

Empowering Posyandu Cadres to Improve Community-Based Prevention and Management of Type 2 Diabetes Mellitus

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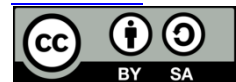
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Abstract

Type 2 diabetes mellitus (T2DM) is a major public health problem with increasing prevalence worldwide, including in Indonesia. Limited public awareness of risk factors, prevention, and early detection contributes to delayed diagnosis and increased complications. This community empowerment program aimed to improve the knowledge and capacity of community members and Posyandu cadres regarding T2DM prevention and early detection through health education and community-based screening. The program was conducted at Kertapati Primary Health Center, Palembang, on 25 and 31 October 2025, involving approximately 50 participants. The intervention consisted of educational lectures, interactive discussions, pre-test and post-test assessments, and health screening, including random blood glucose and waist circumference measurements. Program effectiveness was evaluated by comparing participants' knowledge before and after the intervention. The mean knowledge score increased from 50.58 before the intervention to 77.55 after the intervention, representing a 53.3% improvement. The mean random blood glucose level was 152.5 mg/dL, while the mean waist circumference was 95.05 cm, indicating the presence of metabolic risk factors among participants. This program effectively improved participants' knowledge and awareness of T2DM prevention and early detection. Community empowerment through Posyandu cadres represents a feasible and sustainable strategy for strengthening diabetes prevention at the primary healthcare level.

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A. Introduction

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from insulin resistance, impaired insulin secretion, and

progressive pancreatic β -cell dysfunction. The disease develops through complex interactions among genetic susceptibility, environmental exposures, and unhealthy lifestyle behaviors. As one of the leading non-communicable diseases (NCDs), T2DM substantially increases the risk of microvascular and macrovascular complications, including cardiovascular disease, chronic kidney disease, neuropathy, and retinopathy, which ultimately contribute to premature mortality and reduced quality of life.^{1,2}

The global burden of T2DM continues to rise at an alarming rate. In 2019, approximately 463 million adults worldwide were living with diabetes, representing 9.3% of the global adult population. This number is projected to increase to 578 million by 2030 and reach 700 million by 2045. Indonesia is among the countries with the highest diabetes burden, with an estimated 10 million adults affected, accounting for approximately 6.2% of the adult population. The increasing prevalence of T2DM has become a major public health concern because many individuals remain undiagnosed until complications develop, particularly in developing countries where access to early detection and preventive healthcare remains limited.³

The pathogenesis of T2DM involves progressive impairment of insulin action and insulin secretion. Insulin resistance reduces glucose uptake in skeletal muscle and adipose tissue while increasing hepatic glucose production. Simultaneously, pancreatic β -cell dysfunction progressively decreases insulin secretion, resulting in worsening hyperglycemia. Although genetic predisposition contributes significantly to disease susceptibility, modifiable risk factors such as obesity, physical inactivity, unhealthy dietary habits, smoking, excessive alcohol consumption, and sedentary behavior play dominant roles in disease development. Obesity alone is estimated to contribute to more than half of

¹ Nor Izyani Bahari et al., "Issues and Challenges in the Primary Prevention of Type 2 Diabetes Mellitus: A Systematic Review," *Journal of Prevention* (2022) 44, no. 1 (February 1, 2023): 105–25, <https://doi.org/10.1007/S10935-022-00707-X>.

² Rosette J. Chakkalakal et al., "Test and Treat for Prediabetes: A Review of the Health Effects of Prediabetes and the Role of Screening and Prevention," *Annual Review of Public Health* 45, no. 1 (May 20, 2024): 151–67, <https://doi.org/10.1146/ANNUREV-PUBLHEALTH-060222-023417>.

³ Hong Sun et al., "IDF Diabetes Atlas: Global, Regional and Country-Level Diabetes Prevalence Estimates for 2021 and Projections for 2045," *Diabetes Research and Clinical Practice* 183 (2022): 109119.

T2DM cases, highlighting the importance of lifestyle modification as the primary strategy for disease prevention.^{4,5,6}

Early detection through screening is essential to identify individuals at risk before irreversible complications occur. The American Diabetes Association recommends routine screening for adults aged 45 years and older, or younger adults with one or more risk factors, including overweight or obesity, hypertension, dyslipidemia, family history of diabetes, previous gestational diabetes, impaired glucose regulation, or cardiovascular disease. Screening methods such as fasting plasma glucose (FPG), random blood glucose (RBG), glycated hemoglobin (HbA1c), and oral glucose tolerance tests are effective for identifying prediabetes and diabetes. Among these methods, FPG and RBG measurements are relatively simple, inexpensive, and feasible for community-based screening programs.⁷

In Kertapati District, Palembang, rapid urbanization and population mobility have contributed to lifestyle changes characterized by reduced physical activity, unhealthy dietary patterns, and increased psychological stress, all of which elevate the risk of T2DM. Preliminary surveys, interviews with community leaders and primary healthcare personnel, and focus group discussions with community health volunteers (Posyandu cadres) revealed increasing numbers of T2DM cases accompanied by limited public awareness regarding risk factors, prevention strategies, and the importance of early screening. Although community health posts are widely available, resources for chronic disease prevention, including glucometers, educational materials, and structured training programs, remain limited. Community health volunteers (Posyandu cadres) represent valuable community-based health resources because they maintain close relationships with local residents and are widely trusted as health promoters. However, their training has traditionally focused on maternal and child health services, with limited emphasis on non-

⁴ Unai Galicia-Garcia et al., "Pathophysiology of Type 2 Diabetes Mellitus," *International Journal of Molecular Sciences* 21, no. 17 (2020): 6275; Karly Pippitt, Marlana Li, and Holly E. Gurgle, "Diabetes Mellitus: Screening and Diagnosis," *American Family Physician* 93, no. 2 (January 15, 2016): 103-9, <https://www.aafp.org/afp/2016/0115/p103>; Pouya Saeedi et al., "Global and Regional Diabetes Prevalence Estimates for 2019 and Projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th Edition," *Diabetes Research and Clinical Practice* 157 (November 1, 2019), <https://doi.org/10.1016/j.diabres.2019.107843>.

⁵ Pippitt, Li, and Gurgle, "Diabetes Mellitus: Screening and Diagnosis."

⁶ Saeedi et al., "Global and Regional Diabetes Prevalence Estimates for 2019 and Projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th Edition."

⁷ International Diabetes Federation, "IDF Diabetes Atlas 10th," Brussels, Belgium: International Diabetes Federation., 2021, <https://idf.org/news-and-resources/resources/idf-diabetes-atlas-2021/>.

communicable disease prevention, including T2DM. Strengthening the capacity of Posyandu cadres through education, practical screening skills, and continuous mentoring may improve community awareness, facilitate early identification of individuals at risk, and promote healthier lifestyles. Such an approach is expected to strengthen primary healthcare services while extending the reach of preventive interventions at the household level.⁸

Based on these considerations, a community empowerment program was conducted to enhance the knowledge and practical competencies of Posyandu cadres regarding T2DM prevention and management. The program combined educational activities, hands-on training in diabetes risk assessment and blood glucose screening, and continuous mentoring to enable cadres to provide health education, promote healthy behaviors, identify high-risk individuals, and encourage timely referral to primary healthcare facilities. Ultimately, this community-based intervention aims to improve public awareness, support early detection of T2DM, and contribute to reducing the burden of diabetes through sustainable community participation.

B. Method

This community service program employed a community-based participatory approach to strengthen the capacity of community health volunteers (Posyandu cadres) in the prevention and early detection of type 2 diabetes mellitus (T2DM). The program was conducted in the working area of Kertapati Primary Health Center (Puskesmas Kertapati), Palembang, Indonesia, targeting the limited public awareness of T2DM prevention and the insufficient capacity of Posyandu cadres in non-communicable disease management. The activities were initiated in August 2025 following administrative preparation, proposal development, and collaboration with the local primary healthcare center.

Prior to implementation, the project team coordinated with the management of Puskesmas Kertapati to obtain institutional approval and establish collaborative agreements. Initial meetings were held with healthcare personnel and Posyandu cadres to

⁸ World Health Organization, "WHO Guidelines on the Prevention and Management of Diabetes," *Geneva: World Health Organization.*, 2022. Margaret A. Powers et al., "Diabetes Self-Management Education and Support in Adults With Type 2 Diabetes: A Consensus Report of the American Diabetes Association, the Association of Diabetes Care & Education Specialists, the Academy of Nutrition and Dietetics, the American Academy...", *Diabetes Educator* 46, no. 4 (August 1, 2020): 350–69, <https://doi.org/10.1177/0145721720930959>; WEBSITE:WEBSITE:SAGE;JOURNAL:JOURNAL:TDEB;WGROUP:STRING:PUBLICATION. Nuha A. Elsayed et al., "Improving Care and Promoting Health in Populations: Standards of Care in Diabetes—2023," *Diabetes Care* 46, no. Supplement_1 (January 1, 2023): S10–18, <https://doi.org/10.2337/DC23-S001>.

introduce the objectives, expected outcomes, implementation schedule, and roles of each stakeholder. Community health volunteers participated in organizing community members, scheduling activities, and facilitating communication between the project team and local residents.

The intervention was implemented through five sequential phases. The first phase consisted of program socialization, during which meetings were conducted with Posyandu cadres and healthcare personnel to ensure a common understanding of the program objectives, implementation procedures, and expected outcomes. Commitment from all stakeholders was established before the intervention began.

The second phase involved capacity-building training for Posyandu cadres. Training sessions covered the basic concepts of T2DM, risk factors, prevention strategies, early detection methods, proper use of screening equipment including glucometers and body mass index (BMI) assessment, effective health education and communication techniques, as well as manual and digital documentation procedures. A training module was developed as the primary educational resource. Participants completed knowledge assessments immediately before and after the training using structured pre-test and post-test questionnaires to evaluate changes in knowledge.

The third phase consisted of community health education activities delivered by the project team with active involvement of the trained Posyandu cadres. Educational sessions focused on increasing community awareness regarding T2DM risk factors, healthy lifestyle practices, early symptoms, and the importance of regular screening. Educational materials included printed leaflets and booklets designed to facilitate knowledge transfer and encourage healthy behavioral changes. Community participants also completed pre-test and post-test questionnaires to evaluate improvements in knowledge following the educational intervention.

Appropriate technology was incorporated into the program to facilitate community-based screening and health promotion. The technology package included portable glucometers for random blood glucose measurement, body mass index assessment, standardized diabetes risk screening forms, and educational materials such as leaflets and booklets. Prior to capillary blood glucose testing, all participants were informed about the purpose and procedure of the examination, and verbal informed consent was obtained from each participant before the finger-prick procedure was performed. These tools enabled

Posyandu cadres to conduct basic screening activities independently while improving the effectiveness and coverage of health education within the community.

Following the training and distribution of screening equipment, the project entered the mentoring and evaluation phase. Continuous mentoring was provided for three months through direct supervision during Posyandu activities, regular discussions with cadres, and technical assistance from the project team. Monitoring visits were conducted at the fourth, eighth, and twelfth weeks after training. During each visit, observations were performed to assess the implementation of screening activities, accuracy of documentation, and the cadres' ability to deliver health education. Screening records were compiled and reviewed, while qualitative feedback was collected through interviews and discussions with cadres and healthcare personnel to identify challenges and opportunities for program improvement.

The sustainability of the program was promoted through a train-the-trainer approach that enabled trained cadres to disseminate knowledge to other volunteers within their communities. A coordination group was established to strengthen communication among cadres and healthcare personnel from Puskesmas Kertapati. In addition, a Type 2 Diabetes Mellitus Prevention Guidebook was provided to support continuous health promotion activities and facilitate the integration of diabetes prevention into routine Posyandu services.

The target participants consisted of 50 individuals, including community members and Posyandu cadres from the Kertapati Primary Health Center service area. Posyandu cadres actively participated throughout program planning, implementation, monitoring, and evaluation, while Puskesmas Kertapati provided technical supervision, training facilities, and support for community screening activities.

Program effectiveness was evaluated using both quantitative and qualitative approaches. Quantitative evaluation included attendance records, comparisons of pre-test and post-test knowledge scores, and documentation of community screening activities conducted by the cadres. Qualitative evaluation consisted of direct observations, interviews, focus group discussions with Posyandu cadres, and feedback from healthcare personnel to assess program implementation, participant satisfaction, and the feasibility of sustaining the intervention within routine community health services.

C. Results and Discussion

Implementation and Evaluation of the T2DM Community Empowerment Program

A community empowerment program focusing on the prevention and management of type 2 diabetes mellitus (T2DM) was conducted at Kertapati Primary Health Center (Puskesmas Kertapati), Palembang, on 25 and 31 October 2025. Approximately 50 participants, consisting of community members and Posyandu cadres from the Kertapati Primary Health Center service area, attended the program. Registration began at 08:00 a.m., followed by the official opening ceremony conducted by the Head of Puskesmas Kertapati. The program received strong support from healthcare personnel, community leaders, and participants, reflecting the community's interest in strengthening diabetes prevention and early detection initiatives. The stakeholders also expressed their expectation that similar educational activities would continue regularly with different health topics or advanced diabetes-related materials.

Preparation Phase

The preparation phase involved close collaboration between the project team and Puskesmas Kertapati. The healthcare center provided the venue and logistical support, while the project team prepared educational materials and audiovisual equipment, including a laptop and LCD projector. A structured educational module was developed covering the definition, etiology, risk factors, clinical manifestations, diagnosis, early detection, screening methods, disease monitoring, complications, treatment, and prevention of T2DM. The activity flow consisted of an opening session, educational lecture, interactive discussion, question-and-answer session, and program evaluation.

The educational intervention was delivered from 09:00 a.m. to 12:00 p.m. Before the educational session, participants completed a pre-test questionnaire to assess their baseline knowledge regarding T2DM. The moderator initiated the session by facilitating a discussion to identify participants' existing knowledge, attitudes, and practices related to diabetes prevention and early detection.

The educational session was delivered by Dr. Desi Oktariana, M.Biomed., using PowerPoint presentations and simple, easy-to-understand language. The topics included the definition of T2DM, risk factors, disease etiology, signs and symptoms, diagnostic criteria, screening methods, disease monitoring, complications, treatment options, and preventive strategies. Following the presentation, participants actively engaged in interactive discussions and question-and-answer sessions moderated by the facilitator. At the conclusion of the session, the moderator summarized the key messages and reinforced the importance of healthy lifestyles and regular diabetes screening. The program officially

concluded at 12:00 p.m. with a closing ceremony and group documentation.

In addition to health education, participants underwent community-based health screening, including random blood glucose measurement and waist circumference assessment. These screening activities provided immediate feedback regarding participants' metabolic health status while increasing awareness of diabetes risk factors.

Program effectiveness was evaluated using observations, interactive discussions, question-and-answer sessions, and comparisons between pre-test and post-test knowledge scores. Participants demonstrated active involvement throughout the educational sessions and were able to answer questions regarding the definition, risk factors, symptoms, diagnosis, complications, prevention, and early detection of T2DM more accurately after the intervention.

The mean pre-test knowledge score was 50.58, with scores ranging from 10 to 90. Following the educational intervention, the mean post-test score increased to 77.55, with scores ranging from 60 to 100, representing a 53.3% improvement in average knowledge. These findings indicate that the health education program effectively improved participants' understanding of T2DM prevention and early detection.

Community screening also identified several participants with metabolic risk factors. The average random blood glucose level was 152.5 mg/dL, while the mean waist circumference was 95.05 cm. These findings suggest that a considerable proportion of participants may have elevated cardiometabolic risk and would benefit from further medical evaluation and continuous lifestyle interventions. The screening activity therefore served not only as an educational component but also as an opportunity for early identification of individuals at risk of T2DM.



Figure 1. Community Health Education

The discussion and evaluation sessions further demonstrated that participants were able to recognize common diabetes symptoms, identify modifiable risk factors, explain the

importance of routine blood glucose screening, and understand preventive behaviors such as healthy eating, regular physical activity, weight control, and smoking cessation. Small-group discussions also enabled participants to share their experiences and identify barriers to adopting healthier lifestyles within their communities.



Figure 2. Health Education for Posyandu Cadres

Implications of Community Empowerment for T2DM Prevention

The substantial improvement in post-test knowledge indicates that community-based health education remains an effective strategy for improving diabetes literacy among community members and Posyandu cadres. Educational interventions delivered using interactive methods, simple language, and culturally appropriate communication facilitate better understanding and retention of health information. The active participation observed during discussions suggests that community engagement plays an important role in strengthening health promotion programs.^{9,10,11}

The implementation of community screening complemented the educational activities by allowing participants to directly assess their diabetes risk. The average random blood glucose level of 152.5 mg/dL and the mean waist circumference of 95.05 cm indicate the presence of important metabolic risk factors among participants. Although these measurements alone cannot establish a diagnosis of diabetes, they provide valuable

⁹ Desi Oktariana et al., "Edukasi Pencegahan Diabetes Melitus Tipe 2 Pada Masyarakat," *Jurnal Abdimas ADPI Sains Dan Teknologi* 5, no. 3 (September 30, 2024): 11–18, <https://doi.org/10.47841/SAINTEK.V5I3.412>.

¹⁰ Desi Oktariana et al., "BLOOD GLUCOSE TEST FOR DM TYPE 2," *Conferences of Medical Sciences Dies Natalis Faculty of Medicine Universitas Sriwijaya* 3, no. 1 (December 9, 2021): 123–28, <https://doi.org/10.32539/CONFMEDNATALISUNSRI.V3I1.79>.

¹¹ Christian Bommer et al., "The Global Economic Burden of Diabetes in Adults Aged 20–79 Years: A Cost-of-Illness Study," *The Lancet Diabetes & Endocrinology* 5, no. 6 (June 1, 2017): 423–30, [https://doi.org/10.1016/S2213-8587\(17\)30097-9](https://doi.org/10.1016/S2213-8587(17)30097-9).

opportunities for identifying individuals who require further clinical assessment and follow-up at primary healthcare facilities. Similar community-based screening programs have demonstrated that combining health education with simple screening methods increases community awareness and promotes earlier utilization of healthcare services.¹²

Empowering Posyandu cadres is a sustainable strategy for strengthening primary healthcare services in Indonesia. Because cadres are trusted members of the community, they are well positioned to deliver health education, encourage healthy lifestyle behaviors, identify individuals at high risk, and facilitate referrals to primary healthcare centers. The positive collaboration between the project team, Puskesmas Kertapati, and community volunteers throughout this program demonstrates the feasibility of integrating diabetes prevention into routine Posyandu activities.¹³

Overall, this community empowerment program successfully increased participants' knowledge regarding T2DM prevention and early detection while providing practical experience in community-based diabetes screening. Continued mentoring of Posyandu cadres, regular health education sessions, and integration of diabetes screening into routine community health services are recommended to sustain the program and contribute to reducing the burden of T2DM in the Kertapati community.

D. Conclusion

The community empowerment program on type 2 diabetes mellitus (T2DM) prevention conducted at Kertapati Primary Health Center was successfully implemented and well received by community members and Posyandu cadres. The educational intervention significantly improved participants' knowledge regarding T2DM risk factors, early detection, prevention, and management, as reflected by higher post-test scores. Community-based education combined with simple health screening represents an effective strategy to increase diabetes awareness and supports the strengthening of sustainable diabetes prevention efforts at the primary healthcare level through the active involvement of Posyandu cadres.

E. Acknowledgements

¹² Juliana C.N. Chan et al., "The Lancet Commission on Diabetes: Using Data to Transform Diabetes Care and Patient Lives," *The Lancet* 396, no. 10267 (December 19, 2020): 2019–82, [https://doi.org/10.1016/S0140-6736\(20\)32374-6](https://doi.org/10.1016/S0140-6736(20)32374-6).

¹³ Edward W. Gregg et al., "Improving Health Outcomes of People with Diabetes: Target Setting for the WHO Global Diabetes Compact," *The Lancet* 401, no. 10384 (April 15, 2023): 1302–12, [https://doi.org/10.1016/S0140-6736\(23\)00001-6](https://doi.org/10.1016/S0140-6736(23)00001-6).

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F. Author Contributions Statement

All authors contributed substantially to the conception and design of the community service program, data collection, implementation of the intervention, data analysis and interpretation, manuscript preparation, critical revision of the manuscript, and approval of the final version for publication.

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