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Empowerment of Community Health Volunteers in the Prevention and Management of Non-Communicable Diseases (NCDs) through the Utilization of *Tanaman Obat Keluarga (TOGA)* in Lempuing and Nusa Indah Subdistricts, Bengkulu City

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Abstract

Background: The rising prevalence of non-communicable diseases (NCDs), particularly hypertension and diabetes mellitus, poses a significant public health challenge in Bengkulu City, especially in Lempuing and Nusa Indah subdistricts. Community empowerment is a strategic approach to strengthen promotive and preventive health efforts. The utilization of *Tanaman Obat Keluarga (TOGA)* was introduced as an innovative, culturally appropriate, and practical method aligned with *Gerakan Masyarakat Hidup Sehat (GERMAS).*

Aims: This program aims to enhance the knowledge and skills of community health volunteers in preventing and managing NCDs, establish TOGA demonstration gardens managed by volunteers, and develop a replicable community empowerment model.

Methods: A participatory approach was applied through cross-sectoral coordination with primary health centers and local government. Educational modules and media were developed, followed by training sessions for community health volunteers using lectures, discussions, and hands-on practice. Continuous mentoring supported the management of TOGA gardens. Program evaluation was conducted using pre-test and post-test to assess changes in volunteers' knowledge and observations to monitor implementation.

Results: The program was successfully implemented. Educational modules were developed, and training activities led to an average increase of 30% in volunteers' knowledge scores. Two TOGA demonstration gardens were established and actively managed by volunteers. Educational media were utilized during Pos Pelayanan Terpadu (posyandu) services by community health centers and Pemberdayaan Kesehatan Keluarga (PKK) activities at Lempuing and Nusa Indah subdistricts.

Conclusion: The program effectively improved the capacity of community health volunteers and promoted community participation in family-based NCD prevention and management. The TOGA-based empowerment model demonstrates strong potential for replication as a promotive and preventive strategy for NCD control.

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INTRODUCTION

Non-communicable diseases (NCDs) are the leading cause of mortality in Indonesia, accounting for approximately 66% of all deaths (Laverack, 2004). Major NCDs include cardiovascular diseases, cancers, diabetes mellitus, hypertension, stroke, and chronic kidney diseases. The high burden of

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NCDs places significant pressure on the healthcare system, particularly at the primary care level (Febriyanti et al., 2024).

Local data from Ranomuut and Lempuing Primary Health Centers indicate a high number of daily visits related to NCDs, especially hypertension, diabetes mellitus, and gout arthritis (N. Sari & Andjasmara, 2023). A preliminary survey conducted by community and family nursing students found that 25–35 patients with NCDs seek care daily, with limited knowledge among patients and families regarding prevention and self-management, including the utilization of *Tanaman Obat Keluarga (TOGA)*.

Effective NCD prevention requires early intervention through lifestyle modification, risk factor control, and community-based self-management strategies (Kuba et al., 2021). Health literacy and community participation play a critical role in improving early detection and disease control (Nutbeam & Lloyd, 2021). The utilization of TOGA has been recognized as a culturally appropriate approach supporting promotive, preventive, curative, and rehabilitative health efforts, while also enhancing family welfare and preserving traditional knowledge (P. Sari et al., 2024). Community empowerment facilitated by health volunteers is essential for sustainable health promotion initiatives (Febyanesti et al., 2025).

Despite the high prevalence of NCDs, TOGA utilization for NCD prevention and management remains suboptimal. Neither Ranomuut nor Lempuing Primary Health Centers have implemented a structured TOGA-based program targeting NCD control (Rahmayanti & Hargono, 2017). Community members demonstrate limited knowledge regarding NCD risk factors, complications, and appropriate use of medicinal plants. Additionally, community health volunteers became inactive during the COVID-19 pandemic and lacked updated training related to early NCD detection and TOGA utilization (Rocha & Alexandre Weiss, 2019; Adiyasa & Meiyanti, 2021).

Given the increasing burden of NCDs and limited community-based preventive initiatives, there is a critical need to strengthen community capacity through empowerment approaches. Integrating TOGA utilization into NCD prevention aligns with national health policies and local cultural practices (Beaglehole et al., 2021). Training and revitalizing community health volunteers can enhance health literacy, promote self-care behaviors, and support sustainable NCD control at the family and community levels (Handayani et al., 2022).

This community service program (*Pengabdian Masyarakat/PKM*) aims to improve the knowledge and skills of community health volunteers in preventing and managing NCDs through TOGA utilization, to strengthen community participation in early detection and self-care practices, and to develop a replicable TOGA-based community empowerment model for NCD prevention and management.

METHODS

Research Design

This study employed a community-based participatory observational design with a pre-test and post-test approach. The program was implemented as a Community Partnership Program (PKM) focusing on health education, skills training, and mentoring related to non-communicable diseases (NCDs) prevention and the utilization of *Tanaman Obat Keluarga (TOGA).*

Participants

Participants consisted of Pos Pembinaan Terpadu (Posbindu), non-communicable disease patients, and family members registered at Lempuing and Nusa Indah Primary Health Centers, Bengkulu City, Indonesia. The primary targets of the intervention were community health volunteers who played a key role in NCD prevention and monitoring at the community level.

Population and Sampling Technique

The population included community health volunteers and community members involved in NCD services within the service areas of Lempuing and Nusa Indah Primary Health Centers. A total of 30 participants were selected using purposive sampling, based on the following criteria:

1. Registered as active posbindu or community health cadres,
2. Residing in the health center service areas,
3. Willing to participate in all program activities, and
4. Able to attend the complete intervention sessions.

Instruments

Data were collected using the following instruments:

1. A structured pre-test and post-test questionnaire assessing knowledge of TOGA utilization for NCD prevention and management.
2. A general NCD knowledge questionnaire covering causes, risk factors, prevention, and complications.
3. A skill observation checklist evaluating participants' ability to prepare herbal remedies using TOGA.
4. A monitoring and evaluation form documenting attendance, participation, and implementation fidelity.

The questionnaires were developed based on relevant literature and national guidelines. Content validity was reviewed by public health and nursing experts. Reliability testing demonstrated acceptable internal consistency (Cronbach's alpha > 0.70).

Procedures

The program was conducted in three stages:

1. Preparation stage**:** coordination with local government, primary health centers, and identification of cadres.
2. Implementation stage**:** Information, Education, and Communication (IEC) sessions on NCDs and TOGA, followed by training and hands-on demonstrations of herbal preparation and TOGA planting.
3. Mentoring stage**:** refresher training for Posbindu cadres on early detection and monitoring of NCDs, including blood pressure and blood glucose measurement.

The intervention was implemented over a three-month period, including follow-up mentoring.

Analysis Plan

Descriptive statistics were used to summarize participant characteristics. Differences between pre-test and post-test knowledge scores were analyzed using paired t-test. Observation checklist data were analyzed descriptively to assess skill improvement. All analyses were conducted at a 95% confidence level.

Limitations of the Methodology

This study was limited by a relatively small sample size and the absence of a control group, which may limit generalizability. The short duration of follow-up also restricted the assessment of long-term behavioral change and clinical outcomes. However, the participatory approach strengthened community engagement and program feasibility. This manuscript follows the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for reporting observational studies.

RESULTS AND DISCUSSION

Results

The community service program was successfully implemented in Lempuing and Nusa Indah Primary Health Centers with active participation from community health volunteers, patients, and family members. All planned stages, including coordination, education, training, TOGA planting, and

mentoring, were conducted as scheduled. The program was carried out from 20–24 August 2025, beginning with training sessions on the benefits and utilization of *Tanaman Obat Keluarga (TOGA)* for the prevention and management of non-communicable diseases (NCDs) at Lempuing and Nusa Indah Primary Health Centers. On 20–21 September 2025, the program continued with the establishment and planting of TOGA gardens by community health volunteers in designated areas around the health centers and within the community.

The results demonstrated a significant improvement in participants' knowledge regarding the benefits of TOGA for NCD prevention and management. The average pre-test score was 60, which increased to an average post-test score of 78, representing an average increase of 30% in knowledge scores after the intervention. This indicates that the education and training activities were effective in improving participants' understanding of TOGA utilization.

Table 1. Pre-test and Post-test Knowledge Scores

Measurement	Mean Score	Interpretation
Pre-test	60	Moderate
Post-test	78	Good
Increase	+18 points (30%)	Improved

Figure 1. Community service activities with cadres from the Nusa Indah and Lempuing Primary Health Centers, 2025

In addition, community health volunteers demonstrated improved skills in preparing herbal remedies and conducting early detection and monitoring of NCDs, such as measuring blood pressure and identifying early symptoms of disease progression. The establishment of TOGA gardens further strengthened the sustainability of the program by providing continuous access to medicinal plants within the community. These findings support previous studies indicating that community empowerment and the use of locally available resources can enhance health knowledge and promote preventive behaviors. The integration of education, practical training, TOGA planting, and mentoring proved to be an effective strategy for strengthening community capacity in NCD prevention and management. Overall, the program contributed to strengthening the role of community health volunteers and families in NCD control and demonstrated that TOGA-based empowerment is a feasible, culturally appropriate, and sustainable approach for promotive and preventive health efforts in the community.

Discussion

This community service program demonstrates that a structured empowerment approach combining education, skills training, practical demonstration, mentoring, and the utilization of local resources (TOGA) can significantly enhance community capacity in preventing and managing non-communicable diseases (NCDs) (Puspitasari et al., 2021). The increase in participants' knowledge scores and the observed improvement in cadres' skills indicate that the intervention effectively addressed both cognitive and practical dimensions of behavior change (Kuba et al., 2021). The 30% increase in knowledge scores (from a mean pre-test of 60 to a post-test of 78) reflects the effectiveness of participatory learning methods used in this program. Health literacy is a critical determinant of health behavior, and improvements in knowledge are a necessary prerequisite for

behavior change (Kausar et al., 2021). The use of interactive education methods such as discussions, demonstrations, and hands-on practice aligns with adult learning theory, which emphasizes experiential learning as more effective than passive information transfer (Mayor, 2020).

Moreover, the contextualization of educational content to local needs and cultural practices increased its relevance and acceptability. The integration of TOGA, which is familiar and culturally embedded within Indonesian communities, enhanced participant engagement and motivation (Nurbaeti et al., 2023). WHO (2013) and Ministry of Health of Indonesia (2020) emphasize that culturally appropriate interventions are more likely to be accepted and sustained, particularly in primary health care and community-based settings (S. M. Sari et al., 2019). The establishment of TOGA gardens represents an important structural component of the intervention. While education increases knowledge, the availability of resources enables practice (Karamina et al., 2020). The presence of TOGA gardens ensured that participants had continuous access to medicinal plants, reducing dependency on external resources and fostering self-reliance (Malkani et al., 2022). This supports the socio-ecological model of health promotion, which highlights that behavior is influenced not only by individual knowledge but also by environmental and structural factors (Mardiana & Subaidah, 2022).

The strengthened role of community health volunteers (cadres) is another key outcome of this program. Cadres functioned as intermediaries between health services and the community, facilitating health education, monitoring, and follow-up (Perry et al., 2021). Previous studies have shown that trained community health workers can significantly improve early detection, treatment adherence, and preventive behaviors related to NCDs (Beaglehole et al., 2021). In this program, cadres demonstrated improved ability to measure blood pressure, recognize early symptoms, and guide families in the safe use of herbal remedies. The integration of traditional medicine with biomedical monitoring also reflects a holistic approach to health care. Herbal therapies derived from TOGA, when supported by scientific evidence and appropriate guidance, can complement conventional treatment and promote patient-centered care (Nurbaeti et al., 2023). However, it is important that such practices remain aligned with clinical guidelines and are used as complementary rather than substitutive therapies, especially for chronic conditions such as hypertension and diabetes (Adiyasa & Meiyanti, 2021).

Figure 2. Planting of TOGA and Handover to community health cadres

In addition to improving knowledge and skills, this program contributed to increased community participation and ownership of health initiatives. Community involvement in planting, maintaining TOGA gardens, and participating in monitoring activities fostered a sense of responsibility and collective action. Community ownership is a key factor in the sustainability of health interventions (S. M. Sari et al., 2019), suggesting that the impact of this program may extend beyond the immediate implementation period. Despite its positive outcomes, this program has limitations (Suwarno et al., 2022). The relatively small sample size and the short duration of follow-up limit the ability to assess long-term behavioral change and clinical outcomes (Balfas et al., 2025). Future programs should include longer monitoring periods and incorporate objective health indicators, such as changes in blood pressure or blood glucose levels, to strengthen evidence of impact (Puspitasari et al., 2021).

Overall, this program provides empirical support for the effectiveness of community-based, culturally grounded empowerment strategies in NCD prevention and management. The combination of education, practical skills training, environmental support through TOGA gardens, and continuous mentoring of cadres offers a comprehensive model that can be adapted and replicated in other communities with similar characteristics (Adiyasa & Meiyanti, 2021).

Implications

The findings of this community service program indicate that community-based empowerment is an effective approach for strengthening the prevention and management of non-communicable diseases (NCDs) at the primary health care level (Indraloka et al., 2025). The improvement in knowledge and skills among community health volunteers suggests that regular training and mentoring can enhance the capacity of communities to conduct early detection, health promotion, and self-care activities. The integration of *Tanaman Obat Keluarga (TOGA)* into health promotion efforts also demonstrates that culturally appropriate and locally available resources can increase community participation and support the sustainability of interventions, particularly in resource-limited settings (Francis et al., 2024).

Furthermore, the establishment of TOGA gardens provides a practical mechanism for improving household-level access to preventive health resources and promoting self-reliance among families. This approach has the potential to reduce the burden on primary health care facilities by enabling communities to manage minor health problems independently while maintaining appropriate referral for more serious conditions. The program also highlights the importance of collaboration between health centers, local governments, and communities in sustaining empowerment initiatives. Overall, these findings suggest that TOGA-based community empowerment can be considered a viable and scalable strategy for strengthening promotive and preventive health services within existing national programs such as Posbindu and GERMAS.

Research Contribution

This study provides empirical evidence on the effectiveness of integrating community empowerment with the utilization of *Tanaman Obat Keluarga (TOGA)* for the prevention and management of non-communicable diseases (NCDs). The findings demonstrate that a participatory intervention model combining health education, skills training, environmental support through TOGA gardens, and continuous mentoring of community health volunteers can effectively enhance community capacity in NCD control. Methodologically, this study contributes a practical and replicable framework for community-based NCD prevention that can be adapted to other settings with similar socio-cultural characteristics. Furthermore, it enriches the limited literature on the role of traditional medicinal plants in promotive and preventive health strategies, particularly within urban and semi-urban communities in Indonesia. The study also strengthens understanding of how culturally appropriate and locally available resources can improve community engagement, health literacy, and the sustainability of health interventions. Overall, this research contributes to both theory and practice by illustrating the synergistic integration of community empowerment and traditional medicine within primary health care–based NCD control programs.

Limitations

The findings of this community service program indicate that community-based empowerment is an effective approach for strengthening the prevention and management of non-communicable diseases (NCDs) at the primary health care level. The improvement in knowledge and skills among community health volunteers suggests that regular training and mentoring can enhance the capacity of communities to conduct early detection, health promotion, and self-care activities. The integration of *Tanaman Obat Keluarga (TOGA)* into health promotion efforts also demonstrates that culturally appropriate and locally available resources can increase community participation and support the sustainability of interventions, particularly in resource-limited settings.

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Suggestions

To enhance the effectiveness and sustainability of future programs, the following suggestions are proposed:

1. Future studies should involve larger and more diverse samples from different regions to improve the generalizability of the findings.
2. Long-term follow-up is recommended to assess the sustainability of knowledge improvement, behavioral change, and the impact on NCD-related health outcomes.
3. Objective clinical measurements such as blood pressure, blood glucose, and body mass index should be included to strengthen the evaluation of program effectiveness.
4. The inclusion of a control or comparison group is suggested to allow stronger causal interpretation of the intervention effects.
5. Qualitative methods such as in-depth interviews or focus group discussions could be used to explore participants' perceptions, motivations, and barriers related to TOGA utilization.
6. Further research should examine the cost-effectiveness and scalability of TOGA-based empowerment programs within primary health care systems.
7. Policymakers are encouraged to integrate TOGA-based community empowerment into national health promotion initiatives to enhance sustainability and broader implementation.

CONCLUSION

This program demonstrated that empowering community health volunteers through education, training, mentoring, and the use of *Tanaman Obat Keluarga (TOGA)* effectively improved knowledge and capacity for NCD prevention and management. The 30% increase in knowledge scores indicated that the intervention was successful. The integration of TOGA was culturally appropriate, feasible, and sustainable, as it utilized local resources and encouraged community participation. This TOGA-based empowerment model has strong potential to be replicated as a promotive and preventive strategy for NCD control in other communities.

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AUTHOR CONTRIBUTION STATEMENT

AR and DW conceptualized and designed the community service program. AR, DW, RN, EB, and DA were involved in data collection, training implementation, and community mentoring. DW and RN conducted data analysis and interpretation. AR drafted the manuscript, while DW, EB, and DA critically revised the content. All authors read and approved the final manuscript.

AI DISCLOSURE STATEMENT

The authors declare that this research was conceived, conducted, analyzed, written, and edited entirely by the authors without the use of any artificial intelligence (AI) tools or services at any stage of the research or manuscript preparation.

CONFLICT OF INTEREST

The authors declare no conflicts of interest. There are no financial, institutional, or personal relationships that could have influenced the design of the study, data collection, data analysis, interpretation of results, manuscript preparation, or the decision to publish.

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