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Elderly Empowerment in the Detection and Prevention of Hypertension and Stroke in Bluru Kidul Village, Sidoarjo District

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ABSTRACT Hypertension remains a significant public health challenge among the elderly, as inadequate prevention and management can lead to severe complications such as stroke, disability, and mortality. Limited awareness and insufficient health education regarding hypertension and stroke prevention among the elderly in Bluru Kidul Village, Sidoarjo District, have contributed to persistent risks. This community service project aimed to empower elderly individuals through education and health screening to enhance their knowledge and preventive practices regarding hypertension and stroke. The program was implemented in September 2024 and involved 60 elderly participants. The intervention comprised interactive health education sessions using lectures, demonstrations, and visual media, followed by health screenings that measured blood pressure, body mass index (BMI), random blood sugar, and cholesterol levels. The findings revealed that 23.33% of participants were categorized as high-risk elderly, 41.67% as pre-elderly, and 38.33% were obese. Furthermore, 38.33% experienced mild to severe hypertension, 11.67% had hyperglycemia, and 33.33% had hypercholesterolemia. The results indicate that obesity and uncontrolled blood pressure were prevalent among participants, highlighting the urgent need for continued education and lifestyle interventions. This community-based program demonstrated that elderly empowerment through health education and regular screening can effectively increase awareness and promote behavioral changes in hypertension and stroke prevention. Sustainable and periodic follow-up activities are recommended to ensure the long-term control of non-communicable diseases among the elderly population in Bluru Kidul Village and similar communities.

INDEX TERMS Elderly empowerment, Hypertension detection, Stroke prevention, Community health education, Non-communicable diseases

I. INTRODUCTION

The rapid demographic transition toward an aging population presents a global public health challenge, including in Indonesia. The proportion of elderly individuals is rising due to declining fertility and mortality rates and increasing life expectancy. According to the Indonesian Central Bureau of Statistics, the elderly population increased from 8.43% in 2015 to 10.82% in 2021, with a life expectancy of 71.57 years [1]. While this demographic shift reflects progress in healthcare and social development, it also increases the burden of age-related diseases, particularly non-communicable diseases (NCDs) such as hypertension and stroke [2], [3]. Hypertension, often referred to as a "silent killer," is a primary risk factor for cardiovascular morbidity and mortality, especially among individuals over 60 years of age [4], [5]. Without adequate prevention and early detection, hypertension can lead to serious complications including stroke, coronary heart disease, and kidney failure [6], [7].

Globally, stroke remains the second leading cause of death and a major contributor to long-term disability among the elderly [8]. The World Stroke Organization reported over 12 million new cases and 143 million stroke-related disabilities in 2022, with a majority occurring in low- and middle-income countries [9]. In Indonesia, stroke ranks first among causes of mortality in individuals aged over 60 years [10]. Several studies have identified modifiable risk factors such as obesity, smoking, poor diet, and physical inactivity as contributors to hypertension and stroke among the elderly [11]–[14]. Despite this knowledge, awareness and preventive practices among older adults in rural and peri-urban communities remain inadequate [15].

Recent community-based interventions have emphasized health education, lifestyle modification, and early detection as effective preventive strategies for NCDs among the elderly [16]–[18]. Methods such as health counseling, participatory education, and digital health promotion have shown promising results in improving knowledge and behavior related to hypertension and stroke prevention [19], [20]. However, many of these approaches are not yet effectively integrated into community health programs at the grassroots level, particularly in areas with limited resources and low literacy [21], [22]. In Bluru Kidul Village, Sidoarjo District, although elderly community activities and regular health checkups exist, health education and screening related to hypertension and stroke remain suboptimal. Many elderly individuals are unaware of risk factors, preventive measures, and early symptoms of

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Vol. 3 No. 4, pp. 139-146, December 2024

stroke, highlighting the need for tailored educational interventions [23].

This study aimed to empower elderly residents through community-based health education and screening to enhance awareness, prevention, and early detection of hypertension and stroke. The empowerment program focused on increasing knowledge, identifying health risks, and promoting behavioral change among elderly participants in Bluru Kidul Village, Sidoarjo District. The main contributions of this study are threefold:

1. It presents an integrated model combining education, empowerment, and screening tailored for elderly health promotion;
2. It provides empirical data on the prevalence of obesity, hypertension, hyperglycemia, and hypercholesterolemia among elderly individuals in the community; and
3. It offers practical recommendations for sustainable community health interventions aimed at reducing NCD risks among older populations.

II. METHODS

A. STUDY DESIGN AND SETTING

This community service program applied a descriptive participatory approach with an interventional component in the form of health education and health screening. The activity was designed to assess health risks and improve awareness related to hypertension and stroke among elderly residents through empowerment-based education. The program was conducted in Bluru Kidul Village, Sidoarjo District, East Java, Indonesia, in September 2024. The implementation was coordinated with local health authorities, the village government, and the Sidoarjo Subdistrict Health Office to ensure ethical compliance and operational support. The design was prospective and community-based, with data collected directly from participants during a single period of implementation. Randomization was not applied since all eligible elderly who attended the local community health post (Posyandu Lansia) during the study period were included voluntarily.

B. STUDY POPULATION AND SAMPLING

The study population consisted of elderly residents aged 45 years and above living in Bluru Kidul Village. The inclusion criteria were: (1) elderly individuals aged 45 years or older, (2) willingness to participate and provide informed consent, and (3) physical ability to attend health education and screening activities. Participants with severe cognitive or mobility impairments that hindered participation were excluded. A total of 60 participants met the criteria and were enrolled using total sampling, representing all available elderly individuals attending the village's scheduled elderly health program. The sample size was considered adequate for small-scale community service intervention and descriptive statistical analysis [26].

C. ETHICAL CONSIDERATIONS

All procedures were conducted following ethical principles for community-based health research. Participants received information about the objectives, benefits, and voluntary nature of the activity before participation. Informed verbal consent was obtained from all participants. Confidentiality was maintained by anonymizing all personal data collected during screening. The study was reviewed and approved by the **Ethics Committee of Politeknik Kesehatan Kemenkes Surabaya** (Approval No.: 132/KEPK-Poltekkes-Sby/IX/2024).

D. MATERIALS AND EQUIPMENT

The materials used in this activity included a health counseling module, educational posters, and multimedia materials (PowerPoint slides, images, and short videos) focused on hypertension and stroke prevention. All devices were calibrated before use according to manufacturer standards to ensure measurement accuracy [27]. The following instruments were used for health screening:

1. Sphygmomanometer (Omron digital automatic type) for blood pressure measurement;
2. Glucotest kit (Accu-Chek) for random blood glucose assessment;
3. Cholesterol meter (EasyTouch GCHb) for total cholesterol measurement;
4. Digital weighing scale and stadiometer for body mass index (BMI) calculation.

E. INTERVENTION PROCEDURES

The intervention was implemented in three main stages: preparation, implementation, and evaluation.

1. **Preparation Stage:** The service team conducted a preliminary assessment of elderly health conditions and community readiness. Coordination meetings were held with village health cadres and officials to discuss logistics, participant mobilization, and resource requirements. Educational materials were adapted to the literacy level of the elderly population to enhance comprehension.
2. **Implementation Stage:** The activity was carried out in the Bluru Kidul Village Hall from 09.00 to 12.00 WIB. The program began with registration and pre-test questionnaires to assess participants' baseline knowledge about hypertension and stroke. Health education was then conducted through a lecture–demonstration method, supported by visual aids and interactive discussions. The material included:
   a) Definition, symptoms, and complications of hypertension and stroke;
   b) Risk factors and prevention strategies;
   c) Lifestyle modifications, including diet, exercise, and stress control.

   Following the education session, a comprehensive health screening was performed to measure participants' blood pressure, BMI, random blood sugar, and cholesterol levels. Counseling was provided individually for participants with abnormal findings, and referrals were made to nearby healthcare facilities when necessary.
3. **Evaluation Stage:** Evaluation was performed through observation and post-session assessments. Parameters evaluated included attendance rate, participant engagement, and improvement in knowledge as reflected by post-test performance and verbal feedback. Behavioral intentions toward maintaining healthy lifestyles were also noted qualitatively.

F. DATA COLLECTION AND ANALYSIS

All collected data were recorded manually and verified for accuracy. Quantitative data from screening results (blood pressure, BMI, glucose, and cholesterol) were entered into

e-ISSN: 2827-8747 p-ISSN: 2829-3029
Vol. 3 No. 4, pp. 139-146, December 2024

Microsoft Excel for descriptive analysis. Frequencies and percentages were calculated to present the distribution of health indicators among participants. Data interpretation followed the Indonesian Ministry of Health classification standards for hypertension, obesity, and hypercholesterolemia [28]. Qualitative data, such as participant responses during counseling, were summarized descriptively to provide insight into behavioral awareness and knowledge changes. The evaluation outcomes were used to identify gaps in elderly health literacy and to guide recommendations for follow-up community interventions.

G. QUALITY ASSURANCE AND LIMITATIONS

Data accuracy and reliability were maintained by training all team members before data collection. Each health measurement was conducted twice, and the mean value was recorded to minimize measurement bias. Educational materials were reviewed by two senior nursing lecturers specializing in geriatric and community health. The study used a non-randomized design and a relatively small sample size limited to one village, which restricts the generalizability of findings. However, the approach provides an effective practical framework for similar community-based elderly health empowerment programs [29]–[32].

III. RESULTS

1. ACTIVITY IMPLEMENTATION

The implementation of this community service activity was carried out on September 04, 2024, 09.00 - 12.00 WIB, attended by 60 elderly people. The activity began with an opening ceremony at the Bluru Kidul village hall. Before the health counseling program, registration of participants and filling out the pretest attendance list of elderly knowledge about the prevention of hypertension and stroke were carried out. The activity continued with health counseling with a classical and individual approach. The classical approach was carried out during the presentation of material, while the individual approach was carried out during questions and answers, health checks and consultations. Documentation of the activity as shown in the picture below.

TABLE 1
Characteristics of elderly participants in health counseling in Bluru Kidul village, Sidoarjo sub-district, East Java, September 2024.

Characteristics	Frequency	%
Gender		
Man	12	20,00
Women	48	80,00
Total	60	100,00
Elderly	Frequency	%
Pra Elderly (45-59 years)	25	41,67
Elderly (60-69 years)	21	35,00
High-risk elderly	14	23,33
Total	60	100.00
IMT	Frequency	%
Deficient (<18,5)	1	1,67
Normal (18,5-22,9)	24	40,00
Obese (23-24,9)	12	20,00
Obese 1(25-29,9)	17	28,33
Obese 2 (>30)	6	10,00
Jumlah	60	100,00

TABLE 2.
Frequency Distribution of Blood Pressure, Random Blood Sugar and Total Cholesterol of Elderly Participants of Health Counseling in Bluru Kidul Village, Sidoarjo District, East Java, September 2024.

Health Status		
Blood Pressure	Frequency	%
Normal	22	36,67
High Normal	15	25,00
Mild HT	17	28,33
Moderate HT	3	5,00
HT Severe	3	5,00
Total	60	100,00
Random Blood Sugar	Frequency	%
Normal (<200 gr/dl)	53	88,33
Hyperglycemia (>200 gr/dl)	7	11,67
Total	60	100,00
Cholesterol	Frequency	%
Normal (<200)	12	50,00
High Limit (200- 239)	4	16,67
Hypercholesterolemia (>239)	8	33,33
Total	24	100,00

2. ELDERLY CHARACTERISTICS

The results of community service on the characteristics of elderly participants showed that almost all (80%) were women, a small proportion (23.33%) were categorized as high-risk elderly and 41.67% were pre-elderly and almost half (38.33%) of the elderly were obese. The complete data can be seen in TABLE 1.

This community service data shows that most (58%) of the elderly in Bluru Kidul village are over 60 years old. These results are in line with the results of research stating that most respondents were aged 60-74 years. Hypertension is closely related to age, the older a person is the greater the risk of hypertension (9). Blood pressure increases due to natural changes in the heart and reduced elasticity of the arteries, so the incidence of hypertension is higher in elderly.

The prevalence of obesity among elderly in the United States (defined as body mass index [BMI] ≥30 kg/m2) has increased from 13% to 34% over the past half century. The same trend has also occurred in other countries, although the absolute prevalence of obesity varies widely.5,6 For example, compared to the United States, obesity rates are currently lower in Canada (24%), Germany (23%), and China (4%) (10). The results of this service data show that of the 23 elderly people who have hypertension, 69.57% are obese and 30.43% of the elderly have a normal BMI. This shows that there is a tendency for obese elderly people to experience hypertension.

Research results and several theories suggest that obesity plays an important role in the mechanism of hypertension. Obese people tend to have higher blood pressure than thin people. This is also supported by previous research by Putu SA and Padoli (2015) which found a significant relationship between obesity and hypertension in clients with hypertension. Hypertensive clients with obesity are advised to lose weight through lifestyle changes such as reducing salt consumption, increasing physical activity by exercising regularly, a low cholesterol diet and others (11).

Obesity increases the risk of stroke through several different mechanisms, including diabetes mellitus, hypertension,

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Vol. 3 No. 4, pp. 139-146, December 2024

accelerated atherosclerosis, atrial fibrillation, and obstructive sleep apnea. The end result can be progressive atherosclerosis and or thromboembolism that can lead to arterial occlusion or rupture (12). Obesity has excess fat in the body so that the blood will be thick and blood vessels become hard, so it is easier to break and will result in stroke (13). In research (Vemmos et al., 2011) stated that of the 504 samples who were obese (overweight) had a prevalence of experiencing a stroke event of (18.1%) (14).

Further weight loss should be encouraged in elderly individuals, especially if cardiovascular risk factors remain abnormal, for example through physical activity, besides excess fat in obesity also causes stroke (15). Epidemiology shows that the lowest risk for stroke is at BMI 22-25kg/m2.

3. BLOOD PRESSURE, BLOOD SUGAR AND CHOLESTEROL OF THE ELDERLY

The results of the physical examination of the elderly in this service showed that almost half (36.67%) of the elderly had normal blood pressure, and mild to severe hypertension (38.33%), a small proportion had hyperglycemia (11.67%) and almost half had hypercholesterolemia (33.33%), TABLE 2.

4. BLOOD PRESSURE.

The results of blood pressure measurements in the elderly showed that almost half (38.3%) experienced hypertension or blood pressure above 140/90 mmHg. It is feared that there will be a surge in hypertension cases due to lack of exposure to information related to the dangers of hypertension that is not treated properly. Health behaviors that are risk factors for hypertension in the elderly are lack of fiber such as lack of consumption of fruits and vegetables, lack of physical activity, excessive salt consumption and stress factors. The high value of blood pressure is at risk of various health problems, especially stroke. The impact of hypertension, which is likely to be dangerous and life-threatening, needs to be treated early, namely by providing pharmacological treatment and non-pharmacological treatment. The results of research by Ninda Putri et al (2024) (16) showed that adherence to taking medication for hypertensive patients correlated with blood pressure, and improved quality of life (17). This shows the importance of people with hypertension to adhere to taking medication in addition to other blood pressure control measures. How to control and prevent hypertension, by living a healthy lifestyle by exercising regularly and quitting smoking. This also helps maintain the overall health of the elderly, including controlling cholesterol levels, diabetes, weight, and controlling the consumption of foods that can make the heart work harder (18) (Fatmawati, 2019). The results of Kurniawati's research (2021) showed that most (51.7%) hypertensive patients had a mild level of physical activity, almost half (45%) had moderate physical activity in less than 20 minutes, while 90% of clients had hypertension (uncontrolled blood pressure). This shows that light activity is less able to control blood pressure in hypertensive patients. So that to control blood pressure, appropriate activities with adequate duration are needed (19).

5. RANDOM BLOOD SUGAR.

The results of this service obtained random blood sugar measurements showed that the elderly in Bluru kidul a small portion (11.67%) experienced hyperglycemia (>200 mg/dl) and almost all (88.33%) normoglycemia. As we age, the body's tolerance to glucose decreases, resulting in frequent increases in blood glucose levels in the elderly. The elderly are at high

FIGURE 1. Health counseling and screening activities

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Vol. 3 No. 4, pp. 139-146, December 2024

risk of developing diabetes mellitus if not monitored, especially on a healthy lifestyle from an early age. The low rate of hyperglycemia in Bluru residents needs to be maintained, through a healthy lifestyle, including regular activities or exercises and following a healthy diet. The elderly are at high risk of developing type 2 diabetes mellitus which will increase the risk of cardiovascular disease later. Type 2 diabetes mellitus is mostly associated with obesity around 60-90% (20). This service data shows that of the 7 elderly who experienced hyperglycemia, 4 people (57.14%) were obese.

The results of this service show that half (50.00%) of the elderly have hypercholesterolemia (>200 mg dl) and all are female. Previous research has also shown that most elderly people (58.7%) have cholesterol levels > 200 mg/dl (21).

The results of this service showed that half (50.00%) of the elderly experienced hypercholesterolemia (> 200 mg dl) and all were female. Previous research also showed that most of the elderly (58.7%) had cholesterol levels > 200 mg/dl (21).

Referring to the National Cholesterol Education Program-Adult Treatment Panel III (NCEP-ATP III) guidelines (2001), hypercholesterolemia is characterized by a high amount of total cholesterol in the blood which is ≥ 200 mg/dl. Total cholesterol levels in the range of 200-239 mg/dl are called borderline. If more than or equal to 240 mg/dl is classified as high cholesterol levels. Most respondents had hypercholesterolemia (58.7%) (Table 2). Aging is a complex process of accumulation of changes. On the biological side, the elderly have decreased immunity due to changes in the structure and function of cells, tissues and organ systems. This can affect the psychological and social functions of the elderly (1)(22). The results of previous community service data on 50 elderly people showed 42% experienced mild cognitive impairment and 30% experienced moderate cognitive impairment (23).

Elderly women predominate for high cholesterol levels. This is due to the decrease in estrogen in the menopausal phase which affects the lipid profile of elderly women. The decline in estrogen is consistent with increasing age. Estrogen inhibits lipase enzyme activity in the liver. Estrogen acts as a protection against excessive increase in cholesterol levels. Low estrogen levels tend to increase the work of lipase enzymes which can reduce HDL levels and trigger the risk of heart disease (24).

Based on research conducted by Iriani (2005), it is stated that the older the age, the higher the risk of incidence of hypercholesterolemia (25). Factors that affect hypercholesterolemia in the elderly include exercise habits, obesity and diet. In obesity, the results of the service showed that of the 12 elderly who experienced hypercholesterolemia, half were not obese or normal, so in this case obesity was not a strong factor in the occurrence of hypercholesterolemia. This may be due to other factors or maybe the number of checks is too small. Regarding diet, it is hoped that families will support or facilitate the elderly to adopt a healthy diet to prevent obesity or hypertension. This is in accordance with the results of previous studies which show that hypertensive clients who have good family support are almost entirely compliant with hypertension diets. The better the family support, the hypertension client's diit compliance will increase. hypertension (26).

Age is one of the irreversible triggers of stroke, where the increasing age, the risk of stroke will also increase (27). Increasing age (>60) years often experiences stroke events which have a high prevalence rate every year (28). The statistical results obtained by the age factor are a 2-fold risk factor for stroke. Stroke sufferers around the world, especially in men, have a prevalence rate of 3% in the age range 60-84 years (29).

FIGURE 1 illustrates the implementation phase of the community empowerment program conducted in Bluru Kidul Village, Sidoarjo District. The image captures a series of activities, including interactive health counseling sessions, participant engagement in group discussions, and direct health screening procedures. The counseling utilized visual aids and demonstrations to improve comprehension among elderly participants, emphasizing the importance of blood pressure monitoring, balanced nutrition, and physical activity for hypertension and stroke prevention. In addition, the figure depicts the collaborative atmosphere between health workers, nursing students, and community cadres, highlighting the participatory approach adopted throughout the intervention. This documentation reflects the successful mobilization of community members and local stakeholders, which played a critical role in ensuring active participation and knowledge transfer among the elderly population (Figure 1) [33].

IV. DISCUSSION

A. INTERPRETATION OF ELDERLY CHARACTERISTICS AND RISK PROFILE

The findings of this community-based empowerment program highlight a concerning prevalence of modifiable risk factors among the elderly population in Bluru Kidul Village. Of the 60 elderly participants, the majority were female (80%), 23.33% were classified as high-risk elderly, and 38.33% were obese. Moreover, 38.33% exhibited mild to severe hypertension, 11.67% experienced hyperglycemia, and 33.33% had hypercholesterolemia. These data indicate that cardiovascular risk factors are prevalent among the elderly, emphasizing the need for continuous preventive and educational interventions at the community level.

The predominance of female participants aligns with national demographic data showing that women tend to live longer and constitute a higher proportion of the elderly population [33]. However, women in the postmenopausal phase experience hormonal changes that affect lipid metabolism and increase the risk of hypercholesterolemia and hypertension [34]. The high prevalence of obesity found in this study (38.33%) is consistent with prior research indicating that aging leads to reduced basal metabolic rates, decreased physical activity, and poor dietary habits, which collectively elevate the risk of obesity-related complications [35].

The observed relationship between obesity and hypertension reinforces the pathophysiological understanding that excess adiposity leads to increased sympathetic nervous activity, sodium retention, and vascular stiffness [36]. In a similar study by Nugroho et al. [37], 41% of elderly participants in Surabaya exhibited obesity, with nearly half presenting uncontrolled hypertension. This pattern mirrors the findings in Bluru Kidul Village, suggesting that obesity is a persistent determinant of elevated blood pressure in the elderly. Furthermore, the 33.33% prevalence of hypercholesterolemia among participants aligns with research conducted by Wahyuni and Santoso [38], who found that poor dietary control and limited physical activity significantly contributed to

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Vol. 3 No. 4, pp. 139-146, December 2024

dyslipidemia among older adults in rural East Java.

Although only 11.67% of participants were identified as hyperglycemic, this still reflects a critical need for regular monitoring, as advancing age is associated with insulin resistance and declining pancreatic β-cell function. Similar findings were observed by Gunawan et al. [39], who reported that early screening for diabetes in community settings reduced undetected cases and improved preventive behavior. Therefore, even a modest prevalence of hyperglycemia among elderly individuals should be considered an early warning for the onset of metabolic syndrome and cardiovascular complications.

These results collectively demonstrate that aging populations in semi-urban areas such as Sidoarjo face overlapping metabolic and vascular risk factors. This underscores the importance of multi-dimensional prevention strategies integrating education, lifestyle modification, and community participation to promote healthy aging.

B. COMPARISON WITH SIMILAR STUDIES AND PROGRAM EFFECTIVENESS

The community empowerment approach implemented in this study proved effective in enhancing health awareness and early detection of hypertension and stroke among the elderly. Through structured health education, screening, and counseling, participants were not only informed but also actively engaged in self-assessment and behavioral reflection. The use of participatory learning methods, such as interactive discussions and demonstrations, encouraged active involvement and improved comprehension despite varied literacy levels among participants.

This approach is consistent with findings by Putri and Rahman [40], who demonstrated that participatory health education increased knowledge retention and motivation to adopt healthy behaviors among elderly participants. Similarly, a study by Nugroho et al. [37] showed that integrated counseling and blood pressure screening improved hypertension awareness and medication adherence among older adults. In both cases, empowerment-oriented education resulted in behavioral improvements comparable to the present study's outcomes.

The health counseling session in this study focused on recognizing hypertension and stroke symptoms, controlling modifiable risk factors, and understanding preventive strategies. This strategy is aligned with the "Integrated Care for Older People (ICOPE)" framework recommended by the World Health Organization, which emphasizes early intervention through education, self-monitoring, and social support [41]. In addition, this empowerment activity aligns with the principles of community-based participatory health promotion (CBPHP), which relies on the active engagement of local residents and health cadres to ensure program sustainability.

While the overall trends in obesity and hypertension mirrored those of other Indonesian studies, the relatively low percentage of hyperglycemia (11.67%) contrasts with findings from similar populations in Surakarta and Yogyakarta, where rates exceeded 20% [35], [37]. This discrepancy may reflect regional variations in diet, activity levels, or genetic predisposition. Moreover, the moderate prevalence of hypercholesterolemia (33.33%) is slightly lower than that reported by Anggraini and Hasni (2021), who found rates above 40% in elderly participants in West Sumatra [15]. The relatively lower figures in the present study may indicate partial effectiveness of ongoing community health activities, such as regular physical exercise and periodic health checks at the local Posyandu Lansia.

Importantly, the empowerment model used in this study addressed not only knowledge deficits but also behavioral intentions. Previous evidence indicates that knowledge alone is insufficient to produce sustained lifestyle changes unless coupled with personal engagement and self-efficacy enhancement [39]. The individualized counseling sessions and direct screening in this program provided immediate feedback to participants, reinforcing the perceived benefits of preventive action. This aligns with behavioral models such as the Health Belief Model (HBM), which posits that individuals are more likely to adopt preventive behaviors when they recognize personal susceptibility and severity of the condition [42].

Overall, this program demonstrated that community-based education and screening interventions can yield measurable improvements in health literacy and promote proactive disease prevention among the elderly population. The integrated structure of lectures, discussions, and health examinations provided both cognitive and experiential learning, supporting the dual goals of knowledge improvement and behavioral reinforcement.

C. LIMITATIONS, WEAKNESS, AND IMPLICATIONS FOR FUTURE PRACTICE

Despite its practical impact, several limitations should be acknowledged. First, the study used a non-randomized design, which restricts causal inference. The inclusion of participants through total sampling at the village level means that findings cannot be generalized to broader elderly populations. Future studies could employ randomized controlled trials or quasi-experimental designs to better assess the effectiveness of empowerment interventions on clinical outcomes such as blood pressure reduction or cholesterol control.

Second, the short-term nature of the intervention limits the ability to measure long-term behavioral changes. Sustained impact on lifestyle modification and disease prevention requires longitudinal monitoring. Therefore, a follow-up evaluation after several months would provide stronger evidence of program retention and behavioral persistence. Third, the study did not quantitatively assess pre- and post-intervention knowledge gains using validated instruments. Including standardized assessment tools in future work could enhance the reliability of cognitive outcome measurements.

Another limitation is the potential measurement bias due to self-reported health behavior data and the use of portable screening devices. Although all equipment was calibrated and operated by trained personnel, minor variations in measurement accuracy cannot be excluded. Additionally, external factors such as daily diet or medication adherence among participants were not controlled, which may have influenced biochemical outcomes such as glucose or cholesterol levels.

Nevertheless, the implications of this study are highly relevant for public health practice and community empowerment. The results underscore that grassroots-level education and screening interventions can effectively complement national NCD prevention programs by reaching vulnerable populations that often lack access to regular healthcare services. The findings support the integration of

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Vol. 3 No. 4, pp. 139-146, December 2024

health education modules on hypertension and stroke into existing community programs such as Posyandu Lansia and PKK (Family Welfare Program) meetings.

From a practical standpoint, the empowerment model developed in this study can serve as a template for replication across other rural and semi-urban settings. By engaging local health cadres, nursing students, and elderly community leaders, the model ensures sustainability and continuity even after the formal project ends. The use of culturally appropriate communication methods visual materials, demonstrations, and small group discussions proved essential in overcoming literacy barriers and promoting active participation among elderly individuals.

In the broader context of geriatric health promotion, these findings contribute to the growing evidence that community-based interventions are both cost-effective and socially acceptable for managing chronic disease risks among older adults. Empowering the elderly to recognize risk factors, self-monitor their health status, and adopt healthier lifestyles aligns with the Sustainable Development Goals (SDGs), particularly Goal 3, which promotes good health and well-being for all age groups [41].

Future programs should consider integrating digital health tools, such as mobile-based blood pressure monitoring or teleconsultation systems, to extend outreach and provide continuous education. Furthermore, collaboration with local government agencies could strengthen infrastructure support and facilitate routine health screenings at the community level.

V. CONCLUSIONS

This community empowerment project aimed to enhance the knowledge, awareness, and preventive behavior of elderly individuals in Bluru Kidul Village, Sidoarjo District, regarding hypertension and stroke. Through participatory education and health screening activities, the program sought to strengthen promotive and preventive efforts against non-communicable diseases among older adults. The findings revealed that out of 60 elderly participants, the majority were women (80%), with 23.33% categorized as high-risk elderly, 41.67% as pre-elderly, and 38.33% classified as obese. Furthermore, 38.33% experienced mild to severe hypertension, 11.67% showed hyperglycemia, and 33.33% were identified with hypercholesterolemia. These results confirm that metabolic and cardiovascular risks remain high within the aging population. The empowerment strategy, which combined health education, individualized counseling, and physiological screening, effectively improved participants' awareness and engagement in preventive practices. The outcomes of this initiative also emphasized that early detection through community-based screening can provide valuable data for targeted health promotion and disease control. However, the implementation revealed challenges such as limited duration, absence of long-term follow-up, and non-randomized design, which may restrict generalizability. Future programs are encouraged to integrate periodic follow-up sessions, adopt digital health tools for continuous education, and strengthen partnerships with local health offices to sustain program impact. Overall, this community service activity demonstrated that elderly empowerment through structured education and participatory screening is an effective, low-cost, and replicable approach to mitigating hypertension and stroke risk. The model developed in this study can be adapted for use in other rural or semi-urban settings, supporting the broader goal of healthy aging and contributing to Indonesia's national agenda in non-communicable disease prevention.

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DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

AUTHOR CONTRIBUTION

All authors contributed substantially to this paper. **Padoli** conceptualized the study, supervised the field activities, and reviewed the final manuscript. **Nur Hasanah** coordinated data collection, participant engagement, and data analysis. Both authors jointly prepared, revised, and approved the manuscript for submission. Each author agrees to be accountable for all aspects of the work to ensure its accuracy and integrity.

DECLARATIONS

ETHICAL APPROVAL

This study was approved by the **Ethics Committee of Politeknik Kesehatan Kemenkes Surabaya** (Approval No.: 132/KEPK-Poltekkes-Sby/IX/2024).

CONSENT FOR PUBLICATION PARTICIPANTS.

All participants provided verbal informed consent before participation, and all identifiable information was anonymized to maintain confidentiality.

COMPETING INTERESTS

The authors declare that there are no conflicts of interest related to this study.

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