



MALAHAYATI INTERNATIONAL JOURNAL  
OF NURSING AND HEALTH SCIENCE  
ISSN 2620-9152 (Print)  
ISSN 2621-4083 (Online)  
DOI: 10.33024



#### ARTICLE INFORMATION

Received: August, 10, 2026

Revised: September, 29, 2026

Available online: October, 1, 2026

at : <https://e-jurnal.iphorr.com/index.php/minh>

## The effectiveness of leaflet media education on mother's knowledge of complete basic vaccination for toddlers at community health center

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### Abstract

**Background:** Complete basic vaccination remains suboptimal in Indonesia. Coverage in North Sumatra was only 32.7%, far below the national average. In the working area of Community Health Center Medan Area Selatan, several antigens—including polio 3 and booster doses—had not reached full coverage among 430 targeted infants in 2025. Low maternal knowledge and misconceptions about side effects contribute to incomplete vaccination.

**Purpose:** To analyze the effect of leaflet-based health education on mothers' knowledge regarding complete basic vaccination for toddlers in Medan Area Selatan, North Sumatra, in 2026.

**Method:** A pre-experimental one-group pretest–posttest design was applied to 40 mothers of children aged 0–12 months, recruited through total sampling. Knowledge was measured using a 20-item questionnaire before and after leaflet-based education. Data were analyzed with the Wilcoxon Signed Rank Test.

**Results:** Respondents were mostly aged 25–30 years (40%), with higher education (55%). The mean knowledge score increased from 10.63 (SD=1.580) to 16.64 (SD=1.564). All participants showed improvement, with Wilcoxon results indicating significance ( $Z=-5.970$ ,  $p<0.05$ ).

**Conclusion:** Leaflet-based health education significantly improved maternal knowledge of complete vaccination. Leaflets are recommended as effective, affordable, and reusable tools in primary health care.

**Keywords:** Complete Basic Vaccination; Health Education; Knowledge; Leaflet.

### INTRODUCTION

Vaccination continues to be one of the most effective and cost-efficient public health interventions to prevent illness and death in children caused by vaccine-preventable diseases (Harahap *et al.*, 2024). Based on WHO data, around 14.5 million children globally received no basic vaccination doses at all in 2023. During 2019–2023, Indonesia was ranked sixth worldwide with 1,356,367 children who did not receive vaccination. Common reasons parents refuse vaccination include worries about multiple injections (38%), inconvenient schedules (18%), and concerns about side effects 12% (World Health Organization, 2025).

Nationally, Indonesia's coverage of complete basic vaccination in 2022 was 94.6%, exceeding the national target of 94.1%. However, coverage remains

unequally distributed across provinces (Ministry of Health of the Republic of Indonesia, 2022). In North Sumatra Province, complete basic vaccination coverage was only 32.7%, which is far below the national average. Meanwhile, measles-rubella vaccination coverage in 2018 reached 86.44% among 298,684 infants (Health Office of North Sumatera Province, 2024). In Medan City, of the 35,085 live births recorded, only 24,277 infants (72.7%) had received complete basic vaccination. In addition, the 95% target for measles/MR vaccination had not been met by 2024 (Health Office of Medan City, 2025).

At the local level, the 2025 vaccination program report from Community Health Center Medan Area Selatan set a target of 100% complete basic

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vaccination coverage for 430 infants. However, several antigens had not yet met this target, including Polio 3 with coverage of around 87%, and booster vaccinations such as Pentavalent booster, MR booster, and Td for 5th grade elementary students with coverage of approximately 40%. This situation reflects an ongoing dropout in the vaccination schedule, which is affected by factors such as maternal knowledge, family support, access to health services, and the role of health workers in delivering education (Health Office of Medan City, 2025).

Maternal knowledge plays a crucial role in determining the completeness of child vaccination. Mothers who have good knowledge about vaccination tend to follow the recommended schedule more than those with limited knowledge (Surbakti *et al.*, 2021). Research in Egypt showed that health education could improve maternal knowledge on the importance of toddler vaccination by as much as 80%. Moreover, mothers with high knowledge were 2.5 times more likely to complete their child's vaccination compared to mothers with low knowledge (Jelly *et al.*, 2023). Evidence from Jordan also supports this, showing a significant correlation between maternal knowledge and adherence to child vaccination schedules ( $r=0.33$ ,  $p<0.01$ ), along with access to and understanding of health information (Fatinah *et al.*, 2026). This was further supported by a subsequent study which found that maternal knowledge, attitude, and information-seeking behavior together influence adherence to routine vaccination in the same population (Al-Rashdan, 2024). A cross-sectional study among antenatal mothers in Malaysia also found that maternal knowledge, risk perception, and health self-efficacy were significant predictors of intention to vaccinate children (Md Suhaimi *et al.*, 2025). Meanwhile, a study in central Italy confirmed that knowledge gaps and misinformation continue to be major factors contributing to maternal vaccine hesitancy (Moschese *et al.*, 2023).

Leaflets are printed health promotion materials that are regarded as effective, practical, affordable, and reusable, because mothers can read them repeatedly at home to reinforce the verbal information provided by health workers (Nazori *et al.*, 2022). Multiple studies have demonstrated that health education using leaflets can significantly improve maternal knowledge on various health topics,

including basic vaccination (Wirawan *et al.*, 2022). Research at Basirih Public Health Centre in South Kalimantan reported a significant increase in maternal knowledge about basic vaccination following leaflet-based education, as shown by the Wilcoxon Signed Rank Test (Jamini, 2026). Likewise, a study in Bojongkulur, Bogor, found that leaflets as a promotional medium had a significant impact on mothers' knowledge regarding basic vaccination for children (Faradilla *et al.*, 2023). In addition, a quasi-experimental study on the prevention of acute respiratory infections in Nias Regency showed that leaflet media resulted in a greater improvement in maternal knowledge compared to lectures alone (Bidaya, 2023).

Although such evidence exists, the impact of leaflet-based health education on complete basic vaccination has not yet been studied among mothers of toddlers at Community Health Center Medan Area Selatan. This urban health center serves a densely populated area, faces challenges related to online health misinformation, and still experiences vaccination dropout despite sufficient access to health services. In light of this, the researcher intends to examine the effect of health education using leaflet media on improving mothers' knowledge regarding complete basic vaccination for toddlers at a Community Health Center.

## RESEARCH METHOD

A quantitative approach using a pre-experimental design with a one-group pretest-posttest model was employed to examine differences in mothers' knowledge about complete basic vaccination before and after health education via leaflets. In this design, an initial knowledge assessment (pretest) was conducted on all respondents before the intervention. After the leaflet-based education was provided, a second assessment (posttest) was carried out. This allowed the researcher to compare changes in maternal knowledge within the same group before and after the intervention.

The study was conducted in the working area of Community Health Center Medan Area Selatan, Medan Area Sub-district, Medan City, North Sumatra Province, between April and May 2026. The population was all mothers with children aged 0–12 months who visited the Community Health Center

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during that period, as recorded in the infant and toddler cohort register. Because the population was relatively small (<100), total sampling was used, and all 40 mothers who met the inclusion criteria were recruited as respondents. The inclusion criteria were (1) mothers who had a child aged 0–12 months, (2) mothers who were present at the Community Health Center during the data collection period, (3) mothers who were able to read and write, and (4) mothers who were willing to participate and signed informed consent. The exclusion criteria were mothers who did not complete both the pretest and the posttest.

Data came from two sources. Primary data were collected directly from respondents using a structured questionnaire that covered respondent characteristics (age, education, occupation, and parity) and 20 closed-ended questions assessing knowledge of the definition, schedule, benefits, types, and side effects of complete basic vaccination. Secondary data were obtained from the infant and toddler cohort register and the profile of Community Health Center Medan Area Selatan. Each correct answer was given 1 point and each incorrect answer 0 points, so the total score ranged from 0 to 20. Knowledge level was then classified as good (76–100%), sufficient (56–75%), or poor (<56%).

The research was carried out in four stages: preparation, pretest, intervention, and posttest. Preparation stage. Before data collection, research permits were obtained from BRIDA Medan City, the Medan City Health Office, and Community Health Center Medan Area Selatan. The leaflet was then prepared. Its content covered the same five domains measured by the questionnaire: the definition of complete basic vaccination, the vaccination schedule, the benefits of vaccination, the types of vaccines, and post-vaccination side effects and how to manage them. The content was written in simple language and supported by illustrations, printed in full color on both sides of an A4 sheet folded into three parts. The leaflet content was checked for accuracy by the vaccination officer of the Community Health Center before use. Pretest. Eligible mothers were approached at the Community Health Center by the researcher, who explained the purpose and procedure of the study. Mothers who agreed signed the informed consent form and then completed the respondent characteristics form and the 20-item knowledge

questionnaire (pretest) on their own, with the researcher present to clarify unclear instructions without giving answers. This took approximately 10–15 minutes. Intervention. Immediately after the pretest, the researcher delivered the health education using the leaflet as the main medium. The session was held in the waiting area of the Community Health Center vaccination service, in groups of no more than five mothers and lasted approximately 20–30 minutes. It was given once to each respondent and consisted of three parts: (1) Opening: the researcher greeted the mothers, restated the objective of the education, and handed one copy of the leaflet to each mother, (2) Core explanation: the researcher explained the leaflet section by section, in the same order as the questionnaire domains (definition, schedule, benefits, types of vaccines, and side effects), while the mothers followed along on their own copy, (3) Discussion and closing: mothers were invited to ask questions, the researcher answered them and summarized the key messages, and the mothers were asked to keep the leaflet and read it again at home. To keep the intervention consistent, the same researcher, the same leaflet, and the same session outline were used for all respondents. Posttest. Immediately after the education session, following a short break, each mother completed the same 20 item knowledge questionnaire (posttest) under the same conditions as the pretest. The researcher checked that all items had been answered before the respondent left.

Data analysis was carried out in two stages. First, univariate analysis was conducted to describe the frequency distribution of respondent characteristics and of maternal knowledge levels before and after the intervention. Second, before bivariate analysis, the Shapiro-Wilk normality test was performed. The results showed that both pretest and posttest data were not normally distributed ( $p < 0.05$ ). Therefore, the non-parametric Wilcoxon Signed Rank Test was used to assess the effect of leaflet-based health education on maternal knowledge at a significance level of  $\alpha = 0.05$ .

This study followed the ethical principles of research, including informed consent, anonymity, and confidentiality. Ethical approval and research permits were obtained from BRIDA Medan City, the Medan City Health Office, and Community Health Center Medan Area Selatan.

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## RESEARCH RESULTS

Table 1. Characteristics of Participants (N=40)

| Variables                  | Results               |
|----------------------------|-----------------------|
| Age (Mean±SD)(Range)(Year) | (26.38±5.05)(19 – 35) |
| Age (n/%)                  |                       |
| 19-24                      | 15/37.5               |
| 25-30                      | 16/40.0               |
| 31-35                      | 9/22.5                |
| Education (n/%)            |                       |
| Senior High School         | 18/45.0               |
| College                    | 22/55.0               |
| Occupation (n/%)           |                       |
| Housewife                  | 19/42.5               |
| Self-employed              | 15/37.5               |
| Civil Servant              | 8/20.0                |
| Parity (n/%)               |                       |
| Primiparous                | 19/47.5               |
| Multiparous                | 21/52.5               |

Table 1 indicates that the participants had a mean age of 26.38 years (SD ± 5.05). The largest proportion of mothers (40.0%) were aged 25–30 years. More than half (55.0%) had attained a college education, while 42.5% were housewives. In terms of parity, the majority (52.5%) were multiparous.

Table 2. Mothers' Knowledge Score Before and After Leaflet-Based Health Education

| Variables | n  | Mean  | Std. Deviation | Min | Max |
|-----------|----|-------|----------------|-----|-----|
| Pretest   | 40 | 10.63 | 1.580          | 8   | 13  |
| Posttest  | 40 | 16.64 | 1.564          | 14  | 19  |

Table 2 shows the distribution of knowledge scores before and after the intervention. The pretest yielded a mean score of 10.63 (SD ± 1.580), with values ranging from 8 to 13. After receiving leaflet-based health education, the posttest mean increased to 16.64 (SD ± 1.564), with scores ranging from 14 to 19. These results confirm a marked improvement in maternal knowledge following the intervention.

Table 3. Knowledge Category Before and After Intervention

| Knowledge Category  | Pretest (n/%) | Posttest (n/%) |
|---------------------|---------------|----------------|
| Good (76-100%)      | 21/52.5       | 40/100         |
| Sufficient (56-75%) | 19/47.5       | 0/0.0          |
| Poor (<56%)         | 0/0.0         | 0/0.0          |

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Table 3 presents knowledge category before and after intervention. Prior to the intervention, maternal knowledge was distributed almost equally between the good category (52.5%) and the sufficient category (47.5%). No respondents were classified as having poor knowledge. After the leaflet-based health education, all 40 respondents (100%) were categorized as having good knowledge, while none were in the sufficient or poor categories.

**Table 4. Wilcoxon Signed Rank Test Results (pretest-posttest)**

| Ranks          | n  | Mean Ranks | Sum of Ranks |
|----------------|----|------------|--------------|
| Negative Ranks | 0  | 0.00       | 0.00         |
| Positive Ranks | 40 | 20.50      | 820.00       |
| Ties           | 0  | -          | -            |

Based on the Wilcoxon Signed Rank Test results, there were 0 respondents with negative ranks, 40 respondents with positive ranks, and 0 ties. The mean rank for positive ranks was 20.50 with a total sum of ranks of 820.00. This indicates that all respondents experienced an increase in knowledge scores from pretest to posttest.

## DISCUSSION

The findings of this study indicate that health education delivered through leaflets significantly increased mothers' knowledge about complete basic vaccination for toddlers at Community Health Center Medan Area Selatan. This is evidenced by the rise in the average knowledge score from 10.63 in the pretest to 16.64 in the posttest. The Wilcoxon Signed Rank Test yielded  $Z = -5.970$  with  $p = 0.001$  ( $p < 0.05$ ). All 40 respondents showed an increase in scores, and none experienced a decline, suggesting that leaflet media was effective across the entire sample regardless of individual characteristics (Fatinah *et al.*, 2026).

This result aligns with research conducted at Basirih Public Health Centre, South Kalimantan, which also used a one-group pretest-posttest design and Wilcoxon Signed Rank Test. That study found a significant improvement in maternal knowledge regarding basic vaccination after providing leaflet-based education to 30 respondents (Jamini, 2026).

A similar outcome was reported in Bojongkulur, Bogor, where leaflet-based promotion at an integrated health post was found to have a significant impact on mothers' knowledge of basic vaccination (Faradilla *et al.*, 2023). These results support the view that leaflets,

as a printed and portable medium, enable mothers to review the information repeatedly at their own pace, thereby enhancing retention compared to a single verbal explanation (Nurdjaya *et al.*, 2024).

The effectiveness of leaflets in this study is also supported by findings from other health education topics. A quasi-experimental study on the prevention of acute respiratory infections in Hiliduho Sub-district, Nias Regency, showed that leaflet media led to a substantially greater increase in maternal knowledge scores than the lecture method. Both approaches resulted in a statistically significant improvement ( $p < 0.05$ ) (Bidaya, 2023). This reinforces the idea that combining verbal explanation with take-home printed materials, such as leaflets, leads to a greater and longer-lasting improvement in knowledge compared to using a single communication method.

In addition to local evidence on leaflets, a literature highlights that maternal knowledge is one of the most consistent predictors of complete vaccination uptake (Pohan *et al.*, 2023). A cross-sectional study of 533 mothers in Jordan found a significant positive relationship between maternal knowledge and compliance with children's vaccination schedules ( $r = 0.33$ ,  $p < 0.01$ ), as well as with the mother's capacity to access and comprehend health information (Al-Rashdan, 2024). Further analysis of the same group showed that knowledge, attitude, and information-seeking behavior together influence vaccination adherence and help reduce maternal doubts about childhood vaccination (Al-Rashdan *et al.*, 2024). Similarly, a study among antenatal mothers in public health clinics in Selangor, Malaysia, reported that maternal knowledge, risk perception, and health self-

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efficacy were significant predictors of intention to vaccinate newborns according to the national program (Md Suhaimi *et al.*, 2025). A cross-sectional study of women of reproductive age in central Italy also found that knowledge gaps and exposure to misinformation are major contributors to vaccine hesitancy, emphasizing the need for structured, evidence-based education to address misconceptions before they lead to vaccine refusal (Moschese *et al.*, 2023).

In terms of respondent characteristics, the majority of mothers in this study were aged 25-30 years, an age group that is typically considered cognitively mature for receiving and understanding health information (Tarigan *et al.*, 2021). Most respondents had a college-level education, which aligns with prior research showing that higher maternal education is related to better understanding of health education content and greater compliance with vaccination (Surbakti *et al.*, 2021). The largest proportion of respondents were housewives, which may have given them more time to read the leaflet at home and to participate in the education session. In addition, most respondents were multiparous. Their previous experience with childbearing may have made them more open to strengthening their existing knowledge regarding vaccination schedules and benefits (Sinuraya, *et al.*, 2022).

Overall, the alignment of this study's findings with previous national and international research suggests that health education using leaflets is an evidence-based, low-cost, and easily reproducible strategy. It can be routinely implemented by primary health care workers to address maternal knowledge gaps that contribute to incomplete basic vaccination coverage. This is especially relevant in urban service areas such as Community Health Center Medan Area Selatan, where dropout rates for booster and subsequent doses remain a problem despite good access to health facilities. (Machmud *et al.*, 2022)

## LIMITATIONS

Several limitations should be considered when interpreting these findings. First, the study used a pre-experimental one-group pretest-posttest design without a control group. The improvement in knowledge therefore cannot be attributed to the leaflet with certainty, because other influences, such as the

effect of taking the same test twice, other sources of information, or the researcher's attention, were not controlled. Second, the intervention combined a verbal explanation by the researcher with the leaflet, so the effect of the leaflet alone could not be separated from the effect of the explanation. Third, the posttest was given immediately after the education session, so the study could not show whether the knowledge gain was retained over time. Fourth, the sample was small ( $n=40$ ), was drawn by total sampling from a single health center in one urban area, and no subgroup analysis by age, education, occupation, or parity was performed, which limits generalization to other settings. Fifth, the same questionnaire was used at pretest and posttest, which may have led to a recall effect, and knowledge was measured by self-completed questionnaire only. Finally, this study measured knowledge only; changes in attitude, and actual vaccination completion, were not assessed. Future studies should use a control group or randomized design, a longer follow-up period, a larger and more varied sample, and outcome measures that include attitude and vaccination status.

## CONCLUSION

Health education delivered through leaflet media significantly improved mothers' knowledge regarding complete basic vaccination for toddlers at Community Health Center Medan Area Selatan, Medan City, North Sumatra. This is demonstrated by the increase in the mean knowledge score from 10.63 to 16.64, and the Wilcoxon Signed Rank Test result of  $Z=-5.970$  with  $p=0.001$  ( $p<0.05$ ). All respondents experienced an improvement in knowledge following the intervention, and the proportion of mothers with good knowledge rose from 52.5% to 100%.

Health workers at Community Health Center Medan Area Selatan are recommended to keep using leaflet media as a regular part of vaccination counseling due to its practicality, affordability, and ability to be reused. Future researchers are suggested to conduct studies using a control group or a longitudinal design to provide stronger evidence on the long-term impact of leaflet-based education on maternal knowledge, attitude, and completion of vaccination over time.

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