or KIA Book, constitutes an important component of these services because it functions both as a health record and as an educational resource for parents regarding child health, growth, development, and stimulation from birth through the preschool period (Kemenkes RI, 2024; Nishimura et al., 2023). The Primary Health Care Integration policy further strengthens a promotive and preventive life-course approach, enabling child growth and development monitoring to be delivered continuously and closer to families and communities (Kemenkes RI, 2023).

The KIA Book is particularly relevant as a health education medium because it presents structured information in relatively simple language, includes illustrative materials, and is generally owned by mothers from the antenatal period, allowing the information to be reviewed independently at home (Kemenkes RI, 2024; Carandang et al., 2022). Evidence concerning the Maternal and Child Health Handbook has demonstrated its potential to improve parental understanding, communication with health professionals, developmental monitoring, and several maternal and child health outcomes (Hirota et al., 2022; Nishimura et al., 2023). In Selopampang Village, however, although most mothers already possess a KIA Book, its use remains largely limited to record-keeping or bringing the book to health facility visits, while information related to developmental stimulation has not been optimally utilized. This discrepancy between ownership and effective use is reflected in the limited habit of reading the book and the persistence of inadequate maternal understanding of age-appropriate stimulation, indicating the need for health education to optimize the educational function of the KIA Book.

A preliminary assessment based on Family Development for Toddlers, Bina Keluarga Balita or BKB, activities in Selopampang Village during August, September, and October identified 116 children under five as targets for developmental monitoring, although 10 children did not participate because they were travelling or unwell. Developmental screening using the Pre-Screening Developmental Questionnaire, Kuesioner Pra Skrining Perkembangan or KPSP, assessed four developmental domains, namely gross motor, fine motor, speech and language, and socialization and independence, which are essential for identifying possible developmental deviations at an early stage (Kim, 2022; Hirota et al., 2022). The screening results showed that 30 children obtained scores of 9–10 and were classified as developmentally appropriate, whereas 25 children scored 7–8 and were categorized as doubtful, indicating the need for further monitoring and developmental stimulation. A further 15 children obtained scores of ≤ 6 and were classified as having suspected developmental deviations, suggesting the need for referral and further developmental assessment by qualified health professionals.

Preliminary interviews with 20 mothers in Selopampang Village further demonstrated substantial gaps in maternal knowledge, as 16 mothers reported that they did not understand age-appropriate child development and therefore had limited ability to recognize developmental delays at an early stage. Seventeen of the 20 mothers also reported that they did not know how to provide developmentally appropriate stimulation across motor, language, and social domains. Inadequate knowledge of developmental milestones and stimulation may reduce parents' ability to recognize developmental delays in a timely manner and may restrict children's opportunities to receive appropriate stimulation and intervention during sensitive developmental periods (Alghamdi et al., 2023; Orlando et al., 2023). These findings indicate that the local problem is not limited to the presence of children requiring additional developmental monitoring but also includes a maternal knowledge gap that should be addressed through targeted and practically applicable health education.

Empirical evidence indicates that maternal and child health handbooks, when used as home-based health records, function not only as documentation tools but also as resources that can improve maternal knowledge, communication, engagement, and selected maternal and child health outcomes (Carandang et al., 2022; Nishimura et al., 2023). The use of a Maternal and Child Health Handbook

for developmental surveillance may also support parents and health professionals in systematically monitoring the attainment of developmental milestones over time (Hirota et al., 2022). Parenting and educational interventions that provide practical information on stimulation, play, communication, and responsive caregiving have been shown to improve parenting practices and early childhood developmental outcomes (Bemanalizadeh et al., 2022; Onyango et al., 2023; Sargsyan et al., 2024). These findings demonstrate the potential value of education delivered through the KIA Book; however, the conditions identified in Selopampang Village suggest that possession of the book alone does not necessarily ensure adequate maternal understanding of developmental stimulation, and its effectiveness as an educational intervention therefore requires empirical evaluation.

The combination of persistent developmental monitoring needs, the identification of children with doubtful and deviant KPSP results, and the limited maternal understanding identified during the preliminary assessment indicates a clear need for a structured health education intervention in Selopampang Village. Health education using the KIA Book is considered appropriate because it utilizes an official resource that is already available within families and allows information regarding developmental stages and age-appropriate stimulation to be reviewed both during educational sessions and subsequently at home (Kemenkes RI, 2024; Carandang et al., 2022). This study therefore aims to analyze the effect of health education through the KIA Book on mothers' knowledge of developmental stimulation in Selopampang Village, Temanggung Regency. The findings are expected to provide empirical evidence regarding the effectiveness of the KIA Book as a health education medium and to support the strengthening of parental education, BKB activities, Posyandu services, and child growth and development monitoring within primary health care settings.

RESEARCH METHODS

This study employed a quantitative pre-experimental design using a one-group pretest–posttest approach to examine the effect of health education delivered through the Maternal and Child Health Book, *Buku Kesehatan Ibu dan Anak* or KIA Book, on mothers' knowledge of developmental stimulation in Selopampang Village, Temanggung Regency. The study involved 54 mothers who had children aged 12–59 months and were selected using purposive sampling based on their suitability with the study population. Maternal knowledge of developmental stimulation was measured before and after the health education intervention using a structured knowledge questionnaire. The pretest was administered prior to the educational session to determine baseline knowledge, while the posttest was conducted after the intervention to assess changes in mothers' understanding following health education through the KIA Book.

The collected data were analyzed by comparing pre-intervention and post-intervention knowledge scores. Because the analysis involved two paired measurements from the same respondents, the Wilcoxon Signed-Rank Test was applied to determine whether there was a statistically significant difference in mothers' knowledge before and after the intervention. Statistical significance was interpreted at a p -value of <0.05 . The study received ethical approval from the Health Research Ethics Committee, *Komisi Etik Penelitian Kesehatan* or KEPK, Faculty of Pharmacy, Universitas Islam Sultan Agung, under Ethical Clearance No. 131/KEPK-RSISA/VI/2026, issued on June 8, 2026, ensuring that the study procedures complied with applicable ethical standards for health research.

RESULTS AND DISCUSSION

Characteristics of Respondents

The study involved 54 mothers of children aged 12–59 months residing in Selopampang Village, Temanggung Regency. Respondent characteristics were examined according to maternal age, educational attainment, occupation, and number of children because these variables provide important contextual information for interpreting maternal knowledge and responsiveness to health education. The distribution shows that the study population was predominantly composed of mothers in the reproductive-age group, with secondary education, who were not formally employed outside the household, and who had previous childcare experience. These characteristics should not be interpreted as direct determinants of the intervention effect, but rather as contextual factors that may shape access to information, familiarity with maternal and child health services, and the capacity to process developmental information (Glanz et al., 2020; Haryanti et al., 2024).

Maternal age was dominated by respondents aged 20–35 years, comprising 38 mothers or 70.4% of the sample, whereas 16 mothers or 29.6% were older than 35 years. This distribution indicates that most participants were within an age range commonly associated with active child-rearing responsibilities and frequent interaction with maternal and child health services. Age may influence the way health information is received and interpreted through differences in previous experience, information exposure, and decision-making patterns, although age alone cannot be assumed to determine maternal knowledge. Health education therefore needs to remain accessible across age groups rather than relying on chronological age as an indicator of educational readiness (Glanz et al., 2020; Howlett et al., 2020).

Educational attainment was heterogeneous, although upper secondary education constituted the largest category. A total of 23 respondents (42.6%) had completed senior high school, vocational high school, or Islamic senior high school, while 12 respondents (22.2%) had completed junior high school and 9 respondents (16.7%) had completed elementary education. Seven respondents (13.0%) had diploma-level education and 3 respondents (5.6%) held a bachelor's degree. Educational background is relevant because maternal health knowledge depends partly on the ability to access, understand, evaluate, and apply health-related information, including information concerning child development and caregiving practices (Haryanti et al., 2024; Alghamdi et al., 2023).

The occupational profile showed that 37 respondents (68.5%) were housewives, making this the largest occupational group in the study. The remaining participants consisted of 9 civil servants, teachers, midwives, or nurses (16.7%), 5 private-sector employees (9.3%), 2 traders (3.7%), and 1 laborer or casual worker (1.9%). Occupational status may influence the time available for childcare activities, participation in community health services, and exposure to health information, although the relationship is not necessarily linear. Mothers who spend more time at home may have greater opportunities to interact with their children, whereas formally employed mothers may have access to broader informational networks; consequently, occupation should be treated as a contextual rather than deterministic factor (Green & Kreuter, 2020; Orlando et al., 2023).

The distribution according to number of children showed that 21 respondents (38.9%) had two children, 17 respondents (31.5%) had one child, and 16 respondents (29.6%) had three or more children. The relatively balanced distribution across parity-related categories indicates variation in previous parenting experience among respondents. Mothers with more than one child may have accumulated practical experience from previous childcare and contact with maternal and child health services, but previous experience does not necessarily ensure correct knowledge of developmental milestones or age-appropriate stimulation. Evidence indicates that gaps in parental knowledge regarding child development can persist even among caregivers with parenting experience, reinforcing the importance of structured educational resources (Alghamdi et al., 2023; Carandang et al., 2022).

Table 1. Distribution of Respondent Characteristics in Selopampang Village, Temanggung Regency, May 1–June 9, 2026 (n = 54)

Respondent Characteristics	Frequency	Percentage (%)
Maternal age		
20–35 years	38	70.4
>35 years	16	29.6
Maternal educational attainment		
Bachelor's degree (S1)	3	5.6
Diploma (D1/D2/D3)	7	13.0
Senior high school / vocational high school / MA	23	42.6
Junior high school / MTs	12	22.2
Elementary school / MI	9	16.7
Maternal occupation		
Housewife	37	68.5
Laborer / casual worker	1	1.9
Trader	2	3.7
Private-sector employee	5	9.3
Civil servant / teacher / midwife / nurse	9	16.7

Number of children		
1 child	17	31.5
2 children	21	38.9
≥3 children	16	29.6
Total	54	100

The respondent profile provides an important basis for interpreting the subsequent pretest and posttest findings because health education occurs within a social and experiential context. The predominance of mothers aged 20–35 years and the relatively large proportion with secondary education suggest that most participants were likely accustomed to interacting with written and verbal health information. Nevertheless, the presence of respondents with elementary and junior secondary education demonstrates that the educational intervention needed to remain sufficiently clear and practical for participants with varying literacy backgrounds. The KIA Book is particularly relevant in this setting because it combines written information with structured guidance and illustrations that can facilitate repeated learning at home (Kemenkes RI, 2024; Carandang et al., 2022).

The educational distribution also has implications for the interpretation of knowledge acquisition. Maternal knowledge is not merely the product of formal education but may develop through repeated contact with healthcare professionals, personal experience, community health programs, and exposure to structured educational materials. Haryanti et al. (2024) demonstrated that maternal knowledge concerning child nurturing is associated with multiple individual and contextual factors rather than a single demographic characteristic. Similar evidence from studies of maternal and child health handbooks suggests that structured home-based information can contribute to maternal understanding across diverse populations when the material is actively used rather than simply possessed (Nishimura et al., 2023; Tobe et al., 2022).

The predominance of housewives is also relevant to the implementation context of the intervention because community-based maternal and child health activities frequently require mothers to attend scheduled services and subsequently apply health information in the home environment. The available time for direct interaction with children may create opportunities for developmental stimulation, but opportunity alone does not guarantee that stimulation is developmentally appropriate. Studies of parenting and early childhood development consistently indicate that the quality and responsiveness of caregiver–child interactions are more important than mere physical proximity between caregiver and child (Bemanalizadeh et al., 2022; Onyango et al., 2023). Health education is therefore required to convert caregiving opportunities into informed practices that correspond to children’s developmental stages.

Previous parenting experience, reflected in the proportion of respondents with two or more children, may similarly facilitate familiarity with routine child health services but should not be considered equivalent to accurate developmental knowledge. Parents may acquire practices through experience, family traditions, or informal advice, yet some of these practices may not correspond to current recommendations for developmental stimulation. Research examining educational resources for infant development has shown that caregivers continue to require reliable, accessible, and professionally supported information even when they already have practical childcare experience (Orlando et al., 2023). The KIA Book can therefore function as a standardized reference that helps align experiential knowledge with recommended child development practices (Kemenkes RI, 2024; Hirota et al., 2022).

The respondent characteristics further indicate that the intervention was conducted within a population with substantial variation in educational and occupational backgrounds, although certain categories were dominant. Such heterogeneity is relevant because a health education intervention should be understandable and applicable across different levels of formal education and everyday social circumstances. Evidence regarding the Maternal and Child Health Handbook indicates that its usefulness is strengthened when caregivers are encouraged to actively read, discuss, and use the material rather than treating it solely as a clinical record (Carandang et al., 2022; Nishimura et al., 2023). This consideration is particularly pertinent to Selopampang Village, where the preliminary assessment identified a gap between ownership of the KIA Book and its effective use as a source of developmental stimulation information.

The demographic results should therefore be interpreted as the background against which changes in maternal knowledge occurred rather than as independent evidence of educational effectiveness. Most respondents were aged 20–35 years, 42.6% had completed senior secondary education, 68.5% were housewives, and 38.9% had two children, but substantial variation remained within each characteristic. This profile supports the use of an educational strategy that is standardized but sufficiently practical to accommodate differences in literacy, parenting experience, and daily activities. The subsequent analysis of maternal knowledge before and after health education is consequently necessary to determine whether the KIA Book intervention produced measurable improvement beyond the respondents' pre-existing demographic and experiential characteristics (Hapsari & Tahun, 2022; Karwati et al., 2021; Maulida et al., 2025).

Mothers' Knowledge of Developmental Stimulation Before and After Health Education Through the KIA Book

The pre-intervention assessment showed that most respondents already had a relatively high level of knowledge regarding developmental stimulation. Of the 54 mothers, 42 respondents (77.8%) were classified as having good knowledge, 8 respondents (14.8%) had moderate knowledge, and 4 respondents (7.4%) had poor knowledge before receiving health education through the KIA Book. This finding indicates that a considerable proportion of mothers had previously been exposed to information related to child growth and development, either through routine maternal and child health services, previous parenting experience, or informal and formal educational sources. Previous studies have similarly shown that maternal knowledge may already be established before a structured intervention, although important gaps often remain in the understanding of developmental milestones and age-appropriate stimulation (Alghamdi et al., 2023; Orlando et al., 2023).

The relatively high baseline level of knowledge should not be interpreted as evidence that all mothers possessed adequate and comprehensive understanding of developmental stimulation. The presence of 8 mothers in the moderate category and 4 mothers in the poor category demonstrates that knowledge remained uneven across the study population. Such variation is clinically relevant because incomplete understanding of developmental milestones may delay parental recognition of potential developmental problems and reduce the timeliness of stimulation or consultation with health professionals (Alghamdi et al., 2023; Kim, 2022). The preliminary findings in Selopampang Village, where many mothers reported difficulty identifying developmental stages and appropriate forms of stimulation, further support the need for structured educational reinforcement despite the relatively favorable baseline distribution.

Knowledge of developmental stimulation is influenced by several interacting factors, including formal education, parenting experience, access to health information, exposure to healthcare professionals, and opportunities to participate in community-based maternal and child health programs. The KIA Book provides a standardized source of information that can reduce discrepancies in the type and quality of developmental information received by mothers (Kemenkes RI, 2024). Home-based maternal and child health records have been reported to strengthen mothers' access to health information, communication with providers, and engagement with maternal and child health services when actively used as educational tools (Carandang et al., 2022). Consequently, health education through the KIA Book may be particularly important for mothers whose previous knowledge was derived from fragmented or inconsistent sources.

After the health education intervention, a clear descriptive change was observed in the distribution of maternal knowledge. All 54 respondents (100.0%) were classified as having good knowledge, while no respondents remained in either the moderate or poor categories. This shift indicates that the educational session was followed by a uniform improvement in knowledge classification across the study population. The result is consistent with the educational function of the KIA Book, which provides mothers with structured information on child health, developmental stages, and stimulation activities that can be reviewed repeatedly after the educational session (Kemenkes RI, 2024; Maulida et al., 2025).

Table 2. Distribution of Mothers' Knowledge of Developmental Stimulation Before and After Health Education Through the KIA Book in Selopampang Village, Temanggung Regency, May 1–June 9, 2026 (n = 54)

Knowledge Category	Pretest, n	Pretest (%)	Posttest, n	Posttest (%)
Poor (≤ 16)	4	7.4	0	0.0
Moderate (17–22)	8	14.8	0	0.0
Good (23–30)	42	77.8	54	100.0
Total	54	100	54	100

The transition from 77.8% to 100.0% in the good-knowledge category suggests that the intervention strengthened understanding even among mothers who had already demonstrated relatively favorable baseline knowledge. Health education may improve knowledge not only by introducing new information but also by correcting misconceptions, organizing previously fragmented knowledge, and reinforcing information that has been encountered through other sources. Hapsari and Tahun (2022) reported that the utilization of the KIA Book was associated with improved maternal knowledge regarding early detection and stimulation of child growth and development. Karwati et al. (2021) likewise found that the use of the KIA Book combined with counseling improved maternal knowledge about developmental stimulation in infants and young children.

The educational characteristics of the KIA Book provide a plausible explanation for the observed improvement. Information is presented in a structured format, supported by illustrations and practical guidance that can facilitate comprehension among mothers with different educational backgrounds (Kemenkes RI, 2024). Evidence from research on maternal and child health handbooks indicates that such materials are most beneficial when they are actively explained and discussed rather than merely distributed or used as administrative records (Carandang et al., 2022; Nishimura et al., 2023). In the present study, the KIA Book was used as part of a structured health education intervention, allowing mothers to connect written information with direct explanations and their own childcare experiences.

The improvement in maternal knowledge is also consistent with broader evidence concerning parenting interventions for early childhood development. Bemanalizadeh et al. (2022) demonstrated that structured parenting guidance based on developmental care principles can improve caregiving-related outcomes and support early child development. Sargsyan et al. (2024) similarly reported that structured parenting programs can positively influence caregiving practices and early developmental outcomes among young children. These findings suggest that the effectiveness of educational interventions depends not merely on providing information but also on translating developmental principles into practical actions that parents can understand and apply in the home environment.

Maternal understanding of developmental stimulation has particular importance because stimulation is most effective when it is responsive, developmentally appropriate, and integrated into everyday interactions between caregivers and children. Evidence from Kenya and Zambia has shown that maternal stimulation is closely related to early childhood developmental outcomes, emphasizing the role of caregiver behavior in shaping developmental opportunities (Onyango et al., 2023). Parenting interventions have also been shown to improve early child development by strengthening caregiver knowledge and responsive practices during the first years of life (Jeong et al., 2021). The post-intervention findings in Selopampang therefore have practical relevance because improved maternal knowledge may constitute an important prerequisite for more appropriate stimulation practices at home.

The results also support the role of the KIA Book as more than a documentation instrument. Hirota et al. (2022) demonstrated that maternal and child health handbooks can contribute to developmental surveillance by providing longitudinal information on developmental milestone attainment. Tobe et al. (2022) further showed that maternal and child health handbooks can strengthen continuity of maternal and child care when integrated into routine health service delivery. Within the context of Selopampang Village, using the KIA Book during health education may therefore strengthen both maternal understanding and the continuity of developmental monitoring between households, Posyandu activities, and primary healthcare providers.

The descriptive improvement observed in this study is particularly meaningful when considered alongside the preliminary findings in Selopampang Village. Before the intervention, 16 of 20 mothers interviewed during the preliminary assessment did not understand age-appropriate child development, while 17 did not know how to provide appropriate motor, language, and social stimulation. The post-intervention finding that all 54 study participants reached the good-knowledge category suggests that structured education through an already available household resource can address important informational gaps. Such an approach is consistent with the broader public health principle that educational interventions should use accessible and culturally embedded resources to improve health literacy and strengthen caregiver participation in child development monitoring (Glanz et al., 2020; Green & Kreuter, 2020).

The overall pattern therefore indicates a substantial descriptive improvement in maternal knowledge following the intervention, from 42 respondents (77.8%) with good knowledge at baseline to 54 respondents (100.0%) after health education. No mother remained in the poor or moderate knowledge categories following the intervention, indicating a more homogeneous level of understanding after exposure to the educational material. These findings support previous evidence that maternal and child health handbooks and structured parenting education can improve mothers' access to, comprehension of, and use of child development information (Nishimura et al., 2023; Maulida et al., 2025). The descriptive change, however, must be interpreted together with the inferential analysis of paired pretest and posttest scores, which is presented in the following subsection to determine whether the observed improvement was statistically significant.

Effect of Health Education Through the KIA Book on Mothers' Knowledge of Developmental Stimulation

The inferential analysis demonstrated a statistically significant difference in mothers' knowledge of developmental stimulation before and after receiving health education through the KIA Book. The Wilcoxon Signed-Rank Test yielded a Z value of -6.273 with an output p -value of 0.000, which is conventionally reported as $p < 0.001$. The result indicates that the post-intervention knowledge scores differed significantly from the corresponding pre-intervention scores among the 54 respondents. Because the analysis compared paired observations from the same participants, the Wilcoxon Signed-Rank Test was appropriate for examining changes between the two measurement occasions when the assumptions for a parametric paired test were not applied (Cahyono, 2018; Gahayu, 2019).

The direction of the ranks provides additional evidence regarding the pattern of change. No respondent experienced a decrease in knowledge score after the intervention (*negative ranks* = 0), while 51 respondents showed higher posttest than pretest scores (*positive ranks* = 51), and 3 respondents had unchanged scores (*ties* = 3). Thus, 94.4% of participants demonstrated an increase in their individual knowledge scores, whereas 5.6% remained unchanged and none experienced deterioration. This pattern strengthens the interpretation that the observed statistical difference was driven predominantly by improvement rather than by inconsistent bidirectional score changes.

The statistical result is consistent with the descriptive findings presented previously, in which the proportion of mothers classified as having good knowledge increased from 77.8% before the intervention to 100.0% after the intervention. The convergence between the categorical distribution and the paired-rank analysis indicates that the intervention was associated with both an upward shift in individual scores and a complete transition of the sample into the good-knowledge category. Such consistency is important because statistical significance should be interpreted together with the direction and distribution of observed changes rather than solely on the basis of the p -value (Bzovsky et al., 2022). In this study, the absence of negative ranks and the dominance of positive ranks provide clear descriptive support for the inferential finding.

The KIA Book may facilitate this improvement because it functions simultaneously as a health record and as a structured educational resource that mothers can repeatedly consult outside formal healthcare encounters. The book contains information related to maternal health, newborn care, immunization, growth monitoring, developmental milestones, and age-appropriate stimulation, thereby providing continuity between information delivered by health professionals and caregiving practices at home (Kemenkes RI, 2024). Evidence regarding maternal and child health handbooks suggests that their benefit is greater when the book is actively explained, discussed, and integrated

into maternal education rather than being used only as an administrative record (Carandang et al., 2022; Nishimura et al., 2023). The intervention in Selopampang Village therefore addressed not only access to the KIA Book but also the need to convert its contents into understandable and practically applicable developmental information.

Table 3. Comparison of Mothers' Knowledge of Developmental Stimulation Before and After Health Education Through the KIA Book in Selopampang Village, Temanggung Regency (n = 54)

Variable	Negative Ranks	Positive Ranks	Ties	p-value	Z
Mothers' knowledge of developmental stimulation before and after health education	0	51	3	0.000*	-6.273

Note: Statistical output of 0.000 is reported conventionally as $p < 0.001$.

The findings are consistent with previous studies examining the educational function of the KIA Book and related maternal and child health handbooks. Hapsari and Tahun (2022) reported that utilization of the KIA Book contributed to mothers' knowledge concerning early detection and developmental stimulation, while Karwati et al. (2021) found that the combined use of the KIA Book and counseling improved maternal knowledge regarding stimulation for infants and young children. Maulida et al. (2025) similarly emphasized the role of the KIA Book in supporting mothers in providing developmental stimulation. These studies support the present finding that the book can become more effective when used within an active educational process rather than simply being owned by the mother.

The result also corresponds with international evidence on home-based maternal and child health records. Tobe et al. (2022) demonstrated that a maternal and child health handbook could strengthen continuity of maternal and child care when incorporated into routine community-based services, while Nishimura et al. (2023) reported broader beneficial effects of such handbooks in their systematic review and meta-analysis. Hirota et al. (2022) further showed that maternal and child health handbooks can support developmental surveillance by documenting milestone attainment trajectories over time. These findings are particularly relevant to developmental stimulation because mothers require both knowledge of expected developmental milestones and practical guidance on activities that can support those milestones.

The effectiveness of the intervention can also be understood within the broader evidence on parenting education and responsive caregiving. Bemanalizadeh et al. (2022) showed that a structured parenting intervention based on the *Care for Child Development* guideline improved caregiving-related outcomes and supported early child development, while Sargsyan et al. (2024) found beneficial effects of a playful parenting program on early childhood development and care outcomes. Maternal stimulation itself has been associated with developmental outcomes across multiple early childhood domains, as demonstrated by Onyango et al. (2023). Parenting interventions therefore function not merely by increasing factual knowledge but by providing parents with practical frameworks for interacting, playing, communicating, and responding appropriately to children's developmental needs (Jeong et al., 2021).

The findings are also important when considered against the preliminary conditions identified in Selopampang Village. Among the 20 mothers interviewed before the study, 16 reported inadequate understanding of age-appropriate child development and 17 reported that they did not know how to provide suitable motor, language, and social stimulation. Limited knowledge of developmental milestones may delay recognition of developmental problems and reduce opportunities for timely intervention, a concern also identified by Alghamdi et al. (2023). In addition, the preliminary KPSP screening identified 25 children in the doubtful category and 15 children in the deviation category, further demonstrating the local relevance of strengthening maternal knowledge and developmental surveillance.

From a health education perspective, the observed improvement is compatible with the principle that learning interventions should provide information that is understandable, relevant to daily experience, and reinforced through accessible educational media. Health behavior frameworks

emphasize that knowledge is an important predisposing component for behavioral change, although knowledge alone does not guarantee subsequent behavioral implementation (Glanz et al., 2020; Green & Kreuter, 2020). The KIA Book offers an advantage because mothers can revisit the material after the education session, potentially reinforcing memory and facilitating discussion with cadres or healthcare professionals during Posyandu visits. Educational materials that can be repeatedly accessed may therefore extend the learning process beyond a single face-to-face session (Howlett et al., 2020).

The result should nevertheless be interpreted within the methodological characteristics of the study. A one-group pretest–posttest design is useful for detecting within-participant change after an intervention, but the absence of a control group limits the extent to which the observed improvement can be attributed exclusively to the intervention without considering potential testing, exposure, or other contextual effects (Arikunto, 2020, 2025; Kurniullah et al., 2021). Operationally, maternal knowledge was the measured outcome and health education through the KIA Book represented the intervention variable, making explicit definition and measurement of these variables essential for consistent interpretation (Andrade, 2021). The present findings therefore provide strong evidence of a statistically significant within-group improvement but should not be interpreted as establishing the same level of causal certainty as a randomized controlled trial.

Health education through the KIA Book was associated with a significant increase in mothers' knowledge of developmental stimulation in Selopampang Village, Temanggung Regency. The Wilcoxon Signed-Rank Test showed $Z = -6.273$ and $p < 0.001$, with 51 respondents demonstrating increased scores, 3 showing unchanged scores, and none experiencing a decrease. These findings indicate that an official maternal and child health resource already available within households can be strengthened as an educational medium when its developmental content is actively explained and linked to everyday caregiving practices. The intervention therefore has practical potential for integration into Posyandu, BKB, and primary healthcare education activities aimed at strengthening parental knowledge, developmental stimulation, and early recognition of developmental problems (Kemenkes RI, 2023, 2024; Kim, 2022).

CONCLUSION

This study demonstrates that health education delivered through the Maternal and Child Health Book (KIA Book) was associated with a substantial improvement in mothers' knowledge of developmental stimulation in Selopampang Village, Temanggung Regency. Before the intervention, 42 respondents (77.8%) had good knowledge, 8 respondents (14.8%) had moderate knowledge, and 4 respondents (7.4%) had poor knowledge, whereas after the intervention all 54 respondents (100.0%) were classified as having good knowledge. The Wilcoxon Signed-Rank Test showed 51 positive ranks, 3 ties, and no negative ranks, with a statistically significant difference between pretest and posttest knowledge scores ($Z = -6.273$; $p < 0.001$). These findings indicate that structured health education using the KIA Book can effectively strengthen mothers' understanding of age-appropriate developmental stimulation.

The KIA Book therefore has potential to function not only as a maternal and child health record but also as a practical educational resource for strengthening parental knowledge of child development. Its systematic use during Posyandu, Bina Keluarga Balita (BKB), and primary health care activities may help mothers understand developmental milestones, provide appropriate stimulation at home, and recognize possible developmental problems at an earlier stage. Health professionals and community health cadres should actively integrate explanation and discussion of the KIA Book into routine educational activities rather than limiting its use to health documentation. Further studies using controlled designs, larger samples, longer follow-up periods, and behavioral outcomes are recommended to determine whether improvements in maternal knowledge are sustained and translated into consistent developmental stimulation practices.

REFERENCES

- Alghamdi, H. M., Altirkistani, B. A., Baatya, R. A., Marghalani, Y. O., & Alshaikh, N. M. (2023). Bridging the gap: Parents' knowledge of childhood developmental milestones and the early identification of children with developmental delay. *Cureus*. <https://doi.org/10.7759/cureus.48232a>

- Andrade, C. (2021). A student's guide to the classification and operationalization of variables in the conceptualization and design of a clinical study: Part 1. *Indian Journal of Psychological Medicine*, 43(2), 177–179. <https://doi.org/10.1177/0253717621994334>
- Arikunto, S. (2020). *Prosedur penelitian: Suatu pendekatan praktik*. Rineka Cipta.
- Arikunto, S. (2025). *Prosedur penelitian: Suatu pendekatan praktik*. Rineka Cipta.
- Bemanalizadeh, M., Badihian, N., Khoshhali, M., Badihian, S., Hosseini, N., Purpirali, M., Abadian, M., Yaghini, O., Daniali, S. S., & Kelishadi, R. (2022). Effect of parenting intervention through “Care for Child Development Guideline” on early child development and behaviors: A randomized controlled trial. *BMC Pediatrics*, 22, 690. <https://doi.org/10.1186/s12887-022-03752-x>
- Bzovsky, S., Phillips, M. R., Guymer, R. H., Wykoff, C. C., Thabane, L., Bhandari, M., Chaudhary, V., Sivaprasad, S., Kaiser, P., Sarraf, D., Bakri, S. J., Garg, S. J., Singh, R. P., Holz, F. G., & Wong, T. Y. (2022). The clinician's guide to interpreting a regression analysis. *Eye*, 36(9), 1715–1717. <https://doi.org/10.1038/s41433-022-01949-z>
- Cahyono, T. (2018). *Statistika terapan & indikator kesehatan*. Deepublish.
- Carandang, R. R., Sakamoto, J. L., Kunieda, M. K., Shibamura, A., Yarotskaya, E., Basargina, M., & Jimba, M. (2022). Effects of the maternal and child health handbook and other home-based records on mothers' non-health outcomes: A systematic review. *BMJ Open*, 12(6), e058155. <https://doi.org/10.1136/bmjopen-2021-058155>
- Cheung, W. C., Meadan, H., & Shen, S. (2021). Motor, cognitive, and socioemotional skills among children with disabilities over time. *Journal of Special Education*, 55(2), 79–89. <https://doi.org/10.1177/0022466920940800>
- Draper, C. E., Yousafzai, A. K., McCoy, D. C., Cuartas, J., Obradović, J., Bhupal, S., Fisher, J., Jeong, J., Klingberg, S., Milner, K., Pisani, L., Roy, A., Seiden, J., Sudfeld, C. R., Wrottesley, S. V., Fink, G., Nores, M., Tremblay, M. S., & Okely, A. D. (2024). The next 1000 days: Building on early investments for the health and development of young children. *The Lancet*, 404(10467), 2094–2116. [https://doi.org/10.1016/S0140-6736\(24\)01389-8](https://doi.org/10.1016/S0140-6736(24)01389-8)
- Gahayu, S. A. (2019). *Metodologi penelitian kesehatan masyarakat*. Deepublish.
- Glanz, K., Rimer, B., & Viswanath, K. (2020). *Health behavior: Theory, research, and practice* (6th ed.). Jossey-Bass.
- Green, L., & Kreuter, M. (2020). *Health program planning: An educational and ecological approach* (5th ed.). McGraw-Hill.
- Hapsari, H. P., & Tahun, O. D. (2022). Efektifitas pemanfaatan buku KIA terhadap pengetahuan deteksi dini stimulasi tumbuh kembang balita di era pandemi COVID-19 di Puskesmas Cakung. *Syntax Literate: Jurnal Ilmiah Indonesia*, 7(5), 6164–6171.
- Haryanti, F., Hartini, S., Akhmadi, Andarwati, F., Risnawati, H., Pratiwi, A. N., Kusumawati, A. S., Cahyani, R. D., & Lusmilasari, L. (2024). Maternal knowledge on nutritional-focused nurturing care and associated factors among women with stunted children aged 6–23 months in Yogyakarta, Indonesia: A cross-sectional study. *Belitung Nursing Journal*, 10(4), 472–480. <https://doi.org/10.33546/bnj.3481>
- Hirota, T., Nishimura, T., Mikami, M., Saito, M., & Nakamura, K. (2022). The role of the maternal and child health handbook in developmental surveillance: The exploration of milestone attainment trajectories. *Frontiers in Psychiatry*, 13, 902158. <https://doi.org/10.3389/fpsyt.2022.902158>
- Howlett, B., Rogo, E., & Shelton, T. G. (2020). *Evidence-based practice for health professionals: An interprofessional approach*. Jones & Bartlett Learning.
- Jeong, J., Franchett, E. E., Ramos de Oliveira, C. V., Rehmani, K., & Yousafzai, A. K. (2021). Parenting interventions to promote early child development in the first three years of life: A global systematic review and meta-analysis. *PLoS Medicine*, 18(5). <https://doi.org/10.1371/journal.pmed.1003602>
- Julaecha, Galuh, A. W., & Ariasih, I. N. (2019). Pengetahuan ibu balita terhadap pemanfaatan buku KIA. *Jurnal Abdimas Kesehatan (JAK)*, 1(2), 143–147.
- Kaelber, D. C., Russell Localio, A., Ross, M., Leon, J. B., Pace, W. D., Wasserman, R. C., Grundmeier, R. W., Steffes, J., & Fiks, A. G. (2020). Persistent hypertension in children and

- adolescents: A 6-year cohort study. *Pediatrics*, 146(4). <https://doi.org/10.1542/peds.2019-3318>
- Karwati, Maryati, S., & Yanti, D. (2021). Pengaruh penggunaan buku KIA dan konseling terhadap pengetahuan ibu tentang stimulasi perkembangan bayi dan balita. *2-TRIK: Tunas-Tunas Riset Kesehatan*, 11(3), 138–142.
- Kemenkes RI. (2023). *Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/MENKES/2015/2023 tentang petunjuk teknis integrasi pelayanan kesehatan primer*. Kementerian Kesehatan Republik Indonesia.
- Kemenkes RI. (2024). *Buku kesehatan ibu dan anak (KIA)*. Kementerian Kesehatan RI.
- Kemenkes RI. (2025). *Survei status gizi Indonesia tahun 2024*. Kementerian Kesehatan Republik Indonesia.
- Kim, S. (2022). Worldwide national intervention of developmental screening programs in infant and early childhood. *Clinical and Experimental Pediatrics*, 65(1), 10–20. <https://doi.org/10.3345/cep.2021.00248>
- Kurniullah, A. Z., Revida, E., Hasan, M., Tjiptadi, D. D., Saragih, H., Rahayu, P. P., Prijanto, J. H., Krisnawati, A., Sugiarto, M., Malinda, O., Anwarudin, O., Gandasari, D., & Hidayatulloh, A. N. (2021). *Metode penelitian sosial* (pp. 1–180).
- Lulianthy, E., Harvika, I., Palge, G., Wahyuni, I. S., Indriani, F., Azzahra, D. I., Riyani, D., & Ningrum, E. F. (2021). Pemantapan penggunaan buku KIA untuk pemantauan dan stimulasi tumbuh kembang anak selama pandemi COVID-19. *Jurnal Pengabdian*, 4(1), 27. <https://doi.org/10.26418/jplp2km.v4i1.43353>
- Maulida, I., Purwita, E., & Yuniwati, C. (2025). Utilization of maternal and child health (KIA) books in providing stimulation for child development. *Journal of Midwifery and Community Health (JMCH)*, 4(1), 14–21.
- Mboi, N., Syailendrawati, R., Ostroff, S. M., Elyazar, I. R. F., Glenn, S. D., Rachmawati, T., Nugraheni, W. P., Ali, P. B., Trisnantoro, L., Adnani, Q. E. S., Agustiya, R. I., Laksono, A. D., Aji, B., Amalia, L., Ansariadi, A., Antriyandarti, E., Ardani, I., Ariningrum, R., Aryastami, N. K., ... Mokdad, A. H. (2022). The state of health in Indonesia's provinces, 1990–2019: A systematic analysis for the Global Burden of Disease Study 2019. *The Lancet Global Health*, 10(11), e1632–e1645. [https://doi.org/10.1016/S2214-109X\(22\)00371-0](https://doi.org/10.1016/S2214-109X(22)00371-0)
- Nishimura, E., Rahman, M. O., Ota, E., Toyama, N., & Nakamura, Y. (2023). Role of maternal and child health handbook on improving maternal, newborn, and child health outcomes: A systematic review and meta-analysis. *Children*, 10(3), 435. <https://doi.org/10.3390/children10030435>
- Onyango, S., Kitsao-Wekulo, P., Langat, N., Okelo, K., Murdock, D. E., Utzinger, J., & Fink, G. (2023). Maternal stimulation and early child development in sub-Saharan Africa: Evidence from Kenya and Zambia. *BMC Public Health*, 23, 2418. <https://doi.org/10.1186/s12889-023-17235-w>
- Orlando, J. M., Cunha, A. B., Alghamdi, Z. S., & Lobo, M. A. (2023). How do parents and early intervention professionals utilize educational resources about infant development and play? *Early Human Development*, 180, 105763. <https://doi.org/10.1016/j.earlhumdev.2023.105763>
- Sargsyan, V., Walea, H., Mahat, B., Tamale, R., Chaudhary, R., Birungi, J., Marasini, S., Thapa, N., Kuikel, B. S., Karmacharya, B., & Rasheed, M. A. (2024). Effect of a playful parenting programme on early childhood development and care outcomes of young children in vulnerable communities: Findings from a quasi-experimental study. *BMC Pediatrics*, 24, 767. <https://doi.org/10.1186/s12887-024-05161-8>
- Tobe, R. G., Haque, S. E., Mubassara, S., Rahman, R., Ikegami, K., & Mori, R. (2022). Maternal and child health handbook to improve continuum of maternal and child care in rural Bangladesh: Findings of a cluster randomized controlled trial. *PLOS ONE*, 17(4), e0266074. <https://doi.org/10.1371/journal.pone.0266074>
- Wang, K., Qi, Y., Wei, Q., Shi, Y., Zhang, Y., & Shi, H. (2022). Responsive caregiving and opportunities for early learning associated with infant development: Results from a prospective birth cohort in China. *Frontiers in Pediatrics*, 10, 857107. <https://doi.org/10.3389/fped.2022.857107>

- Watabe, Y., Haque, S. E., Datta, B. K., Kashem, A., Nakazawa, M., Tobe, R. G., & Mori, R. (2025). Long-term impact of maternal and child health handbook in rural Bangladesh: A post-trial follow-up study. *Pediatrics International*, 67(1), e70123. <https://doi.org/10.1111/ped.70123>