



The Effect of Leaflet-Based Health Promotion on Mothers' Knowledge and Handwashing Practices

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Abstract

Diarrhea remains an important public health problem among toddlers, and caregiver handwashing is an important preventive practice. This study aimed to assess changes in mothers' knowledge and reported handwashing behavior regarding the prevention of toddler diarrhea following leaflet-based health promotion in Mambo Barat Urban Village, Palu City. A quantitative quasi-experimental study with a one-group pretest-posttest design was conducted among 30 mothers of toddlers who completed the pretest, leaflet-based health promotion, and posttest. Data were collected using structured questionnaires covering knowledge and reported handwashing behavior, with scores converted to a 0–100 scale. Univariate analysis described respondent characteristics and outcome distributions, while paired-samples t-tests compared pretest and posttest mean scores at a 0.05 significance level. Before the intervention, 18 respondents (60.0%) had poor knowledge, and 21 (70.0%) had poor handwashing behavior. After the intervention, 22 respondents (73.3%) had good knowledge, and 26 (86.7%) had good handwashing behavior. The mean knowledge score increased from 56.33 to 82.50, while the mean behavior score increased from 58.10 to 85.20. Paired-samples t-tests indicated significant within-group differences in knowledge ($t = -21.85$, $p = 0.001$) and reported handwashing behavior ($t = -20.84$, $p = 0.001$). Leaflet-based health promotion was associated with short-term improvements in mothers' knowledge and reported handwashing behavior. Because the study used a single group and an immediate posttest, the findings should be interpreted as short-term within-group changes rather than as evidence of sustained behavior change or reduced incidence of diarrhea.

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1. INTRODUCTION

Diarrhea among toddlers remains a public health concern, with dehydration, nutritional deterioration, growth disturbance, and preventable death when treatment and prevention are delayed. Global evidence shows that diarrheal morbidity and mortality are unevenly distributed across low- and middle-income countries, with household water, sanitation, hygiene, and caregiving practices contributing to persistent transmission (Reiner et al., 2020; Wolf et al., 2022; World Health Organization, 2024a).

Mothers and other primary caregivers are central to toddler diarrhea prevention because they prepare food, feed children, clean feces, change diapers, and supervise daily activities that may expose children to enteric pathogens. Studies in Indonesia and other low- and middle-income settings have reported that child feces disposal, caregiver handwashing, safe water, sanitation, and maternal education are associated with childhood diarrhea risk (Cronin et al., 2016; Edward et al., 2019; Luby et al., 2011; Noguchi et al., 2021).

Handwashing with soap is a simple preventive practice that can interrupt the movement of microorganisms from hands to food, drinking water, mouths, and the immediate environment of toddlers. The World Health Organization (World Health Organization, 2024a; World Health Organization, 2024b) emphasizes that hand hygiene education should become a routine family habit, especially where infectious diarrhea is a continuing risk. Systematic reviews also indicate that handwashing promotion can reduce diarrheal disease when messages are understandable, repeated, and supported by accessible handwashing facilities (Ejemot-Nwadiaro et al., 2021; Mbakaya et al., 2020; Staniford & Schmidtke, 2020). For that reason, health promotion for mothers of toddlers remains a relevant household-based prevention strategy.

In Indonesia, educational interventions on handwashing are still needed because diarrhea, water quality, sanitation, and hygiene behavior remain important priorities in child health programs. National health reports continue to underline the need for promotive and preventive actions to strengthen community hygiene practices (Badan Kebijakan Pembangunan Kesehatan, 2024; Kementerian Kesehatan Republik Indonesia, 2024). Indonesian studies have also reported relationships between maternal behavior, handwashing practices, household sanitation, and diarrhea among toddlers (Hendrastuti, 2019; Komala & Pangestika, 2024; Purnama et al., 2024; Sari et al., 2019; Setyobudi et al., 2020). These findings suggest that improving maternal knowledge and daily hygiene practices is an important entry point for preventing diarrhea.

Leaflet media can support health promotion because it is concise, portable, inexpensive, and can be reread after an educational session. Previous studies have shown that education using leaflets or other printed media can improve knowledge, attitudes, motivation, and health behavior related to diarrhea prevention, handwashing with soap, and child health (Achjar et al., 2023; Ariani et al., 2024; Azizi et al., 2024; Ferasinta & Dinata, 2020; Hutasoit et al., 2017; Musdalifah et al., 2021; Rianti et al., 2020; Umboh et al., 2020). Even so, much of the available evidence focuses on knowledge or attitudes, while fewer local community studies examine knowledge and reported handwashing behavior together among mothers of toddlers after a leaflet-based intervention. Evidence from Mamboro Barat Urban Village is therefore useful because local hygiene practices, caregiver routines, and access to health promotion activities may differ across community settings.

This study aimed to determine changes in mothers' knowledge and handwashing behavior regarding toddler diarrhea prevention following health promotion through leaflet media in Mamboro Barat Urban Village, Palu City. A one-group pretest-posttest quasi-

experimental design was used to compare knowledge and behavior scores among the same respondents before and after the intervention.

2. METHODS

This study used a quantitative quasi-experimental approach with a one-group pretest-posttest design. The design was selected to assess within-group changes in mothers' knowledge and reported handwashing behavior before and after health promotion using leaflet media. The study was conducted among mothers of toddlers in Mamboro Barat Urban Village, Palu City.

The study population comprised mothers with toddlers who lived in the study area. A total of 30 mothers who met the eligibility criteria and completed all study stages were included in the analysis. Participants were recruited from the target population based on the stated inclusion criteria and willingness to participate; the study records do not specify a formal probability sampling technique. The inclusion criteria were mothers of toddlers who were willing to participate, able to read the leaflet, and who completed the pretest, intervention, and posttest. Respondents with incomplete questionnaire data or who were absent during the posttest were excluded. Before data collection, each respondent received information about the study's purpose, procedures, potential burden of participation, confidentiality, voluntary participation, and the right to discontinue participation at any time. Informed consent was obtained before the questionnaire was administered. The study did not have a separate institutional ethical clearance number; therefore, no ethical approval number is reported in this manuscript. The ethical safeguards applied in data collection included respect for voluntary participation, informed consent, privacy, confidentiality, and the participants' right to refuse or withdraw without consequences, consistent with the ethical principles for research involving human participants (World Medical Association, 2024).

The independent variable was health promotion using leaflet media. The dependent variables were mothers' knowledge of handwashing with soap and their reported handwashing behavior for preventing diarrhea among toddlers. The leaflet presented the definition of diarrhea, routes of transmission, the importance of handwashing with soap, critical times for handwashing, correct handwashing steps, and household hygiene practices supporting diarrhea prevention.

Data were collected using a structured questionnaire developed from the leaflet content and the main indicators of handwashing with soap for diarrhea prevention. The instrument covered two domains: knowledge of diarrhea transmission and critical handwashing practices, and reported handwashing behavior in daily toddler care. Measurements were performed twice, before the intervention (pretest) and after respondents received the leaflet and a brief explanation (posttest) during the same data-collection visit. Scores were converted to a 0–100 scale by dividing the obtained score by the maximum possible score and multiplying by 100. Knowledge was classified as poor, moderate, or good, while reported handwashing behavior was classified as poor or good according to the study categorization guidelines.

Data analysis included univariate and bivariate analysis. Univariate analysis was used to describe respondent characteristics and the distribution of knowledge and reported handwashing behavior categories before and after the intervention. Bivariate analysis used paired-samples t-tests to compare mean knowledge and reported behavior scores between pretest and posttest measurements. The significance level was set at $\alpha = 0.05$ with a 95% confidence level; p-values <0.05 were considered statistically significant. Because the design did not include a comparison group, the inferential results were

interpreted as evidence of short-term within-group score changes and not as proof of a causal effect or sustained behavioral change.

3. RESULTS AND DISCUSSION

The respondent profile is important for interpreting the educational response because age, education, occupation, and toddler age may shape caregiving routines and the ability to access or apply health information. Table 1 presents the characteristics of the 30 mothers who participated in the pretest, leaflet-based health promotion session, and posttest.

Table 1. Characteristics of respondents (N = 30).

Respondent characteristic	Frequency (n)	Percentage (%)
Maternal age		
< 20 years	2	6.7
20-35 years	23	76.7
> 35 years	5	16.6
Total	30	100.0
Maternal education		
Elementary education (SD/equivalent)	3	10.0
Junior secondary education (SMP/equivalent)	7	23.3
Senior secondary education (SMA/equivalent)	16	53.4
Higher education (D3/S1)	4	13.3
Total	30	100.0
Maternal occupation		
Housewife	22	73.3
Entrepreneur/trader	5	16.7
Private employee/civil servant	3	10.0
Total	30	100.0
Toddler age		
0-12 months	6	20.0
13-36 months	14	46.7
37-59 months	10	33.3
Total	30	100.0

Most respondents were aged 20-35 years (76.7%), had senior secondary education (53.4%), and were housewives (73.3%). Nearly half of the toddlers were aged 13-36 months (46.7%), indicating that the intervention reached mothers who were actively involved in feeding, hygiene supervision, and daily toddler care.

Table 2. Distribution of mothers' knowledge level before and after leaflet-based health promotion (N = 30).

Knowledge category	Pretest (n)	Pretest (%)	Posttest (n)	Posttest (%)
Poor	18	60.0	2	6.7
Moderate	9	30.0	6	20.0
Good	3	10.0	22	73.3

Table 2 shows that before the intervention, most respondents had poor knowledge (18 respondents; 60.0%). After health promotion using leaflet media, most respondents were in the good knowledge category (22 respondents; 73.3%).

Table 2. Distribution of mothers' handwashing behavior before and after leaflet-based health promotion (N = 30).

Behavior category	Pretest (n)	Pretest (%)	Posttest (n)	Posttest (%)
Poor	21	70.0	4	13.3
Good	9	30.0	26	86.7

Table 3 shows that before the intervention, most respondents had poor handwashing behavior (21 respondents; 70.0%). After the intervention, handwashing behavior improved, with 26 respondents (86.7%) classified as having good handwashing behavior.

Table 4. Pretest and posttest scores of knowledge and handwashing behavior.

Variable	Mean	N	Standard deviation	Standard error mean
Knowledge pretest	56.33	30	11.42	2.08
Knowledge posttest	82.50	30	8.25	1.50
Behavior pretest	58.10	30	10.65	1.94
Behavior posttest	85.20	30	7.80	1.42

Table 4 indicates that the mean knowledge score increased from 56.33 at pretest to 82.50 at posttest. The mean behavior score also increased from 58.10 at pretest to 85.20 at posttest.

Table 5. Differences in knowledge and handwashing behavior scores before and after the intervention.

Variable pair	Mean difference	Standard deviation	t	df	Sig. (2-tailed)
Knowledge pretest-posttest	-26.17	6.54	-21.85	29	0.001
Behavior pretest-posttest	-27.10	7.12	-20.84	29	0.001

Table 5 shows significant differences in knowledge scores before and after the intervention ($p = 0.001$). Mothers' handwashing behavior also showed a significant difference before and after the intervention ($p = 0.001$). These results indicate significant short-term within-group improvements in mothers' knowledge and reported handwashing behavior after leaflet-based health promotion.

DISCUSSION

The findings show that leaflet-based health promotion was associated with improved mothers' knowledge of handwashing with soap for preventing toddler diarrhea. The increase in the good knowledge category from 10.0% to 73.3% indicates that the leaflet messages strengthened respondents' understanding of key prevention practices. The mean knowledge score also increased by 26.17 points, indicating improvement not only in the distribution of categories but also in the overall score. This finding is consistent with Rianti et al. (2020), who reported that education delivered through leaflets and audiovisual media influenced parents' knowledge, attitudes, and behavior regarding diarrhea prevention. Musdalifah et al. (2021) also found that health promotion through several media, including leaflets, was effective in improving mothers' knowledge and attitudes regarding diarrhea management among toddlers.

Leaflets may work as reminder media because written and visual information can be reread after counseling. This characteristic helps respondents repeat essential messages about critical times for handwashing, such as before preparing food, before feeding a child, after using the toilet, after cleaning a child who defecates, and after handling waste or dirty objects. Printed educational media are also suitable for community settings because they can be distributed during posyandu, puskesmas, or household-based health activities. Achjar et al. (2023), Ariani et al. (2024), and Azizi et al. (2024) reported that leaflet-based health education improved maternal or student knowledge in different preventive health contexts. These studies support the practical value of leaflets as communication media in health promotion.

Changes in reported handwashing behavior were also observed in this study. Before the intervention, 70.0% of respondents were classified as having poor handwashing behavior. After the intervention, 86.7% were categorized as having good behavior. The mean behavior score increased by 27.10 points, and the paired samples t-test showed a significant difference. This result suggests that leaflet-based health promotion may influence not only cognitive understanding but also intentions and reported tendencies to practice handwashing in toddler care. Similar findings were reported by Umboh et al. (2020), who found that health education on handwashing with soap improved knowledge and attitudes, and by Setyobudi et al. (2020), who emphasized that mothers' handwashing behavior was associated with diarrhea among toddlers.

Handwashing behavior is influenced by knowledge, perceived risk, habits, family support, the availability of water and soap, and environmental cues. A leaflet alone may not remove all behavioral barriers, but it can strengthen awareness and provide clear instructions when combined with brief explanations or demonstrations. Evidence from systematic reviews indicates that hand hygiene interventions are more effective when they combine education, practical facilities, cues, and repeated reinforcement (Ejemot-Nwadiaro et al., 2021; Mbakaya et al., 2020; Staniford & Schmidtke, 2020). Therefore, the leaflet used in this study should be understood as one component of broader behavior-change communication rather than a single solution for all hygiene problems.

The findings are relevant to toddler diarrhea prevention because toddlers frequently put hands or objects into their mouths, depend on caregivers for feeding and hygiene, and may be exposed to contaminated household environments. The World Health Organization (2024a) and UNICEF and WHO (2020) emphasize the importance of water, sanitation, and hygiene practices, including hand hygiene, in preventing infectious

diarrhea. In Mamboro Barat Urban Village, Palu City, strengthening maternal handwashing behavior may improve household care practices and reduce the risk of fecal-oral transmission among toddlers. Nevertheless, this study did not measure actual diarrhea incidence, so the results should be interpreted as improvements in prevention-related knowledge and reported behavior.

Compared with digital media, leaflets offer several advantages for community health education: they do not require internet access, can be read repeatedly, are easy to distribute during community-based health activities, and can be taken home for discussion with family members. Printed educational materials continue to play an important role in supporting health communication, particularly among populations with limited digital access and varying levels of health literacy (Boyle et al., 2020; Kregting et al., 2020). However, the effectiveness of leaflets depends on literacy level, design quality, visual clarity, message simplicity, and respondents' willingness to read and implement the recommended practices. Evidence suggests that health education materials are more effective when they use simple language, visual aids, and action-oriented messages that facilitate understanding and recall, especially among individuals with limited health literacy (Mbanda et al., 2021; Schubbe et al., 2020). Therefore, leaflet content should incorporate simple wording, clear illustrations of handwashing procedures, reminders about critical times for handwashing, and practical messages that encourage immediate action. Whenever possible, leaflet distribution should be accompanied by demonstrations and direct practice of handwashing with soap.

Several limitations should be considered when interpreting these findings. First, the one-group pretest-posttest design lacked a control group; therefore, the observed improvements may also have been influenced by testing effects, repeated measures, or respondents' increased awareness after completing the pretest. This concern is consistent with methodological discussions of quasi-experimental designs, which emphasize that the absence of randomization or a comparison group can weaken causal inference (Andrade, 2021). Second, the sample size was relatively small, with 30 respondents from one urban village, so generalization to broader populations should be made cautiously. Third, handwashing behavior was measured using a questionnaire, which may be affected by information and social desirability biases, especially when respondents report behaviors generally viewed as desirable (Althubaiti, 2016; Krumpal, 2013). Fourth, the posttest measured immediate change after the intervention, and no follow-up assessment was conducted to determine whether behavior was sustained. Future studies are recommended to use quasi-experimental designs with control groups, larger samples, direct observation of handwashing practices, validated instruments, and follow-up measurements.

4. CONCLUSION

Leaflet-based health promotion was associated with improved mothers' knowledge and reported handwashing behavior related to toddler diarrhea prevention in Mamboro Barat Urban Village, Palu City. The findings indicate that leaflet media can support short-term improvement in prevention-related knowledge and self-reported handwashing behavior among mothers of toddlers.

For health promotion practice, leaflets may be used as simple, accessible educational media and should preferably be accompanied by brief explanations or practical demonstrations of handwashing with soap. Future studies should involve larger

samples, a comparison group, validated measurement instruments, direct observation of handwashing practices, and follow-up assessments to determine whether behavioral changes are sustained. Because the present study used a single-group design and measured self-reported behavior immediately after the intervention, its findings should not be interpreted as evidence of long-term behavior change or reduced diarrhea incidence.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Beny Suyanto contributed to the conceptualization, study design, methodology, data collection, data analysis, and preparation of the manuscript. Mustafa contributed to data collection, investigation, data validation, and interpretation of the findings. Abdul Ganing contributed to the literature review, data validation, critical revision, and refinement of the manuscript. All authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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DECLARATION OF ARTIFICIAL INTELLIGENCE USE

The authors declare that artificial intelligence (AI) tools were used solely to assist with language editing, grammar checking, and improving the clarity and readability of the manuscript. AI tools were not used to generate research data, conduct data analysis, interpret the results, or make scientific decisions. The authors remain fully responsible for the accuracy, originality, integrity, and final content of the manuscript.

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