



Empowering communities: Education for hypertension and diabetes prevention

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ABSTRACT

Hypertension and diabetes serve as significant risk factors for cardiovascular disease. Nutrition education plays a pivotal role in both preventing and managing these conditions. By promoting healthy eating behaviors and encouraging regular exercise, nutrition education can significantly reduce the likelihood of developing these chronic diseases and enhance overall health outcomes. The volunteering project's primary objective is to enhance knowledge about hypertension and diabetes to prevent and manage these conditions in Sepaku, Penajam Paser Utara, East Kalimantan, while also understanding the underlying causes of hypertension and diabetes. Implementation involves conducting lectures utilizing PowerPoint presentations, facilitating discussions, and conducting measurements of glucose levels, blood pressure, weight, and height. Before and after nutrition education, measurements of knowledge about hypertension and diabetes were conducted, with paired t-test analysis. The result of the activity is that participants gained significant information and increased their knowledge about the causes, prevention and treatment of hypertension and diabetes. Therefore, the importance of regular activities in increasing awareness in the prevention and treatment of hypertension and diabetes.

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1. INTRODUCTION

Non-communicable diseases (NCDs) are the primary cause of death and morbidity worldwide, putting tremendous strain on patients and their families (Bukhman et al., 2020; NCD Countdown 2030 Collaborators, 2018). Nearly two-fifths of NCD-related deaths in low- and middle-income countries (LMICs) involve individuals under the age of 70. Low- and middle-income nations account for four-fifths of NCD cases (World Health Organization, 2021; Vos et al., 2020). Cardiovascular diseases, accounting for 17.9 million deaths each year, stand out as the primary culprit, followed closely by cancer (9.3 million), chronic respiratory diseases (4.1 million), and diabetes (2.0 million, encompassing deaths related to diabetes-induced kidney disease) (World Health Organization, 2021). Interestingly, there is a significant global aim regarding noncommunicable diseases, which involves decreasing the prevalence of hypertension by 33 percent from 2010 to 2030. Approximately 1.28 billion adults aged between 30 and 79 worldwide are affected by hypertension, with the majority (two-thirds) residing in low- and

middle-income nations ([World Health Organization, 2023](#)). Indonesia has a similar trends also, that 73 percent of deaths are related to NCDs ([World Health Organization, 2018](#)). The third highest risk factors for NCDs in Indonesia are current tobacco smoking, obesity, and raised blood pressure ([World Health Organization, 2018](#)).

The new national capital city of Indonesia (or Ibu Kota Nusantara - IKN), is located in Penajam Paser Utara, East Kalimantan ([Kementrian Sekretariat Negara Republik Indonesia, 2022](#)). Binuang Village, Sepaku, Penajam Paser Utara, is part of the IKN. Based on preliminary studies, hypertension and diabetes are the most prevalent non-communicable diseases in Binuang Village. According to interviews with the hamlet head of Binuang village, there are still numerous cases of noncommunicable diseases such hypertension and diabetes mellitus. Therefore, prevention and management programs for hypertension and diabetes should be implemented in Binuang Village. All cadres of the Polindes (village maternity facility) in Binuang village, which is part of the PKK (family health empowerment) group, are involved in this activity. The cadres discovered that public awareness of attending to the community health center was still quite low. The community's excitement for taking an active participation in prior activities is still insufficient for solving the issue of non-communicable diseases in Binuang Village.

Based on the problems that exist in Binuang Village, it is critical to conduct early detection of blood pressure and blood sugar levels. This is intimately tied to people's diet and exercise habits. Furthermore, efforts will be made to increase understanding of the potential and determinants of hypertension and diabetes mellitus in order to increase community capacity for initiatives to prevent non-communicable diseases.

A review study found that nutrition stands as the primary modifiable lifestyle factor influencing non-communicable conditions, such as chronic pain ([Elma et al., 2022](#)). New recommendations also have been developed based on a comprehensive review of literature dating back to 2018. These recommendations place greater emphasis on addressing social determinants of health, improving the healthcare system, and promoting physical activity, including sleep ([Davies et al., 2022](#)). Additionally, there is now a stronger emphasis on integrating weight management and nutritional strategies into the holistic approach to managing diabetes and hypertention ([Simões Corrêa Galendi et al., 2022](#)).

Analyzing evidence from over 300 studies reveals that effective nutrition education focuses on behavior/action alongside theory, research, and practice integration ([Luesse et al., 2018](#)). Program design can follow a logic model: Inputs include resources and needs analysis, outputs consist of activities within the three components, and outcomes are short, medium, or long-term impacts, evaluated using appropriate designs and instruments. Nutrition education programs that integrate research, theory, and practice tend to be more effective ([Luesse et al., 2018](#)). In addition, a study involving 1040 participants (aged 18-75) in England found a significant association between nutrition knowledge and 'healthy eating' behaviors, such as adequate intake of fruits and vegetables ([Wardle et al., 2000](#)). In fact, individuals with higher knowledge were 25 times more likely to consume sufficient amounts of fruits and vegetables on a daily basis. An increasing nutrition knowledge was found also for both groups (100 cases with diagnosed type 2 diabetes, 101 controls without diagnosed diabetes) after nutrition intervention ([Fitzgerald et al., 2008](#)).

Research efforts should focus on enhancing understanding of the mechanisms underlying vulnerability, improving detection tools, and enhancing the effectiveness of intervention studies, alongside addressing the specific needs of older individuals. For instance, prioritizing the maintenance of adequate nutritional status to combat age-related increases in undernutrition or sarcopenic obesity is essential ([Feart, 2019](#)).

A study found that knowledge and attitudes increased after nutrition education, but no association was found with practice (Machalani et al., 2022). Increased knowledge was also observed among type 2 diabetes patients (Bukhsh et al., 2018). Therefore, this community service focuses on increasing knowledge to prevent and manage hypertension and type 2 diabetes.

In Indonesia, nutrition education was held in Samarinda (Wisnuwardani et al., 2023) and Malang (Paramita et al., 2022). These intervention significantly increase the knowledge of participants (Paramita et al., 2022; Wisnuwardani et al., 2023). Therefore, it is essential to integrate dietary enhancements and behavioral adjustments into hypertension and diabetes management strategies.

This community service program aims to raise the public's knowledge of hypertension and diabetes mellitus, as well as detect blood sugar and blood pressure levels in the community to establish the follow-up activities needed to solve these issues.

2. METHODS

The outreach approach is used to implement community service in Binuang Village, which involves presenting presentation material followed by a question-and-answer session. An evaluation approach will be used before and after the information is delivered, using a pre-test and post-test to determine the level of public knowledge about hypertension and diabetes mellitus. An examination approach will be used to do public health checks, such as measuring blood pressure and blood sugar.

Location

The community service took place in Binuang village, situated in the Sepaku District, Penajam Paser Utara Regency, East Kalimantan Province. It spans an area of 2.39 km², bordered by Pemaluan Subdistrict to the North, Maridan Subdistrict to the South, Telemow Village to the East, and Pemaluan Subdistrict to the West. Polindes cadres from Binuang Village are the partners in this community service program. Apart from cadres, PKK women also participated in the event. The target audience for the activity is the entire population aged 40 and above who have a higher risk of hypertension and diabetes. Most of the visitors are individuals registered with the village's elderly integrated health post (*Posyandu Lansia*).

Tools and Materials

The issue that prompted this action was identification. The initial phase of this community initiative involved engaging with the cadre in Binuang Village, Penajam Paser Utara, located in East Kalimantan. Subsequently, we identified the underlying issue, collaborated with the community, and public figure to pinpoint its root cause, and collectively devised a solution. The specifics of this arrangement are discussed below.

Problems Identification

According to interviews with the hamlet head of Binuang village, there are still numerous cases of non-communicable diseases such as hypertension, stroke, diabetes mellitus, cholesterol, and gout. Drawing from both community surveys and secondary data analysis conducted in Binuang Village, it has been revealed that hypertension and diabetes are the most prevalent non-communicable diseases

in the area. In September 2023, community leaders participated in problem identification activities. Consequently, there is a pressing need for the implementation of strategies aimed at preventing and managing hypertension and diabetes within Binuang Village. The specifics of these implementation measures are elucidated in Figure 1.

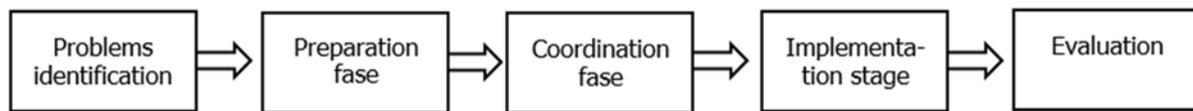


Figure 1. Community service implementation

Preparation Stage

Community engagement initiatives are integrated into the planning phase and continue throughout the entirety of the process. This stage involves the collaboration of students, academic institutions, community leaders, public figures, and cadres in coordinating the community engagement efforts. The preparation stages were completed in early October 2023. Each member of the team is responsible for preparing materials that will be presented following each activity. Additionally, the team is tasked with developing and replicating questionnaires to be utilized in community engagement projects.

Coordination Fase

Recently, the team spearheaded educational initiatives in collaboration with the village head and the leaders of the health cadres. During this phase, both the team and the health cadres evaluate the duration of the health education sessions, ascertain the necessary equipment, and determine the criteria for selecting participants for these educational activities. The coordination phase was carried out one week before implementation.

Implementation Stage

The participation of the head of the wellness cadres, the village head and community in recent nutrition educational activities organized by the organization is noteworthy. The nutrition education was involved 32 audiences and 10 commite members, and conducted on 12 October, 2023 During this phase, all participants evaluate various aspects such as the definition, prevention and managing hypertension and diabetes. The tools used in this activity are LCD screens, laptops, digital weight scales, digital tensimeters, microtoises, digital blood sugar levels.

Evaluation

The success of community service is contingent upon the effective implementation of activities, the acquisition and application of knowledge, the facilitation of assistance to participants, and the engagement of both service providers and beneficiaries. Therefore, the evaluation of this community service encompasses the execution of activities, the involvement of both participants and implementers, and the enhancement of participant knowledge. The data on characteristics, consumption pattern, daily Activities and knowledge were obtained from a self-administered questionnaire filled out by the participants. The data analysis employs either a paired t-test (for normally distributed data) or a Wilcoxon test (for non-normally distributed data).

3. RESULTS DAN DISCUSSION

Results

The community service implementation in Binuang Village includes: (1) Nutrition Education; (2) Anthropometric Measurements; (3) Blood Pressure Measurement; (4) Blood Sugar Level Measurement; (5) Nutrition Consultation and Physical Activity.

Nutrition education

All participants receive an explanation about diseases and how to prevent and manage hypertension and diabetes using PowerPoint presentations. The session starts with introductions of the resource person, the team, and the audience. Then, the audience can ask questions about their health. After addressing the audience's health concerns, the resource person explains methods for preventing and managing hypertension, and the audience takes notes. Following the explanation, there is a discussion, where participants share their experiences in managing hypertension and diabetes (Figure 2). The link is available at: https://bit.ly/CommService_Sepaku_PPT



Figure 2. Activities to provide education related to hypertension and diabetes mellitus

Anthropometric measurements

Body weight and height are measured to assess the nutritional status of the participants. Body weight is measured using a digital scale (in kilograms), and height is measured using a microtoise (in centimeters).

Blood pressure measurement

Blood pressure is measured using a digital blood pressure monitor branded OMRON model HEM-8712. Measurements are taken twice, and the average of both readings is recorded (Figure 3).

Blood sugar level measurement

Blood sugar levels are measured using Benecheck blood glucose strips and a Benecheck multi-meter for cholesterol/glucose and urine acid. Trained personnel collect blood samples using these tools (Figure 3).

Nutrition consultation and physical activity

After receiving anthropometric measurements, hypertension status, and blood sugar levels, participants proceed to the consultation table to discuss suitable diets and physical activities. Each participant receives examination results and recommendations for food consumption and physical activity agreed upon during the consultation (Figure 3).



Figure 3. Process of measuring blood pressure, blood sugar, and consultation

Table 1. Characteristic participants distribution

| Variable (1) | Amount (N) (2) | Percentage (%) (3) |
|--------------------------|----------------|--------------------|
| Age (years) | | |
| 45-59 | 26 | 81.3 |
| 60-69 | 5 | 15.6 |
| 70-79 | 1 | 3.1 |
| BMI | | |
| Underweight | 1 | 3.1 |
| Normal | 8 | 25 |
| Risk of obesity | 5 | 15.6 |
| Obesity 1 | 14 | 43.8 |
| Obesity 2 | 4 | 12.5 |
| Lastest Education | | |
| No School | 4 | 12.5 |
| Elementary School | 11 | 34.4 |
| High School First | 6 | 18.8 |
| High School | 9 | 28.1 |
| Graduate | 1 | 3.1 |
| Package C | 1 | 3.1 |
| Employment | | |
| Housewives | 21 | 65.6 |
| Teacher | 1 | 3.1 |
| Kader | 4 | 12.5 |
| Retirement | 1 | 3.1 |
| Garden Farmers | 4 | 12.5 |
| Private | 1 | 3.1 |
| Income | | |
| < UMR | 32 | 100 |
| Tribe | | |
| Banjar | 1 | 3.1 |
| Bugis | 6 | 18.8 |
| Jawa | 8 | 25 |
| Kaeli | 1 | 3.1 |
| Kutai | 3 | 9.4 |
| Mamuju | 1 | 3.1 |
| Mandar | 1 | 3.1 |
| Paser | 8 | 25 |
| Toraja | 3 | 9.4 |
| Blood Pressure | | |
| Normal | 9 | 28.1 |
| Hypertension | 23 | 71.9 |
| Glucose | | |
| Normal | 10 | 31.3 |
| Diabetes | 22 | 68.8 |

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The majority of participants were aged 45-59 years (81.3 percent), with 43.8 percent classified as Obesity Class 1. Most were housewives (65.6 percent), from Java (25 percent), and had an elementary school education (34.4 percent). All participants had a total income below the regional minimum wage. The most common non-communicable diseases were hypertension (71.9 percent) and type 2 diabetes (68.8 percent). Details of the participants' characteristics are presented in Table 1.

Lifestyles such as food consumption, exercise and physical activity greatly affect health. Half of the participants consumed sweet, salty and fatty foods. Most participants did not exercise and did physical activities (Table 2).

Table 2. Distribution Frequency of Consumption Pattern and Daily Activities

| Variable (1) | Amount (N) (2) | Percentage (%) (3) |
|---------------------|-----------------------|---------------------------|
| Sweet food | | |
| No | 18 | 56.3 |
| Yes | 14 | 43.8 |
| Sugar food | | |
| No | 16 | 50 |
| Yes | 16 | 50 |
| Fat Food | | |
| No | 16 | 50 |
| Yes | 16 | 50 |
| Sports | | |
| No | 18 | 56.3 |
| Yes | 14 | 43.8 |

Significant knowledge enhancement was observed following nutrition education, resulting in a remarkable 51.27 percent increase (Figure 4). All respondents comprehended the prevention of hypertension and diabetes mellitus, with a 100 percent accuracy rate. However, only 40.6 percent of participants accurately answered questions regarding hypertension (Table 3).

Table 3. Correct answers of knowledge questions before and after the intervention

| Knowledge | Percentage (%) | |
|--|-----------------------|--------------|
| | Before | After |
| Understanding hypertension | 18.8 | 40.6 |
| Causes of Diabetes Mellitus | 12.5 | 53.1 |
| Cause of hypertension | 50 | 75 |
| Prevention of hypertension and diabetes mellitus | 71.9 | 100 |
| Food consumption to prevent hypertension and diabetes mellitus | 90.6 | 100 |

Discussion

Implementation of community service activities in Binuang Village, Sepaku District, including education about the prevalence of hypertension and diabetes mellitus (DM), in order to increase community knowledge for preventive measures and noncommunicable disease control. Blood pressure and blood sugar levels were measured in the community in order to early detect the incidence of hypertension and diabetes mellitus. Outreach initiatives to the surrounding community, which are backed by local partners such as Polindes Binuang, are an important first step toward creating a healthy and empowered neighborhood.

Community characteristic, blood pressure, blood sugar levels, consumption pattern, and daily activities

Based on the results of real-time measurements and interviews obtained after the counseling was carried out, it can be seen from the aspect of community characteristics that the pre-elderly age is dominant in this community service activity. Aside from that, the majority of people have only completed elementary school, work as housewives, are ethnic Javanese, and many are obese. The age of participants in community service activities can influence their degree of basic knowledge. Middle-aged and older persons have greater knowledge than young adults, which is due to improved reading efficiency (Soederberg Miller, 2009). However, it cannot be denied that young adults will find it easier to get the most recent knowledge by utilizing new technologies to boost their insight. Even though the elderly are a vulnerable age group for the development of hypertension and diabetes mellitus, there is a need for comprehensive education for all age groups because lifestyle has a role in the long-term consequences of a disease. The educational level aspect is also directly tied to a person's knowledge; the higher the level of knowledge, the higher the level of knowledge held (Damayanti & Sofyan, 2022). Aside from that, the labor component of parents is dominated by housewives with inadequate understanding, which is prompted by a variety of causes such as poor information and education (Pangestika, 2022). Ethnic characteristics will influence behavior which has an impact on the level of knowledge (Nurachma, 2019).

The increasing number in obesity cases is mostly due to changes in food intake patterns, which increase but are not complemented by adequate physical activity. Obesity has also spread to rural communities with low economic levels. People in Binuang Village exhibit a balanced preference for eating sweet, salty, and fatty foods, which is also seen in their behavior. The residents in Binuang Village still have relatively low sports habits, which enhance this issue. Dietary and exercise habits also have a significant influence in the prevalence of non-communicable diseases. Food consumption habits and the prevalence of diabetes mellitus and elevated blood pressure are significantly correlated (Römling & Qaim, 2011). People in Binuang Village exhibit a balanced predilection for eating sweet, salty, and fatty foods, which is also seen in their behavior. The residents in Binuang Village still have relatively low sports habits, which aggravate this issue. Aspects of diet and activity patterns also have an important role in the incidence of non-communicable disease. There is a significant relationship between food consumption patterns and the incidence of diabetes mellitus and increased blood pressure (Asyumdah et al., 2020; Harianto, 2020). The same thing also happens in aspects of exercise habits that are significantly related to the incidence of diabetes mellitus and the incidence of hypertension (Arofah et al., 2015; Putriastuti, 2016).

Meanwhile, in the aspect of early detection of hypertension and blood sugar levels, it was found in this activity that the people who attended showed a predominance of hypertension and the potential for diabetes mellitus (DM). There is a significant relationship between the incidence of hypertension and a risk factor for DM (Oktaviyani et al., 2022). Thus, in order to lower the likelihood of cases of non-communicable diseases, there is a need for efficient techniques, such as raising nutritional knowledge, counseling, or education, which can be coupled with different programs that support physical activity, especially for women (Römling & Qaim, 2011).

The increase community knowledge level before and after providing education

Table 3 illustrate how the 12 percent increase is related to knowledge about what constitutes hypertension, what causes DM and hypertension, what steps can be taken to prevent the occurrence

of DM and hypertension, and how eating fruit can help prevent DM and hypertension. People's views will be impacted by how well-informed they are about health issues and how much effort they put into preventing illness (Irya & Saragih, 2022). As a result, it's critical to foster social mobilization within the community to raise involvement levels in local problem-solving and the accomplishment of shared objectives (World Health Organization, 2003). It is impossible to separate the importance of local community support from the community service program that is implemented in order to raise the standard of good health. An educational program for the early diagnosis of non-communicable diseases in Binuang Village is one of the social mobilization initiatives.

It is necessary to implement preventive measures that can be carried out by the community after providing education and early detection of noncommunicable diseases, such as increasing public awareness, particularly among those who have reached elderly status, conducting regular checkups, and reducing consumption of high-sugar and salt foods. Participants join physical activity events organized by the local community to prevent illness, especially noncommunicable diseases.

Meanwhile, during the process of organizing community service activities, there are several factors that support the smooth running of the program, including stakeholder support, namely the village head and Binuang Polindes cadres. This makes the implementation easier in terms of location and helpful human resources. The active role of the community, which is fully involved in a series of outreach, measurements, and interviews carried out. There is program integration with local locations, making it easier to administer, and community service mechanisms that are in line with the vision and mission of Binuang Village. Internal support from the Faculty of Public Health, Mulawarman University, in the form of funding and human resources that facilitate all community service activities, especially in the area around the IKN.

In addition to encouraging elements, several kinds of community service programs have discouragements, such as the majority of community service participants are older, and in order to maximize the effectiveness of control efforts, we hope that early detection can also reach the productive age of society. Accessibility of the location, the community service location's affordability, its distance from Sepaku City's center, and poor road conditions may cause a range of individuals to visit the location of the activity.

4. CONCLUSION AND RECOMMENDATIONS

This community service program aims to enhance knowledge within the Binuang Village community, located in Sepaku, Penajam Paser Utara, as part of the IKN (the new national capital city of Indonesia), regarding the prevention and management of hypertension and diabetes mellitus. The program's objective is for participants to understand the definitions of hypertension and diabetes, as well as their prevention and management. The program is structured into two stages: implementation and evaluation. Success factors include access to equipment and facilities, available space, partner involvement, and community support. The program's outcomes include increased knowledge following nutrition education sessions. The aim is for communities around the nation's capital, Nusantara, to actively engage in preventing and managing hypertension and diabetes mellitus, leading to healthier, more productive, and self-sufficient communities.

Long-term and continuous nutrition education is vital to assist individuals in preventing and managing diabetes mellitus and hypertension, enabling them to lead healthy lives. It is crucial to establish an established Posyandu, led by individuals from the community and for the community, alongside addressing numerous other non-communicable diseases. To ensure the sustainability of

this program, partners need ongoing mentoring and monitoring. Additionally, the program should be monitored in collaboration with other partners or external stakeholders to gauge the broader response to the implementation of completed community service initiatives. These partners can provide valuable insights into overlapping needs and demands.

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