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IMPROVING COMMUNITY KNOWLEDGE OF DENGUE PREVENTION THROUGH HEALTH EDUCATION IN THE LEMPAKE PUBLIC HEALTH CENTER AREA, SAMARINDA, INDONESIA: A ONE-GROUP PRETEST–POSTTEST STUDY

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Abstract
Dengue remains a major public health challenge in tropical and subtropical settings, including Indonesia, where sustained community participation in vector control is essential. This study evaluated changes in community knowledge regarding dengue prevention following a health education activity in the working area of Lempake Public Health Center, Samarinda, East Kalimantan. A quantitative pre-experimental one-group pretest–posttest design was used. Ten community members, predominantly mothers attending a local posyandu, completed a knowledge questionnaire before and after receiving health education supported by a brochure/leaflet. The questionnaire addressed dengue causes, transmission, symptoms, Aedes breeding sites, and the 3M Plus prevention strategy. Descriptive statistics were used to summarize scores, while the Shapiro–Wilk test assessed distributional assumptions and the Wilcoxon signed-rank test evaluated paired changes. The mean knowledge score increased from 7.4 before education to 9.7 after education, a mean gain of 2.3 points. The median increased from 7 to 10, and the Wilcoxon test indicated a statistically significant difference ($Z = -2.539$, $p = .011$), with a large standardized effect ($r \approx .80$). These findings indicate that a brief, locally delivered health education activity was associated with improved short-term knowledge of dengue prevention. However, because the study had a very small sample, no comparison group, and an immediate post-intervention assessment, the result should be interpreted as evidence of short-term knowledge change rather than proof of causal effectiveness or behavioral impact. The findings support the use of repeated, context-sensitive health education as one component of integrated dengue prevention, particularly when linked with sustained community participation and vector-control activities.
Keywords: dengue prevention, health education, community knowledge, 3M Plus, vector control, Indonesia

Abstrak
Demam berdarah dengue (DBD) masih menjadi tantangan kesehatan masyarakat yang utama di wilayah tropis dan subtropis, termasuk Indonesia, yang memerlukan partisipasi masyarakat secara berkelanjutan dalam pengendalian vektor. Penelitian ini bertujuan mengevaluasi perubahan pengetahuan masyarakat mengenai pencegahan DBD setelah pelaksanaan kegiatan pendidikan kesehatan di wilayah kerja Puskesmas Lempake, Samarinda, Kalimantan Timur. Penelitian ini menggunakan pendekatan kuantitatif dengan desain pra-eksperimental one-group pretest–posttest. Sebanyak 10 anggota masyarakat, yang sebagian besar merupakan ibu-ibu yang menghadiri kegiatan posyandu setempat, mengisi kuesioner pengetahuan sebelum dan sesudah menerima pendidikan kesehatan yang didukung oleh brosur atau leaflet. Kuesioner tersebut mencakup pengetahuan tentang penyebab DBD, cara penularan, gejala, tempat

perkembangbiakan nyamuk Aedes, serta strategi pencegahan 3M Plus. Statistik deskriptif digunakan untuk merangkum skor, sedangkan uji Shapiro–Wilk digunakan untuk menilai asumsi distribusi data dan uji Wilcoxon signed-rank digunakan untuk mengevaluasi perubahan skor berpasangan. Rata-rata skor pengetahuan meningkat dari 7,4 sebelum pendidikan kesehatan menjadi 9,7 setelah pendidikan kesehatan, dengan kenaikan rata-rata sebesar 2,3 poin. Nilai median meningkat dari 7 menjadi 10. Hasil uji Wilcoxon menunjukkan adanya perbedaan yang signifikan secara statistik (Z = -2,539), (p = 0,011), dengan ukuran efek terstandar yang besar (r = 0,80). Temuan ini menunjukkan bahwa kegiatan pendidikan kesehatan singkat yang dilaksanakan secara lokal berkaitan dengan peningkatan pengetahuan jangka pendek mengenai pencegahan DBD. Namun, karena penelitian ini melibatkan jumlah sampel yang sangat kecil, tidak menggunakan kelompok pembanding, dan melakukan pengukuran segera setelah intervensi, hasilnya perlu ditafsirkan sebagai bukti perubahan pengetahuan jangka pendek, bukan sebagai bukti efektivitas kausal atau dampak terhadap perilaku. Temuan ini mendukung pelaksanaan pendidikan kesehatan yang berulang dan disesuaikan dengan konteks lokal sebagai salah satu komponen dalam upaya pencegahan DBD terpadu, terutama apabila diintegrasikan dengan partisipasi masyarakat yang berkelanjutan dan kegiatan pengendalian vektor.
Kata kunci: *pencegahan DBD, pendidikan kesehatan, pengetahuan masyarakat, 3M Plus, pengendalian vektor, Indonesia*

INTRODUCTION

Dengue is a mosquito-borne viral infection transmitted predominantly by infected Aedes mosquitoes and remains one of the most important arboviral diseases affecting tropical and subtropical populations. Global estimates have demonstrated a substantial and geographically expanding burden, while recent surveillance indicates that dengue transmission reached unprecedented levels in 2024. The World Health Organization (WHO) reported more than 14 million dengue cases globally in 2024, and Indonesia was among the countries experiencing a large outbreak burden (Bhatt et al., 2013; Paz-Bailey et al., 2024; World Health Organization [WHO], 2025a, 2025b).

Indonesia's dengue burden is shaped by urbanization, climatic conditions, vector ecology, population mobility, and the persistence of breeding sites around households. Consequently, dengue prevention cannot rely on clinical management alone. WHO emphasizes vector control, early recognition, and community-level preventive practices, while the broader literature indicates that integrated approaches combining vector management, community participation, communication, and other preventive tools are more appropriate than reliance on a single intervention (Achee et al., 2015; Bowman et al., 2016; Guzman et al., 2010; WHO, 2025a).

Community knowledge is particularly relevant because many dengue-control activities require routine household action. The Indonesian 3M Plus strategy—commonly framed as draining or cleaning water containers, covering water-storage containers, recycling or removing unused containers, and undertaking additional mosquito-bite and breeding-site prevention measures—depends on people recognizing transmission pathways and translating information into repeated household practices. Recent Indonesian evidence shows that knowledge, attitudes, and practices remain uneven, despite relatively widespread awareness of basic vector-control measures (Prayitno et al., 2025). A global systematic review similarly found substantial regional variation in dengue-related knowledge and preventive behavior, supporting the need for locally adapted health communication (Jahromi et al., 2024).

Evidence from community and school-based interventions suggests that health education can improve knowledge and, in some contexts, selected preventive practices. A systematic review of dengue education initiatives identified health education as an important component of prevention, while a school-based intervention in Malaysia demonstrated improvements in knowledge following a structured educational program (Díaz-González et al., 2020; AhbiRami & Zuharah, 2020). In Indonesia, community-centered dengue programs and the One House One Jumantik approach have likewise reported improvements in knowledge, participation, or preventive behavior (Ridha et al., 2023; Sulistyawati et al., 2019). However, the evidence also cautions that knowledge gains do not automatically translate into sustained behavior, particularly when educational activities are irregular or insufficiently connected to community engagement (Khun & Manderson, 2007; Arfan et al., 2024).

Despite this evidence, there is a practical need for locally generated evaluations that document whether health education produces measurable short-term changes in knowledge among communities served by primary health-care facilities. The present activity was conducted in the working area of Lempake Public Health Center in Samarinda, East Kalimantan, where dengue cases recorded by the activity team were 16 in 2023, 48 in 2024, 41 in 2025, and 11 during January–March 2026. These local figures are descriptive activity data and are not intended to establish a temporal epidemiological trend because the 2026 observation period covers only three months.

Accordingly, this study asks: does community knowledge regarding dengue prevention differ before and after a health education activity delivered in the Lempake Public Health Center area? The objective was to evaluate the short-term change in dengue-prevention knowledge using a paired pretest–posttest assessment. The contribution of the study is therefore not a claim of definitive intervention efficacy, but a transparent local evaluation that can inform the design of repeated community education and integrated dengue-control activities in primary health-care settings.

METHOD

Study design and setting

The activity used a quantitative pre-experimental one-group pretest–posttest design. The same participants completed a knowledge questionnaire before and after a health education session, allowing within-person change to be examined. The activity was conducted in May 2026 in the working area of Lempake Public Health Center, Samarinda Utara District, Samarinda City, East Kalimantan, Indonesia. Education was delivered at a posyandu in the service area.

Participants and procedure

Participants were community members, predominantly mothers who attended the posyandu and lived within the Lempake Public Health Center service area. Ten participants completed both the pretest and posttest and were therefore included in the paired analysis. The activity began with a baseline questionnaire (pretest), followed by health education delivered using accessible language. The educational material covered the causes and transmission of dengue, common symptoms, Aedes mosquito breeding sites, and the 3M Plus prevention strategy. A brochure/leaflet was distributed as a take-home reinforcement material. On the following day, participants completed the posttest independently at home and returned their responses through WhatsApp.

Measurement

Knowledge was measured using a questionnaire addressing five content domains: dengue causation, transmission, symptoms, Aedes breeding sites, and prevention through 3M Plus. The activity manuscript reports a maximum score of 10. The same instrument was used at both measurement points. Because the source manuscript does not provide a formal psychometric validation study for this questionnaire, the findings are interpreted as an activity-level evaluation rather than as evidence from a fully validated measurement instrument. This distinction is important because contemporary dengue KAP research emphasizes the value of standardized and validated questionnaires for reproducible measurement (Dapari et al., 2024).

Data analysis

Data were checked, coded, and analyzed using IBM SPSS Statistics. Descriptive statistics included the total, mean, median, and range of knowledge scores. Given the small paired sample ($n = 10$), the Shapiro–Wilk test was used to examine distributional assumptions. The pretest distribution did not significantly depart from normality ($p = .062$), whereas the posttest distribution did ($p < .001$). Therefore, the Wilcoxon signed-rank test was used to compare paired scores. Statistical significance was evaluated at $\alpha = .05$. A standardized effect size was additionally calculated from the reported Wilcoxon Z statistic as $r = |Z|/\sqrt{N}$, where N is the number of paired observations.

RESULTS AND DISCUSSION

Participant-level change in knowledge

All 10 participants completed both measurements. Pretest scores ranged from 6 to 10, whereas posttest scores ranged from 9 to 10. The mean score increased from 7.4 to 9.7, corresponding to an average gain of 2.3 points. Eight participants showed an increase, two showed no change, and no participant had a lower posttest score.

Table 1. Individual paired knowledge scores before and after health education

PARTICIPANT	PRETEST	POSTTEST	CHANGE	DIRECTION
P01	6	10	4	Increase
P02	10	10	0	No change
P03	7	10	3	Increase
P04	6	10	4	Increase
P05	6	9	3	Increase
P06	9	10	1	Increase
P07	8	10	2	Increase
P08	6	10	4	Increase
P09	9	9	0	No change
P10	7	9	2	Increase

At the descriptive level, the median score increased from 7 (IQR 6–9) to 10 (IQR 9–10). Seven participants (70%) achieved the maximum score of 10 at posttest, while the remaining three participants (30%) scored 9. This concentration near the upper limit indicates that the posttest distribution was strongly compressed at the maximum score, which is consistent with the observed non-normality and suggests a possible ceiling effect.

Normality assessment and paired comparison

Table 2. Shapiro–Wilk assessment of score distributions

Measurement	Shapiro–Wilk W	p
Pretest	0.853	.062
Posttest	0.594	< .001

Table 3. Paired comparison of pretest and posttest knowledge scores

Test	Z	p (2-tailed)	Effect size r
Wilcoxon signed-rank	−2.539	.011	0.80

The Wilcoxon signed-rank test yielded Z = −2.539 and p = .011, indicating a statistically significant paired difference at the .05 level. The effect size calculated from the reported Z statistic was approximately r = .80, which is large by commonly used conventions. This effect-size estimate should nevertheless be interpreted cautiously because it is based on only 10 paired observations and because the study did not include a control or comparison group

DISCUSSION

The central finding was a short-term increase in dengue-prevention knowledge following a community health education activity. The mean score increased by 2.3 points, and the paired analysis indicated a statistically significant difference. This pattern is consistent with prior dengue education studies showing that structured information delivered through accessible educational media can improve knowledge. For example, AhbiRami and Zuharah (2020) found significant improvements in dengue-related knowledge following a school-based health education program, while Mardinah et al. (2025) reported an increase in community knowledge following interactive dengue-prevention education. Indonesian community-service activities using 3M Plus education and leaflet-based approaches have also reported similar pre–post improvements (Astriana et al., 2024; Pramudaningsih et al., 2024).

The present findings should be interpreted within the broader KAP literature. A global systematic review and meta-analysis found that sufficient dengue knowledge and preventive behaviors were far from universal and varied considerably across regions (Jahromi et al., 2024). In Indonesia, a national adult KAP assessment likewise identified knowledge gaps despite relatively stronger reported attitudes and preventive practices (Prayitno et al., 2025). These findings support the rationale for maintaining community education, but they also show why knowledge should be treated as one component of dengue prevention rather than as a sufficient endpoint.

The result is also compatible with evidence from community-centered dengue programs. Sulistyawati et al. (2019) showed that community empowerment can improve knowledge, attitudes, and participation in dengue vector control, while Ridha et al. (2023) reported improvements associated with mentoring in the One House One Jumantik program in Samarinda. A systematic review by Arfan et al. (2024) similarly concluded that community participation can contribute to increased knowledge, attitudes, behaviors, and vector-control outcomes, although individual, community, and societal barriers can limit participation. Thus, the value of the present activity lies not simply in the leaflet as a communication object, but in its placement within a community health setting where educational information can potentially be connected to routine vector-control practices.

At the same time, the concentration of posttest scores near the maximum requires careful interpretation. Seven of the 10 participants achieved a score of 10, and the remaining three scored 9. The resulting ceiling effect limits the amount of measurable improvement that can occur after the intervention. This may partly explain why participants with lower baseline scores showed larger gains. More importantly, a ceiling effect suggests that a short, relatively simple knowledge instrument may have limited discrimination at the upper end of the scale. Future evaluations should therefore consider a broader item pool, documented content validation, and, where possible, a validated KAP instrument. The recent development and validation of dengue KAP questionnaires underscores the importance of measurement quality when evaluating educational interventions (Dapari et al., 2024).

The educational mechanism is plausible from a health-promotion perspective. Health education can increase functional health literacy by improving access to understandable information and supporting the ability to use that information in health-related decisions (Nutbeam, 2000). In dengue prevention, however, information must be actionable. Community members need to recognize breeding sites, understand why water containers require routine management, and know how household practices fit within broader vector-control strategies. Evidence from Cambodia and other settings indicates that knowledge may not translate into sustained prevention when educational programs are irregular, poorly resourced, or insufficiently linked to practical opportunities for action (Khun & Manderson, 2007).

The present activity therefore has practical implications for primary health-care services. First, dengue education should be repeated rather than treated as a one-time event. Second, printed materials such as leaflets can be used as reinforcement tools, but they should be combined with discussion, demonstration, household monitoring, or community-based activities where feasible. Third, educational content should be aligned with locally relevant prevention practices, particularly 3M Plus and identification of household breeding sites. Fourth, evaluation should extend beyond immediate knowledge to delayed retention and observable preventive practices. These recommendations are consistent with recent evidence emphasizing community participation, locally adapted communication, and integrated dengue-control strategies (Arfan et al., 2025; WHO, 2025a).

The study also illustrates why statistical significance should not be equated with causal effectiveness. The one-group pretest–posttest design cannot exclude alternative explanations such as test familiarity, external information exposure, regression to the mean, or short-term recall. The absence of a control group and the very small convenience sample further limit internal and external validity. The significant Wilcoxon result therefore demonstrates a paired change in observed scores in this group, not definitive proof that the education intervention alone caused the change. This distinction is especially important in community health evaluation, where educational activities occur within dynamic social and environmental contexts.

Finally, dengue prevention requires more than health education. Vector-control evidence indicates that no single intervention is sufficient and that integrated strategies are necessary (Achee et al., 2015; Bowman et al., 2016). Indonesia provides an important example: community empowerment, household monitoring, and newer vector-control approaches such as Wolbachia have been studied alongside conventional control measures (Indriani et al., 2023; Sulistyawati et al., 2019). The appropriate implication of the present findings is therefore that health education

can function as a supporting component of an integrated prevention system. It should strengthen community understanding and participation while being linked to sustained environmental management, surveillance, and primary-health-care action.

Limitations

The sample consisted of only 10 participants, limiting statistical precision and generalizability.

The one-group pretest–posttest design did not include a comparison group, so causal attribution to the education activity is not possible.

The posttest was administered shortly after the intervention, so the study measured immediate knowledge change rather than long-term retention.

The questionnaire had a maximum score of 10 and showed a strong ceiling effect at posttest; the source manuscript does not document formal psychometric validation.

Only knowledge was assessed. The activity did not measure changes in household practices, entomological indices, dengue incidence, or sustained community participation.

CONCLUSION

Community health education in the Lempake Public Health Center area was followed by a measurable increase in dengue-prevention knowledge among the 10 participants evaluated. The mean score increased from 7.4 to 9.7, the median increased from 7 to 10, and the Wilcoxon signed-rank test indicated a statistically significant paired difference ($Z = -2.539$, $p = .011$). The findings provide local evidence that structured, accessible dengue education can produce short-term knowledge gains. However, the result should not be interpreted as definitive evidence of causal intervention effectiveness or behavioral change because of the small sample, absence of a control group, short follow-up, and ceiling effect. Future community evaluations should use larger samples, validated KAP instruments, comparison groups where feasible, and follow-up measures of knowledge retention and actual 3M Plus practices. For primary health-care services, dengue education is best positioned as a recurring component of integrated community participation and vector-control programs rather than as a stand-alone intervention.

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