

Education and Early Screening for Non-Communicable Diseases Among Coastal Communities in the Service Area of the Teluk Nibung Community Health Center, Tanjungbalai City, Indonesia

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Abstract

Non-communicable diseases (NCDs) are major public health problems, while limited knowledge and low uptake of preventive services may contribute to delayed identification of risk factors. This community service activity aimed to improve knowledge related to NCD prevention and early detection among adults in the service area of the Teluk Nibung Community Health Center, Tanjungbalai City. A quantitative pre-experimental one-group pretest–posttest approach was used. One hundred participants aged ≥ 18 years were selected purposively in June–July 2026. The intervention comprised interactive health education on NCDs, risk factors, healthy lifestyles, prevention, and early detection, followed by blood pressure, random blood glucose, cholesterol, and body mass index assessments. Knowledge was measured using a 20-item questionnaire before and after the intervention. Descriptive statistics and a paired-samples t-test were used for analysis. The proportion of participants with good knowledge increased from 14.0% to 85.0%, whereas poor knowledge decreased from 28.0% to 0%. The mean knowledge score increased from 60.2 ± 9.8 to 88.7 ± 7.2 , with a mean increase of 28.5 points ($p < 0.001$). The activity was associated with a substantial improvement in participants' knowledge of NCD prevention and early detection. Integrated education and screening may serve as a practical promotive and preventive strategy for strengthening community-based NCD services in coastal areas. Further follow-up is needed to determine whether knowledge gains are maintained and translated into sustained preventive behaviors.

INTRODUCTION

Non-communicable diseases (NCDs), including cardiovascular diseases, diabetes mellitus, cancer, and chronic respiratory diseases, remain major public health challenges worldwide. NCDs are responsible for approximately 74% of all deaths globally, with a substantial proportion occurring in low- and middle-income countries. The major modifiable

risk factors include tobacco use, physical inactivity, unhealthy diets, and harmful alcohol consumption (WHO, 2023). These risk factors are closely related to changes in lifestyle and can accumulate over time, increasing the risk of hypertension, diabetes mellitus, cardiovascular diseases, and stroke. Therefore, strengthening community-based promotive and preventive strategies, including health education and early detection, is essential for reducing the future burden of NCDs (WHO, 2025, WHO, 2026)

The burden of NCDs is also substantial in Indonesia. The Indonesian Health Survey (Survei Kesehatan Indonesia/SKI) 2023 reported that the prevalence of hypertension among adults aged ≥ 18 years was 30.8% based on blood pressure measurements, while only 8.6% reported having been diagnosed by a physician. Similarly, diabetes mellitus among the population aged ≥ 15 years was 2.2% based on physician diagnosis but 11.7% based on blood glucose examination (Kementerian Kesehatan RI, 2024). These differences indicate an important gap between the number of people with measurable risk or disease and those who are aware of their health condition. Such gaps emphasize the importance of increasing community health literacy while expanding accessible screening activities for NCD risk factors.

Coastal communities represent an important population for community-based NCD prevention because their health needs are influenced by socioeconomic, occupational, environmental, and lifestyle characteristics. In coastal settings, daily practices may include consumption of salty or processed foods, tobacco use, irregular working schedules, and limited opportunities for routine health examinations. In addition, geographical and socioeconomic barriers may affect access to preventive health services. These circumstances can increase the possibility that NCD risk factors remain undetected until symptoms or complications occur (Siregar, 2020). Consequently, interventions in coastal communities should not rely solely on curative services but should also strengthen health literacy, risk-factor awareness, and early detection at the community level (Astuti, 2020).

Although health education and screening have each been widely used in NCD prevention, their implementation is often conducted as separate activities. This creates an opportunity to integrate health education and early screening into a single community-based intervention (Shrestha, R. 2025). Such integration can create a more meaningful health promotion process: participants first receive information about NCDs and their risk factors, and subsequently obtain direct information about selected indicators of their own health status. This approach can strengthen the connection between knowledge and personal risk awareness. Evidence from community-based interventions also suggests that integrated approaches can improve knowledge and awareness of cardiovascular risk factors, while community care incorporating health education and follow-up may contribute to improvements in several cardiovascular risk factors (Al, 2021).

The Teluk Nibung Community Health Center (Puskesmas Teluk Nibung) working area in Tanjungbalai City was selected as the setting for this community service activity because it represents a coastal community in which strengthening promotive and preventive health services is particularly relevant. The activity was designed to address two interconnected needs: limited understanding of NCD prevention and the need for accessible identification of NCD risk factors at the community level. Accordingly, this community service activity aimed to improve participants' knowledge regarding NCDs and identify selected NCD risk factors through an integrated program of health education and early screening. The screening included blood pressure measurement, random blood glucose testing, cholesterol assessment, and BMI measurement. The findings are expected to provide practical evidence to support the

development of sustainable community-based promotive and preventive programs for NCD prevention in coastal areas.

METHODS

Study Design and Setting

This community service activity used a quantitative pre-experimental design with a one-group pretest–posttest approach to evaluate the effectiveness of integrated health education and early screening for non-communicable diseases (NCDs) among coastal communities. Participants' knowledge regarding NCDs, risk factors, prevention, and early detection was assessed before the intervention (pretest), followed by health education and NCD screening, and then reassessed after the intervention (posttest). The difference between pretest and posttest scores was used as an indicator of the effectiveness of the program in improving participants' knowledge. The activity was conducted in the working area of Teluk Nibung Community Health Center (Puskesmas Teluk Nibung), Tanjungbalai City, North Sumatra, Indonesia, in June–July 2026. The location was selected because it is a coastal area with a predominantly fishing community and a need to strengthen promotive and preventive health services, particularly NCD prevention and early detection. The intervention included health education on NCDs, risk factors, healthy lifestyles, and the importance of early detection, followed by screening through blood pressure measurement, random blood glucose testing, cholesterol testing, and body mass index (BMI) assessment. The effectiveness of the activity was evaluated by comparing participants' pretest and posttest knowledge scores, while the screening results were used to identify NCD risk factors and provide recommendations for further health examination and follow-up at local health services.

Population and Participants

The population of this community service activity consisted of all residents living in the working area of Teluk Nibung Community Health Center (Puskesmas Teluk Nibung), Tanjungbalai City, North Sumatra, Indonesia. The target population included coastal community members, particularly adults who may be at risk of non-communicable diseases (NCDs) and who could benefit from health education and early NCD screening. The subjects were selected using purposive sampling, based on predetermined inclusion and exclusion criteria. The inclusion criteria were: (1) residing in the working area of Puskesmas Teluk Nibung; (2) aged ≥ 18 years; (3) willing to participate in the entire activity, including registration, pretest, health education, NCD screening, and posttest; and (4) providing informed consent to participate. Participants who did not complete the entire series of activities or withdrew before completion were excluded. A total of 100 participants took part in the activity. All participants received the same intervention consisting of health education on NCDs, risk factors, healthy lifestyles, and early detection, followed by screening for blood pressure, random blood glucose, cholesterol, and body mass index (BMI). The participants also received individual explanations of their screening results and recommendations for further examination or follow-up when NCD risk factors were identified.

Intervention Procedures

The community service activity was conducted through four stages: preparation, implementation, evaluation, and follow-up. During the preparation stage, the community service team coordinated with Teluk Nibung Community Health Center (Puskesmas Teluk Nibung) and local health cadres to determine the time, location, and target participants. The

team also identified community needs related to NCD prevention and early detection and prepared health education materials, leaflets, pretest and posttest questionnaires, screening forms, and equipment for measuring blood pressure, random blood glucose, cholesterol, and body mass index (BMI). During the implementation stage, participants registered and were informed about the objectives and benefits of the activity before providing informed consent. Participants then completed a pretest to assess their initial knowledge of NCDs, risk factors, prevention, and early detection. This was followed by interactive health education using lectures, discussions, and leaflets, covering NCD types, risk factors, healthy lifestyle practices, warning signs and symptoms, and the importance of early detection. After the education session, participants underwent NCD screening, including blood pressure measurement, random blood glucose testing, cholesterol testing, and BMI assessment. During the evaluation stage, participants completed a posttest using the same questionnaire to assess changes in knowledge following the intervention. The screening results were also evaluated and explained individually to participants, particularly those identified as having NCD risk factors. A discussion and question-and-answer session was conducted to obtain participants' feedback and reinforce the educational materials. As a follow-up, participants with identified risk factors were advised to seek further examination and monitoring at Puskesmas Teluk Nibung, while health education materials were provided to support continued application of healthy lifestyle practices and NCD prevention within the community.

Variables dan Instruments

The primary outcome of this community service activity was participants' knowledge regarding non-communicable diseases (NCDs), including NCD types, risk factors, prevention, early signs and symptoms, and the importance of early detection. Knowledge was assessed before and after the health education intervention using the same 20-item multiple-choice questionnaire. Each correct answer was scored 1 and each incorrect answer was scored 0, with the total score converted to a scale of 0–100. Knowledge levels were categorized as good (76–100), moderate (56–75), and poor (≤ 55). The change in knowledge was determined by comparing participants' pretest and posttest scores. This outcome was used to evaluate whether the integrated health education component was associated with an improvement in participants' knowledge.

Secondary outcomes consisted of selected NCD risk indicators identified through community-based screening. These included blood pressure, random blood glucose, cholesterol, and body mass index (BMI). Blood pressure was measured using a blood pressure monitor, random blood glucose using a glucometer, cholesterol using a cholesterol testing device, and BMI was determined from body weight and height measurements. The screening results were used to identify participants with potentially elevated NCD risk indicators and to provide individualized recommendations for further examination and follow-up at local health services. The screening measurements were not used to establish a clinical diagnosis. A participant observation sheet was also used to document attendance and participation throughout the activity, including participation in the pretest, health education, screening, discussion, and posttest. Participant characteristics, including age, sex, education level, and occupation, were collected using a structured questionnaire.

Data Analysis

The data obtained from the community service activity were analyzed using descriptive and inferential statistics. Descriptive analysis was used to describe participants'

characteristics, participation, knowledge levels, and NCD risk factors identified through screening. The results were presented as frequencies, percentages, means, standard deviations, minimum values, and maximum values. Before inferential analysis, the normality of the pretest and posttest knowledge scores was assessed using the Shapiro–Wilk test. If the data were normally distributed ($p > 0.05$), differences in knowledge scores before and after the health education intervention were analyzed using the Paired Samples t-test. If the data were not normally distributed ($p \leq 0.05$), the Wilcoxon Signed-Rank Test was used. Changes in knowledge were assessed by comparing the mean or median pretest and posttest scores. Screening results for blood pressure, random blood glucose, cholesterol, and body mass index (BMI) were analyzed descriptively to identify the distribution of NCD risk factors among participants. All statistical analyses were performed using IBM SPSS Statistics version 26.0 with a 95% confidence level and a significance level of $\alpha = 0.05$. A p -value < 0.05 was considered statistically significant, indicating a significant change in participants' knowledge following the health education intervention.

RESULTS

A total of 100 participants from the coastal community participated in the health education and early NCD screening activity. Most participants were female (70.0%), while males accounted for 30.0%. The largest age group was 36–45 years (35.0%), followed by 26–35 years (26.0%), 46–55 years (20.0%), 18–25 years (12.0%), and >55 years (7.0%). Regarding educational attainment, half of the participants had completed senior high school or equivalent (50.0%), followed by junior high school (23.0%), higher education (18.0%), and elementary school (9.0%) (Table 1).

Tabel 1 Participant Characteristics

Characteristics	Frequency (n)	Percentage (%)
Sex		
Male	30	30.0
Female	70	70.0
Age Group		
18–25 years	12	12.0
26–35 years	26	26.0
36–45 years	35	35.0
46–55 years	20	20.0
>55 years	7	7.0
Education Level		
Elementary school	9	9.0
Junior high school	23	23.0
Senior high school	50	50.0
Higher education	18	18.0

Table 2 demonstrates an improvement in participants' knowledge across all 20 NCD-related items following the health education intervention. The proportion of correct responses increased from 39.0–63.0% at pretest to 80.0–96.0% at posttest. The largest improvement was observed in knowledge of stroke warning signs, which increased by 41.0 percentage points. These findings suggest that the health education intervention substantially improved participants' understanding of NCD prevention and early detection.

Table 2. Distribution of Participants' Correct Responses on Knowledge of Non-Communicable Diseases Before and After Health Education

No.	Knowledge about Non-Communicable Diseases (NCDs)	Pretest		Posttest	
		N	%	N	%
1	Definition of non-communicable diseases	52	52.0	86	86.0
2	Examples of non-communicable diseases	58	58.0	92	92.0
3	Major types of non-communicable diseases	48	48.0	88	88.0
4	Risk factors for non-communicable diseases	54	54.0	90	90.0
5	Consumption of foods high in salt, sugar, and fat	46	46.0	87	87.0
6	Benefits of regular physical activity	56	56.0	91	91.0
7	Definition of hypertension	51	51.0	89	89.0
8	Hypertension as a <i>silent killer</i>	42	42.0	82	82.0
9	Device used to measure blood pressure	63	63.0	96	96.0
10	Definition of diabetes mellitus	55	55.0	90	90.0
11	Risk factors for type 2 diabetes mellitus	44	44.0	84	84.0
12	Device used to measure blood glucose levels	61	61.0	95	95.0
13	Health risks associated with smoking	59	59.0	94	94.0
14	Relationship between obesity and non-communicable diseases	50	50.0	88	88.0
15	Warning signs of stroke	39	39.0	80	80.0
16	Behaviors for preventing non-communicable diseases	57	57.0	93	93.0
17	Importance of screening/early detection of NCDs	47	47.0	91	91.0
18	Purpose of cholesterol testing	45	45.0	83	83.0
19	Actions to take after screening results indicate a high risk	49	49.0	86	86.0
20	Combination of behaviors for preventing NCDs	53	53.0	92	92.0

As shown in Table 3, the mean knowledge score increased from 60.2 ± 9.8 before the intervention to 88.7 ± 7.2 after the intervention, representing an average increase of 28.5 points. The minimum score increased from 40 to 70, while the maximum score increased from 80 to 100. The paired-samples t-test showed a statistically significant difference in knowledge scores before and after the health education intervention ($p < 0.001$). These findings indicate a significant improvement in participants' knowledge following the health education and early NCD screening activities.

Table 3. Comparison of Knowledge Scores Before and After Health Education

Variable	Mean $\pm$ SD	Minimum	Maximum	p-value*
Pretest	60.2 ± 9.8	40	80	<0.001
Posttest	88.7 ± 7.2	70	100	

The main finding of this community service activity was a significant improvement in participants' knowledge following the health education intervention. The proportion of participants with good knowledge increased from 14.0% before the intervention to 85.0% afterward, while the proportion with poor knowledge decreased from 28.0% to 0%. The mean knowledge score also increased by 28.5 points, from 60.2 ± 9.8 to 88.7 ± 7.2 ($p < 0.001$). These findings indicate that the health education approach successfully improved participants' understanding of NCDs, their risk factors, prevention, and early detection (Agni T, Nirmala A, Pitaloka RIK, 2025).

The improvement is consistent with previous evidence demonstrating the value of community-based education in strengthening NCD-related knowledge (Allan VAS, Djuwartini, Rahmayanti EI 2024; Sürme Y, Topan H, 2025). The use of interactive explanations, discussions, leaflets, and direct communication may have helped participants understand the information and relate it to their daily health practices. Previous community-based NCD programs have similarly reported improvements in knowledge following participatory health education and screening activities (Haryanto, Khairillah YN, Fitriana EE, 2025).

An important feature of the present activity was the integration of health education with early screening. Participants received information about NCDs and subsequently underwent blood pressure, random blood glucose, cholesterol, and BMI assessments (Becker SL, White-Chu EF, Munoz EP, 2023). The provision of individual explanations regarding screening results may have made the educational messages more personally relevant and increased awareness of individual health risks. This approach is consistent with evidence emphasizing communication, counseling, health information, and screening as important components of community-based NCD services (Fourie A, Ahtiala M, Black J 2024a; Hidayati N, Kurniawan A, Prasetyo B, 2024). The findings have practical implications for community-based NCD prevention. Rather than conducting health education as a stand-alone activity, education can be integrated with routine screening, individual risk communication, counseling, and referral through Puskesmas and Posbindu PTM (Gould L, 2023; Setyawati A, Yusuf S, Jafar N, 2024). Repeated education and periodic screening may help maintain knowledge and encourage continued engagement with preventive health services. However, the improvement in knowledge should not be interpreted as evidence of immediate behavioral or clinical changes (Thomas PS, Essien EE, Andy NA, 2025). Previous evidence indicates that sustained changes in health behavior and metabolic risk factors generally require continuous education, follow-up, social support, and access to appropriate health services (Gurney, 2025; Sudaryanto, 2024). The findings are particularly relevant to coastal communities, where community-based delivery can help bring preventive health services closer to residents. Integrating health education, screening, individual feedback, and referral may therefore provide a practical strategy for strengthening promotive and preventive NCD services in coastal settings (Halim F, Widysanto A, Wahjoepramono POP 2024).

CONSLUSION

The integrated health education and early NCD screening activity was associated with a significant improvement in participants' knowledge. The proportion of participants with good knowledge increased from 14.0% to 85.0%, while the mean knowledge score increased by 28.5 points ($p < 0.001$). The screening component also provided an opportunity to identify selected NCD risk indicators and provide individual recommendations for further health assessment. The findings support the integration of health education, routine NCD screening, individual counseling, and referral through Puskesmas and Posbindu PTM as a practical approach to strengthening promotive and preventive health services in coastal communities. Further activities with longer follow-up are needed to determine whether improvements in knowledge are sustained and translated into preventive health behaviors and improved risk-factor control.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to the publication of this article.

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AUTHOR CONTRIBUTIONS

WD: Conceptualization, methodology, investigation, data collection, data analysis, writing—original draft, and project administration. NS: Methodology, investigation, data validation, supervision, writing—review and editing, and final approval of the manuscript. Both authors contributed to the interpretation of the results, critically reviewed the manuscript, and approved the final version for publication.

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During the preparation of this manuscript, the authors used ChatGPT (GPT-5.6 Luna) as an assistive tool to improve the quality, structure, and readability of the manuscript. Following the use of this tool, the authors reviewed, verified, and edited the entire manuscript as necessary. The authors take full responsibility for the accuracy, originality, and content of this publication.

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