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Empowering Communities to Recognize Diabetic Complications Through Self-Assessment in Surabaya, Indonesia

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ABSTRACT Diabetes mellitus is a chronic metabolic disease that is frequently accompanied by preventable complications, which substantially increase morbidity, mortality, and healthcare burden, particularly when early detection and self-monitoring are inadequate. Limited community awareness and insufficient self-assessment skills among people with diabetes contribute to delayed recognition of risk factors such as hypertension, obesity, hyperglycemia, and dyslipidemia. This community service activity aimed to empower individuals with diabetes and community members through education and self-assessment training to enhance early recognition and prevention of diabetic complications. The program employed a community-based empowerment approach conducted at the Menur Pumpungan Village Hall, Surabaya, involving 20 participants comprising patients with diabetes, health cadres, community leaders, and family members. The intervention consisted of registration, basic health examinations (including blood pressure, body mass index, blood glucose, cholesterol, uric acid levels, and foot condition assessment), structured health education using a self-assessment module, practical demonstrations, participant re-demonstrations, and evaluation of knowledge outcomes. The results showed that 60% of participants had systolic blood pressure ≥130 mmHg, 20% had diastolic blood pressure ≥100 mmHg, 55% were classified as overweight or obese (BMI >25), and nearly half exhibited blood glucose and cholesterol levels ≥200 mg/dL, indicating a considerable risk of diabetic complications. Post-education evaluation demonstrated an improvement in participants' knowledge regarding complication prevention and interpretation of self-assessment results. In conclusion, community empowerment through structured education and self-assessment training effectively increased awareness and knowledge related to diabetic complication risks. Continuous education, periodic evaluation, and sustained collaboration between healthcare providers, community cadres, and patients are essential to strengthen self-management practices and reduce the progression of diabetes-related complications.

INDEX TERMS Diabetes mellitus, Diabetic complications, Community empowerment, Self-assessment, Health education.

I. INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia and represents a major global public health concern. The increasing prevalence of diabetes worldwide has been closely linked to urbanization, lifestyle changes, and population aging, particularly in low- and middle-income countries [1]. Diabetes is associated with various long-term complications, including cardiovascular disease, neuropathy, nephropathy, retinopathy, and diabetic foot disorders, which significantly reduce quality of life and increase health-care costs [2]. In Indonesia, diabetes is one of the most prevalent non-communicable diseases and contributes substantially to morbidity and disability, especially in urban settings where preventive practices remain suboptimal [3]. National health surveys indicate that many individuals with diabetes experience delayed detection of complications due to limited awareness and inadequate self-monitoring behaviors [4].

Recent developments in diabetes management have shifted the focus from purely clinical treatment toward patient-centered and community-based approaches that emphasize empowerment and self-management [5]. Self-management education has been recognized as a cornerstone of diabetes care, enabling individuals to actively participate in monitoring their condition and preventing complications [6]. Self-assessment strategies, such as routine measurement of blood glucose, blood pressure, body mass index, lipid profiles, and foot condition, have been shown to improve patients' understanding of their health status and encourage early preventive actions [7]. Evidence suggests that individuals who are able to interpret basic health indicators are more likely to engage in appropriate self-care behaviors and seek timely medical attention [8].

Community empowerment has emerged as an effective strategy to support diabetes self-management, particularly in resource-limited and urban community settings [9]. Programs involving community health workers, cadres, and family members have demonstrated positive outcomes in improving knowledge, adherence to preventive behaviors, and early identification of complication risks [10]. Family involvement further strengthens diabetes management by providing emotional support and reinforcing daily self-care practices [11]. These approaches are consistent with international recommendations that promote participatory and preventive models to address the growing burden of diabetes and its complications [12].

However, several research gaps remain. Many community-based diabetes programs primarily focus on health education through information delivery, with limited emphasis on practical self-assessment skills and hands-on training [13]. In addition, integrated interventions that combine health screening, structured education, and practical demonstrations within community settings are still limited, particularly in Indonesia [14], [15]. Studies evaluating the effectiveness of such integrated empowerment models in improving early recognition of diabetic complication risks among community members are scarce [16], [17].

Therefore, this study aimed to empower community members in Surabaya, Indonesia, to recognize the risk of diabetic complications through structured health education and self-assessment training. The intervention integrated basic health examinations with interactive educational sessions and practical demonstrations to enhance participants' awareness and preventive capacity [18], [19], [20]. This study offers several contributions.

1. Provides empirical evidence on the feasibility of community-based self-assessment empowerment for diabetes complication prevention
2. Highlights the importance of integrating screening activities with education to improve early risk recognition
3. Proposes a replicable community empowerment model that can be implemented by primary health care providers and community cadres.

The remainder of this article is organized as follows. Section II describes the methods of the community empowerment program, Section III presents the results, Section IV discusses the findings in relation to previous studies and practical implications, and Section V concludes the paper with recommendations for future community-based diabetes prevention initiatives [20].

II. METHOD

This chapter describes the methodological framework used to implement and evaluate the community-based empowerment program aimed at improving early recognition of diabetic complication risks. The methods are presented systematically to ensure transparency and replicability, including the study design, setting, participant selection, intervention materials, data collection procedures, analytical approach, and ethical considerations.

A. STUDY DESIGN AND RASIONALE

This study employed a community-based prospective descriptive design with a pre-post evaluation approach. The design was selected to assess changes in participants' awareness and understanding of diabetic complication risks following a structured self-assessment education program. A prospective design allows for systematic observation of outcomes after the intervention while maintaining feasibility and ethical suitability in a community empowerment context [21]. The study was non-experimental and non-randomized, as the primary objective was program implementation and evaluation rather than hypothesis testing under controlled conditions. This approach is commonly applied in community health education and non-communicable disease prevention studies [22].

B. STUDY SETTING

The study was conducted at the Menur Pumpungan Village Hall, Surabaya, Indonesia. This location was purposively selected because it serves as a central community facility frequently used for health promotion activities and is located in an urban area with a high prevalence of non-communicable diseases. All educational sessions, health examinations, and evaluations were carried out on-site to ensure accessibility and participant convenience. The setting allowed standardized delivery of the intervention and facilitated coordination with local community leaders and health cadres [23].

C. STUDY POPULATION AND SAMPLING

The study population consisted of community members with diabetes mellitus or at risk of diabetes, including patients, family members, health cadres, and local community representatives. A purposive sampling method was used to recruit participants who met the inclusion criteria. Inclusion criteria were: (1) adults aged ≥18 years, (2) residence in the Menur Pumpungan area, (3) willingness to participate in health screening and educational activities, and (4) ability to communicate verbally. Individuals with severe illness or cognitive impairment were excluded.

A total of 20 participants were enrolled, which is considered adequate for descriptive community-based education programs aimed at skill development and awareness improvement [24]. The sample was not randomized, as all eligible and willing participants attending the activity were included to maximize community engagement.

D. INTERVENTION DESIGN AND IMPLEMENTATION FRAMEWORK

The educational intervention was designed based on a community empowerment and self-management framework for diabetes prevention. Materials included a self-assessment module, printed educational leaflets, audiovisual presentation slides, and basic medical equipment. Health examination tools consisted of a digital sphygmomanometer, glucometer, cholesterol meter, uric

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acid meter, weighing scale, height measurement device, and foot assessment checklist.

The intervention was implemented in sequential stages: participant registration, baseline health assessment, structured health education, practical demonstrations, participant re-demonstrations, and evaluation. Educational content covered diabetes complications, interpretation of self-assessment results, and preventive strategies such as lifestyle modification and routine monitoring. Demonstrations focused on proper techniques for measuring blood glucose, blood pressure, body mass index, and foot self-examination [25], [26].

E. DATA COLLECTION INSTRUMENTS AND PROCEDURES

Data collection involved basic health screening forms, self-assessment checklists, and knowledge evaluation sheets. Health screening forms recorded blood pressure, body mass index, blood glucose levels, cholesterol levels, uric acid levels, and foot condition findings. Knowledge evaluation sheets were administered before and after the educational session to assess participants' understanding of diabetic complications and self-assessment practices.

All measurements were conducted by trained facilitators following standardized procedures to ensure consistency and accuracy. Educational sessions were delivered using interactive lectures and demonstrations, followed by participant practice under supervision. Data were recorded immediately after measurement and verified for completeness [27].

F. DATA ANALYSIS

Data analysis was conducted using descriptive statistical methods. Numerical data from health screenings were summarized using frequencies, percentages, and categorical classifications based on clinical reference values. Knowledge evaluation results were compared descriptively between pre- and post-intervention assessments to identify changes in participants' understanding. Inferential statistical analysis was not applied due to the small sample size and non-experimental design, consistent with recommendations for community service-based health evaluations [28].

G. ETHICAL CONSIDERATIONS

Ethical principles of voluntary participation, confidentiality, and beneficence were strictly observed. Participants received clear explanations regarding the purpose and procedures of the activity and provided verbal informed consent prior to participation. No personal identifiers were included in the data records. The study adhered to ethical guidelines for community-based health research and health education activities [29], [30].

III. RESULT

Characteristic Data

This SC activity was attended by 20 people from Menur Pumpungan Village, consisting of 4 Great Surabaya Cadres, two community leaders, two family members of DM patients, and 12 DM patients. The data on the characteristics of this community service program consisted of age, gender, systolic blood pressure, diastolic blood pressure, blood sugar levels, and cholesterol levels. Data on systolic blood pressure showed that 60% of participants had a ≥ value of 130 mmHg, while 20% had a diastolic blood pressure ≥ 100 mmHg. Data on BMI from 20 participants showed 55% had a BMI of more than 25. The blood sugar and cholesterol level data showed that some results had a value of ≥ 200 mg/dL (Table 1). The data needs to receive attention and vigilance, so that the development of complications can be prevented or slowed down.

TABLE 1
Characteristics of Community Service Participants in Menur Pumpungan Village, Surabaya

Characteristics	Frequency	Percentage
Age (years)		
< 60	13	65
≥ 60	7	35
Gender		
Man	5	25
Woman	15	75
Systolic Blood Pressure (mmHg)		
< 130	8	40
≥ 130	12	60
Diastolic Blood Pressure (mmHg)		
< 100	16	80
≥ 100	4	20
BMI		
18.5 - 24.9	9	45
25 - 29.9	6	30
≥ 30	5	25
Blood sugar level (mg/dl)		
< 200	11	55
≥ 200	9	45
Cholesterol level (mg/dl)		
< 200	10	50
≥ 200	10	50

A basic health examination, including measurements of height, body weight, waist circumference, blood glucose levels, and cholesterol levels, is illustrated in FIGURE 1. The process of educational delivery and evaluation related to self-assessment of diabetic complication risk is presented in FIGURE 2.

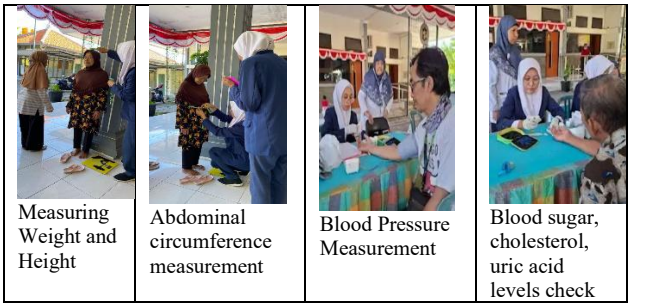

FIGURE 1 Simple Health Services

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Education


Interpretation of examination results


Evaluation

FIGURE 2 Education, Interpretation, and Evaluation

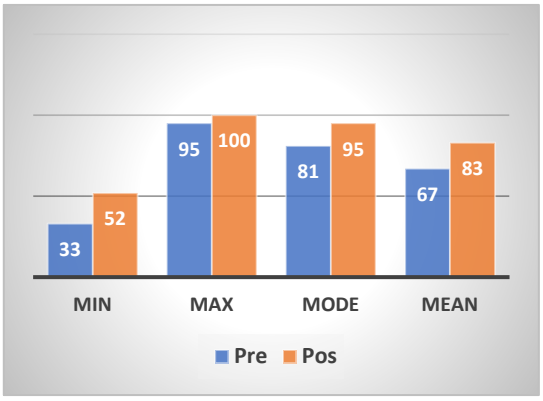

FIGURE 3 Minimum, Maximum, Mode, and Average Values of Knowledge Before and After Education

Changes in participants' knowledge scores regarding the prevention of diabetic complications before and after the educational intervention are presented in FIGURE 3. Following the education session, the minimum, maximum, mode, and mean scores showed an overall increase compared with the pre-education results.

IV. DISCUSSION

The findings of this community-based empowerment program demonstrate that a structured self-assessment education intervention can enhance participants' awareness and knowledge related to the prevention of diabetic complications. The baseline health examination revealed that a considerable proportion of participants exhibited elevated blood pressure, increased body mass index, and high blood glucose and cholesterol levels, indicating a substantial risk of developing diabetes-related complications. These results are consistent with epidemiological evidence showing that uncontrolled metabolic and cardiovascular risk factors remain prevalent among individuals with diabetes and those at risk, particularly in urban communities [31].

Following the educational intervention, an improvement in knowledge scores related to diabetic complication prevention was observed, as reflected by increases in minimum, maximum, mode, and mean scores. This improvement suggests that the combination of basic health screening, structured education, and practical demonstrations facilitated better understanding of risk factors and self-monitoring practices. Educational strategies that incorporate experiential learning, such as demonstrations and re-demonstrations, have been shown to enhance comprehension and retention of health-related information compared with didactic approaches alone [32]. The ability of participants to interpret their own health measurements may foster a sense of ownership and responsibility toward disease prevention, which is a key element of effective diabetes self-management [33].

Moreover, the integration of community health cadres and family members in the intervention may have contributed to the positive outcomes. Social support and community engagement play a critical role in reinforcing health behaviors and sustaining lifestyle modifications among individuals with chronic conditions [34]. By situating the intervention within a familiar community setting, the program reduced barriers to participation and encouraged open discussion regarding health concerns. These findings support the notion that community empowerment approaches are particularly suitable for addressing non-communicable diseases, such as diabetes, where long-term self-care is essential [35].

The results of this study align with previous research demonstrating the effectiveness of community-based diabetes education programs in improving knowledge and self-care behaviors. Several studies have reported that diabetes self-management education significantly enhances patients' understanding of disease processes and complication risks, leading to improved preventive practices [36], [37]. Similar to the present findings, community interventions that incorporate health screening and education have been associated with increased awareness of cardiovascular and metabolic risk factors [38]. However, this study differs from some previous interventions in its emphasis on self-assessment skills rather than solely on knowledge transmission. While many educational programs focus on dietary counseling or medication adherence, fewer studies have explicitly trained participants to measure and interpret basic health indicators independently [39]. The inclusion of practical self-assessment components in this program may explain the observed improvements in post-education knowledge scores. This approach is consistent with recent recommendations advocating for skill-based education to enhance diabetes self-efficacy and long-term disease control [40].

In contrast to randomized controlled trials that report measurable clinical outcomes, such as reductions in glycated hemoglobin or blood pressure, this study primarily focused on knowledge improvement and early risk recognition. Although some studies have demonstrated significant clinical improvements following intensive education programs [41], such outcomes often require longer follow-up periods and more comprehensive interventions. The present study's short-term, community-based design prioritizes feasibility and scalability, which may be more appropriate for primary prevention initiatives in resource-limited settings [42].

Cultural and contextual factors may also influence the effectiveness of community empowerment programs. Previous studies conducted in different sociocultural environments have reported varying levels of participant

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engagement and outcome magnitude [43]. The positive response observed in this study may be attributed to the involvement of local leaders and cadres, which enhanced trust and cultural relevance. This highlights the importance of adapting diabetes education interventions to local contexts to maximize impact [44].

Despite its strengths, this study has several limitations that should be considered when interpreting the findings. First, the small sample size limits the generalizability of the results. Although the number of participants was sufficient for a descriptive community empowerment program, larger studies are needed to confirm the effectiveness of the intervention across diverse populations. Second, the non-randomized and non-experimental design restricts the ability to establish causal relationships between the intervention and observed improvements in knowledge. Future studies employing controlled or quasi-experimental designs may provide stronger evidence [45].

Third, the evaluation focused primarily on short-term knowledge outcomes rather than long-term behavioral changes or clinical indicators. While improved knowledge is an essential prerequisite for behavior change, it does not necessarily translate into sustained self-care practices. Longitudinal studies are needed to assess whether self-assessment education leads to lasting improvements in lifestyle behaviors, metabolic control, and complication prevention [46]. Additionally, self-reported measures may be subject to response bias, which could affect the accuracy of knowledge assessments.

Despite these limitations, the findings have important implications for public health practice and diabetes prevention strategies. The study demonstrates that simple, low-cost interventions combining basic health screening with self-assessment education can be feasibly implemented in community settings. Such programs may serve as an effective entry point for early detection of risk factors and prompt referral to health services [47]. The empowerment of community members to monitor and interpret their own health indicators aligns with global strategies emphasizing preventive care and community participation in non-communicable disease control [48].

Furthermore, this model has potential implications for primary health care systems, particularly in urban areas with limited resources. By engaging community health cadres and leveraging existing community infrastructure, health promotion activities can be expanded beyond clinical settings. This approach may reduce the burden on health facilities while strengthening community capacity for chronic disease management [49]. Policymakers and health practitioners may consider integrating self-assessment education into routine community health programs to enhance early prevention of diabetic complications [50].

V. CONCLUSION

This study aimed to empower community members in Surabaya, Indonesia, to recognize the risk of diabetic complications through structured health education and self-assessment training integrated with basic health screening. The findings indicate that a substantial proportion of participants presented with risk factors associated with diabetes-related complications, including elevated systolic blood pressure (≥130 mmHg in 60% of participants), diastolic blood pressure ≥100 mmHg (20%), overweight or obesity based on body mass index (55%), and increased blood glucose and cholesterol levels (approximately 45–50% with values ≥200 mg/dL). These results highlight the considerable burden of modifiable metabolic and cardiovascular risks within the community. Following the educational intervention, participants demonstrated measurable improvements in knowledge related to diabetic complication prevention, as evidenced by increases in the minimum, maximum, mode, and mean post-education knowledge scores compared with baseline assessments. The observed improvement suggests that the integration of practical self-assessment skills with interactive education effectively enhances participants' understanding of risk factors and preventive measures. Although the intervention was not designed to evaluate long-term behavioral or clinical outcomes, the findings underscore the potential value of community-based empowerment strategies in facilitating early recognition of diabetic complication risks. Future studies should involve larger and more diverse populations, incorporate randomized or quasi-experimental designs, and include longer follow-up periods to assess sustained behavioral changes and clinical indicators such as glycemic control, lipid profiles, and blood pressure. In addition, further research is warranted to evaluate the scalability and cost-effectiveness of integrating self-assessment education into routine primary health care and community health programs. Strengthening collaboration between health professionals, community health cadres, and families may further enhance the effectiveness of such interventions and contribute to the long-term prevention and reduction of diabetes-related complications.

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DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

Anita Joeliantina contributed to the conceptualization and design of the study, coordination of the community-based

intervention, data collection and analysis, and drafting of the manuscript. Irfany Nurul Hamid contributed to the development of educational materials, implementation of the self-assessment education program, and revision of the manuscript. Sri Hardi Wuryaningsih contributed to community coordination, supervision of field activities, and critical review of the manuscript. Jujuk Proboningsih contributed to data collection, monitoring of program implementation, and final manuscript editing. All authors read and approved the final manuscript.

DECLARATIONS

ETHICAL APPROVAL

Information is not availabel.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests

VI. REFERENCES

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