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Community-Based Early Detection of Non-Communicable Diseases Through Laboratory Screening in Kersanagara Village

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ABSTRACT

Non-communicable diseases (NCDs) are among the leading causes of mortality worldwide, including in Indonesia. Early detection through laboratory based health screening can help identify the risk of NCDs at an early stage. This community based program aimed to improve early detection and awareness of non-communicable diseases (NCDs) through integrated health education and laboratory screening in Kersanagara Village, Tasikmalaya. Unlike previous programs that focused on specific age groups, this intervention targeted a mixed community population and incorporated locally tailored education with direct screening services. The program was conducted through stages of problem identification, planning, implementation, and evaluation. A total of 20 participants underwent examinations including hemoglobin, cholesterol, uric acid, blood glucose, and blood pressure measurements. The results showed that 100% of participants had normal hemoglobin levels. Cholesterol levels were normal in 90% and high in 10% of participants. Uric acid levels were normal in 70%, high in 25%, and low in 5%. Blood glucose levels were normal in 75% and high in 25%, while 15% of participants were identified with hypertension. These findings indicate that although most participants were within normal ranges, a considerable proportion showed early risk indicators for NCDs. The integration of education and screening proved effective in increasing awareness and encouraging preventive behavior. This approach highlights the importance of community-based screening as a practical strategy for early detection and long-term NCD prevention.

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INTRODUCTION

Non-communicable diseases (NCDs) have become the leading cause of global morbidity and mortality, replacing the dominance of communicable diseases over the past decades. Changes in modern lifestyles, such as unhealthy dietary patterns, lack of physical activity, and increased stress levels, are major risk factors contributing to the rising incidence of NCDs in many countries, including Indonesia (Beaglehole et al., 2011). This highlights that preventive efforts and public education regarding healthy lifestyles are essential to reduce the incidence of NCDs in the future.

The lack of public awareness regarding the importance of regular health check-ups remains a major challenge in controlling NCDs. Most individuals tend to seek medical examination only when symptoms have become severe, resulting in diseases often being detected at an advanced stage. Therefore, preventive measures through laboratory-based health screening play a crucial role in identifying risk factors early and preventing more serious complications (Erista Nai & Wulandari, 2024). In fact, many non-communicable diseases can be prevented or effectively managed if detected early through simple laboratory tests, such as blood glucose, cholesterol, uric acid, and blood pressure measurements. These examinations provide an initial overview of an individual's metabolic condition and serve as a basis for medical decision-making as well as lifestyle modifications.

However, limited access to healthcare services, low health literacy, and the common perception that medical check-ups are only necessary when one is ill remain major barriers to the widespread implementation of early detection in the community (Kabir et al., 2022).

Failure to undergo regular blood glucose screening may lead to delayed diagnosis of diabetes mellitus, which increases the risk of chronic complications such as kidney damage (nephropathy), blindness (retinopathy), non-healing wounds, and even amputation (Canfell et al., 2022; Kroll et al., 2015). Similarly, undetected low hemoglobin levels (anemia) can reduce immune function, cause chronic fatigue, decrease concentration, and limit productivity, particularly among individuals of working age and pregnant women.

Elevated and unmonitored cholesterol levels are a major risk factor for coronary heart disease and stroke. Without screening, this condition is often asymptomatic and is therefore referred to as a "silent killer." Meanwhile, high uric acid levels may lead to joint inflammation (gout arthritis), severe pain, and, in the long term, kidney damage. Equally important, unrecognized high blood pressure (hypertension) can trigger various serious complications, including heart attack, stroke, and heart failure (Dalbeth et al., 2016).

The location of this community service activity was selected based on a preliminary survey conducted to identify areas with a high need for improving community health. One of the selected locations was Kersanagara Village, located in Cibeureum District, Tasikmalaya City. According to the 2023 Kersanagara Village Profile data, the population of this area is 6,410 people, the majority of whom are of productive age and elderly groups that are particularly vulnerable to non-communicable diseases (NCDs).

Kersanagara has limited access to health information and preventive services, despite its relatively close proximity, approximately 2 kilometers to the Kersanagara Community Health Center (UPTD Puskesmas Kersanagara). This healthcare facility serves as a primary care center providing basic health examinations, immunization services, and health education programs. However, limitations in healthcare personnel and the suboptimal implementation of promotive and preventive programs have resulted in low utilization of these services by the local community, particularly in terms of disease prevention. The

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urgency of this activity is based on the need to increase public awareness of healthy lifestyles, disease prevention, and the adoption of behaviors that support environmental health. According to the 2023 report from the Kersanagara Community Health Center, the highest morbidity rates in this area are attributed to hypertension, diabetes mellitus, and acute respiratory infections (ARI), with a 12% increase in cases compared to the previous year. Additionally, cases of undernutrition among the elderly and children remain relatively high. The lack of education on healthy lifestyles constitutes a significant issue. Many community members are not fully aware of the importance of healthy behaviors, such as balanced nutrition, maintaining personal and environmental hygiene, and engaging in regular physical activity. The limited availability of health education programs at the village level further exacerbates this situation, making the community more vulnerable to preventable diseases such as heart disease, diabetes, and infections. Therefore, education-based interventions through this community service activity are expected to contribute positively to improving the health status of the Kersanagara community.

Various community service initiatives have previously been conducted to enhance awareness and prevention of non-communicable diseases (NCDs). For example, (Nugrahaeni et al., 2023). Conducted health screenings among the elderly in Wonolelo Village, Bantul, revealing that 51.4% of participants had hypertension and 9% had elevated blood glucose levels. This activity demonstrated that education and screening can improve the elderly's knowledge regarding NCD prevention. Similarly, Erista Nai & Wulandari (2024) organized routine health examinations under the “PATIN” program in Lorog Village, Tawangsari, involving 135 participants. The results showed that 31% of participants had hypertension and 8% had high blood glucose levels, highlighting the importance of routine check-ups for early detection of NCDs. However, most of these community service activities have focused on specific age groups, such as the elderly or young adults, and have not specifically targeted communities in areas with limited access to healthcare services. In addition, the approaches used tend to be general and do not fully consider local characteristics and the specific needs of the community.

Despite numerous community-based NCD screening programs, most interventions have primarily targeted specific groups, such as the elderly, and have not fully addressed communities with limited access to healthcare services. In addition, many programs rely on general approaches without adapting to local characteristics or integrating education with screening activities. Therefore, there is a need for a more contextual and participatory approach that combines health education with laboratory-based screening tailored to community needs [t4.1]. Furthermore, this program will integrate health education on healthy lifestyles with basic health examinations, such as blood pressure and blood glucose measurements, to enhance awareness and early detection of NCDs within the community. By adopting a locally tailored approach and encouraging active community participation, this initiative is expected to make a meaningful contribution to improving awareness and prevention of NCDs in Kersanagara Village.

The implementation of this community service activity is expected to provide sustainable benefits by increasing public awareness of the importance of healthy lifestyles and early detection of non-communicable diseases through health screening activities. Basic laboratory examinations will be conducted as an initial screening to map the community’s health status and to serve as a basis for planning further interventions in collaboration with local healthcare service units. In the long term, this program is designed to promote sustainability through the active involvement of health cares and local healthcare providers in delivering education and conducting routine monitoring. Thus, health screening will not be a one-time activity but will become part of a continuous community health monitoring program. In addition, the community will be encouraged and assisted to make better use of available healthcare services in the Kersanagara Village area, Cibeureum District, Tasikmalaya City.

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Therefore, this community service activity aims to evaluate the effectiveness of laboratory-based health screening and education in improving early detection and awareness of NCDs in Kersanagara Village.

METHOD

This study employed a community-based descriptive intervention design to evaluate the effectiveness of integrated health education and laboratory screening [t5.1]. The implementation of this community service activity was carried out through five main stages:

- Problem Identification

The activity began with a preliminary observation through surveys and interviews with village officials, neighborhood leaders (RT/RW), and several community representatives in RT 003 RW 002, Kersanagara Village. The aim was to assess the community's health condition and identify priority needs for intervention.

- Program Planning

The implementation team developed intervention strategies and methods based on the findings from the initial assessment. This stage included determining the schedule, target participants (20 community members ranging from adults to the elderly, consisting of 11 females and 9 males), types of activities, and task distribution among the team members.

- Activity Implementation

The activities were conducted in the village hall and consisted of the following components:

- ✓ Health Education: Educational sessions were delivered by lecturers from the Diploma III Medical Laboratory Technology Program, Universitas Bakti Tunas Husada. The materials covered healthy lifestyles, the importance of regular health check-ups, and the prevention of non-communicable diseases.
- ✓ Demonstration: The team demonstrated proper handwashing techniques, self-monitoring of blood pressure, and how to read nutritional labels on food packaging. These demonstrations were conducted by students under the supervision of lecturers.
- ✓ Health and Laboratory Examinations: The instruments used in this study were standardized point-of-care testing devices, which have been widely validated for community-based screening. To ensure data reliability, all measurements were conducted under the supervision of trained laboratory professionals following standard operating procedures [t6.1]. The assessments included blood pressure measurement, hemoglobin level, total cholesterol level, uric acid level, and blood glucose level. Blood samples were collected using a capillary (finger-prick) method with validated point-of-care testing devices and test strips. For cholesterol examination, participants were instructed to fast for at least 9–12 hours before blood collection to ensure more accurate results. Each participant received their written results, which were explained directly during the activity. All participants provided informed consent before participation.

- Monitoring and Evaluation

The team conducted observations on participant engagement, technical challenges, and feedback regarding the educational materials. Evaluation was performed using pre-test and post-test assessments

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to measure participants' understanding of the provided information. The data were analyzed descriptively using frequency and percentage distributions.

- Reporting and Follow-up

All activities were documented and analyzed for the preparation of the final report. The team also developed recommendations for program sustainability, including the involvement of local health cadres to ensure the continuation of educational activities independently within the community.

This community service activity involved 20 participants from RT 003 RW 002, consisting of adults and elderly individuals. The majority were adults (18 participants; 90%), while elderly participants accounted for 2 individuals (10%). Based on gender, female participants were predominant, with 15 individuals (75%), compared to 5 male participants (25%). Descriptive analysis was used to provide an initial overview of community health status and to identify early risk patterns of NCDs in a small population setting.

RESULTS AND DISCUSSION

TABLE 1. Frequency Distribution of Laboratory Examination Results

Examination	Category	Frequency	Percentage (%)
Hemoglobin	Normal	20	100
Cholesterol	High	1	10
	Normal	19	90
Uric Acid	High	5	25
	Normal	14	70
	Low	1	5
Blood Glucose	High	5	25
	Normal	15	75
Blood Pressure	High	3	15
	Normal	17	85

Note: No "low" category results were found for blood pressure and blood glucose.

Based on the hemoglobin examination results in Table 1 of 20 community respondents in RT 003 RW 002, Kersanagara Village, all respondents (100%) had hemoglobin levels within the normal range. No cases of either high or low hemoglobin levels were identified in the examined group. This indicates that the hemoglobin status of the community falls within a safe range and does not suggest the presence of anemia or polycythemia.

The normal hemoglobin reference values used in this examination were as follows: 13–17 g/dL for males, 12–15 g/dL for females, 11–14 g/dL for pregnant women, and 11–15 g/dL for children (Beaglehole et al., 2011). These findings represent a positive indicator, suggesting that the community has a good hemoglobin status, which plays an essential role in maintaining immune function and oxygen transport capacity in the blood. Nevertheless, regular monitoring remains necessary to ensure stability, particularly among vulnerable groups such as pregnant women, children, and the elderly. Previous research (Jane Ling et al., 2023; Turon et al., 2023) indicates that rural areas with adequate access to nutritious food and proper sanitation tend to have a lower prevalence of anemia.

The results of cholesterol level examination showed that the majority of respondents (19 individuals; 90%) had normal cholesterol levels, while only 1 respondent (10%) was found to have elevated

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cholesterol levels (>200 mg/dL). This suggests that most participants have lipid profiles within a safe range and are not at high risk for cardiovascular diseases due to dyslipidemia.

High cholesterol is a major risk factor for coronary heart disease, stroke, and other metabolic disorders. Since this condition is often asymptomatic in its early stages, early detection through routine screening is essential. The identified case of elevated cholesterol requires follow-up through education on low saturated fat diets, increased physical activity, and regular monitoring to prevent progression into chronic conditions (Bhuiyan et al., 2024). Studies have shown that hypercholesterolemia is significantly associated with increased cardiovascular risk, particularly when accompanied by obesity and hypertension. The combination of these factors can accelerate atherosclerosis and impair blood flow, thereby increasing the likelihood of cardiovascular events (Kroll et al., 2015). Prevention strategies include non-pharmacological approaches such as dietary modification, increased physical activity, and stress management, while pharmacological interventions (e.g., statins or fibrates) may be considered for high-risk individuals based on medical recommendations (Canfell et al., 2022; Kabir et al., 2022).

The results of the uric acid examination indicated that most participants were within the normal range, reflecting relatively good metabolic status. This finding is positive, as it suggests that some community members have adopted relatively healthy dietary patterns and lifestyles, particularly in limiting high-purine intake that may trigger hyperuricemia. However, continued education and periodic monitoring are necessary as reinforcement to maintain these healthy behaviors, especially in regulating dietary intake and physical activity to prevent metabolic disorders and complications such as gout, arthritis, and kidney dysfunction (Karan et al., 2024).

Elevated uric acid levels can lead to hyperuricemia, which may cause joint pain, inflammation (gout arthritis), and long-term kidney damage if not properly managed. Conversely, excessively low uric acid levels may also indicate other metabolic disturbances requiring medical attention. This highlights the importance of educating the community on maintaining a balanced diet, limiting high-purine foods such as organ meats and certain seafood, and ensuring adequate hydration. Through screening activities, individuals with abnormal uric acid levels can be identified early and encouraged to seek further medical consultation, thereby minimizing the risk of complications (Dalbeth et al., 2016).

FIGURE 1. Activity Documentation

Based on random blood glucose examination results among 20 respondents, the majority (75%) had normal glucose levels, while 25% showed elevated levels, indicating a risk of hyperglycemia. As the examination was conducted without fasting preparation, the results reflect random blood glucose levels influenced by recent dietary intake (Bhuiyan et al., 2024).

These findings indicate the need for further education regarding dietary patterns, sugar intake control, and early detection of metabolic disorders. Regular glucose monitoring is recommended as part of preventive efforts against type 2 diabetes mellitus, particularly through community-based screening

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programs (Christe et al., 2020). Elevated blood glucose levels may serve as an early indicator of prediabetes or type 2 diabetes mellitus. If left undetected and unmanaged, this condition can lead to chronic complications such as neuropathy, visual impairment, cardiovascular disease, and kidney disorders. Therefore, individuals identified with high glucose levels should be encouraged to adopt lifestyle modifications, including low-sugar diets, increased physical activity, and follow-up examinations at healthcare facilities. This screening plays a crucial role as a preventive measure in identifying at-risk individuals early, allowing more effective control before severe clinical symptoms develop (Murray et al., 2020).

Blood pressure examination results showed that 17 respondents (85%) had normal blood pressure, while 3 respondents (15%) were identified as hypertensive. This finding underscores the importance of education and early detection, as hypertension is often asymptomatic yet poses a high risk of complications such as coronary heart disease, stroke, and kidney failure if left untreated (Ngaruiya et al., 2022).

Hypertension is often referred to as a "silent killer" because it typically presents without symptoms in its early stages but can lead to severe complications such as stroke, heart attack, kidney failure, and vascular damage if not properly managed. Therefore, early detection through blood pressure screening is a crucial step in preventing and controlling cardiovascular diseases.

Promotive and preventive approaches are key strategies in hypertension control, particularly through health education, increased physical activity, and regular blood pressure monitoring at the community level. Healthcare services such as community health centers play a vital role in facilitating routine screening and educating the public about risk factors and early management (Turon et al., 2023). These findings highlight the importance of regular blood pressure monitoring, especially for individuals with risk factors such as advanced age, obesity, smoking habits, physical inactivity, and excessive salt intake. Individuals identified with hypertension are advised to seek further medical care and consistently adopt healthier lifestyles.

In terms of healthy behavior practices, it was found that before the educational intervention, most community members had not consistently practiced proper handwashing with soap, had unbalanced dietary habits, and frequently smoked indoors. After the education and demonstration sessions, approximately 65% of participants began adopting proper handwashing practices, particularly before meals and after using the toilet, and demonstrated increased awareness of the importance of balanced nutrition. Although challenges remain in reducing indoor smoking habits, there was improved awareness, particularly among pregnant women and the elderly, regarding the importance of maintaining a clean and smoke-free home environment. Additionally, there was an increased interest in routine health check-ups, which were previously often avoided unless illness occurred.

Overall, the findings indicate that the majority of participants were in relatively good health condition; however, a notable proportion showed early signs of metabolic risk, particularly in blood glucose and uric acid levels. This suggests the presence of potential risk clustering within the community, which may increase the likelihood of developing NCDs if not addressed early. Compared to other indicators, elevated blood glucose and uric acid were the most prevalent abnormalities, highlighting the need for targeted interventions focusing on dietary habits and lifestyle modification [t7.1]

These findings indicate that direct and participatory educational approaches can effectively improve community understanding of Clean and Healthy Living Behavior (PHBS), in line with previous studies (Green et al., 2009), which highlight the effectiveness of educational interventions in promoting positive health behavior changes.

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CONCLUSION

This community-based intervention demonstrates that integrating health education with laboratory screening is effective in improving early detection and awareness of non-communicable diseases. Although most participants showed normal health indicators, a significant proportion exhibited early risk factors, particularly in blood glucose and uric acid levels. These findings emphasize the importance of routine community screening as a preventive strategy. Future programs should focus on expanding coverage, strengthening follow-up systems, and ensuring sustainability through collaboration with local health providers and community health cadres.

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