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THE EFFECTIVENESS OF HEALTH EDUCATION IN IMPROVING UNDERSTANDING OF PREVENTION OF CEREBROVASCULAR STROKE

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ABSTRACT
Cerebral Vascular Attack (CVA) or stroke is a serious condition resulting from interrupted blood flow to the brain, potentially leading to brain cell damage or death. This study investigates how health education about cholesterol can enhance community awareness of CVA prevention in Bontoramba, Tamalanrea, Makassar. The purpose of this study was to evaluate the effect of health education related to cholesterol on increasing public awareness in preventing CVA. This study employed a quantitative experimental design using a one-group pre-test and post-test approach with observations. Conducted from July 2 to 8, 2025, it involved 45 community respondents from Bontoramba, selected using purposive sampling technique. Data were analyzed using paired sample t-test and Fisher Exact Test at a 0.05 significance level. The results of the analysis show that there is a significant difference between respondents' knowledge before and after the counseling. The p-value = 0.000 (<0.05) indicates that there is a significant effect of health counseling on cholesterol on increasing public understanding of CVA prevention**.** The increase in knowledge after the counseling session proves that health education plays an important role in raising public awareness about the risks of high cholesterol, which causes strokes. The information provided broadened the respondents' understanding so that they were able to implement preventive measures more effectively. Health education about cholesterol has been proven to increase public knowledge about CVA prevention in Bontoramba, so it needs to be continuously promoted as a preventive measure to reduce the risk of stroke.

Keywords: community; CVA; education; health; influence; prevention

INTRODUCTION
According to the WHO (2019), stroke causes approximately 7.9% of deaths in Indonesia. In developed countries, ischemic stroke is the third leading cause of death worldwide after cancer (12%) and coronary heart disease (13%) (Feigin et al., 2022). InIn donesia, approximately 10.9% of the population has experienced ischemic stroke, with 10.9% of women and 11.0% of men affected. In East Java Province, approximately 36.32% of the population has experienced ischemic stroke, with a mortality rate of 1 in 20 cases, while rehabilitation and recovery rates remain low. Based on the symptoms that appear, approximately 10.5% of the 302,987 people in Indonesia are affected, with 39.4% experiencing permanent disability or immobility, while 38.7% can recover gradually (Yanti & Santik, 2022).

Data from the Indonesian Ministry of Health shows that stroke is the leading cause of death in hospitals. According to the Indonesian Stroke Foundation, approximately 500,000 people suffer from stroke each year, and 25% or 125,000 people die (Venketasubramanian et al., 2022). The rest suffer from mild to severe disabilities. In Indonesia, the prevalence of stroke is 12.1 per 1,000 people, and of every 7 people who die, 1 is due to stroke (Rahmawati et al., 2023). Based on the number of strokes diagnosed by health workers and those diagnosed based on symptoms, the incidence increases with age, reaching its highest level in the 75+ age group (38.5% and 69.1%) (Amalia, 2023).

Strokes are more common in men than in women. People with lower levels of education have a higher prevalence of stroke. In urban areas, the incidence of stroke is also higher than in rural areas. The prevalence of stroke is higher in people who are not working (Jackson et al., 2018). Surveillance data in South Sulawesi in 2015 recorded 2,623 long-term stroke patients, with 606 in community health centers and 2,017 in hospitals. In Makassar City, stroke is one of the 10 leading causes of death. In 2013, stroke ranked 10th among causes of death with 96 cases, rising to 6th place in 2014 with 179 cases, and 5th place in 2015 with 151 cases. This indicates that deaths due to stroke continue to increase (Idris et al., 2024).

Cerebrovascular accident (CVA) Infarction remains one of the major health problems, not only in Indonesia but also worldwide. Cerebrovascular accident (CVA) Infarction occurs when blood vessels in the brain become blocked or rupture, causing part of the brain to be deprived of the oxygen-rich blood supply it needs, resulting in cell or tissue death (Zhao, 2024). CVA infarction occurs due to a blockage in the blood vessels leading to the brain. This blockage can be caused by two things: first, a blood clot originating in the heart that is carried to the brain (embolism) (Williams & Oka, 2024) Second, due to thickening of the blood vessel walls called atherosclerosis, in which blood clots and fat stick to the vessel walls (thrombus). Blood flow to the brain can change, becoming faster or slower, due to local disorders such as embolism and thrombus, or general disorders of the heart, lungs, and lack of oxygen (hypoxia)(Richard A. Calkins, MD, 2024) This condition causes the brain to lack oxygen and nutrients. If the blockage occurs in the area that regulates muscle and nerve function, such as in the limbs, it can cause physical disabilities, especially problems with movement or mobility in patients with ischemic stroke (Park et al., 2022).

Cholesterol is a natural substance found in the body. However, if there is too much of it in the blood, cholesterol can cause blood vessel blockages. According to the World Health Organization (WHO) in 2023, approximately 17.5 million people worldwide died from coronary heart disease caused by high cholesterol levels, or about 31% of total global deaths (Duan et al., 2022). According to data, high cholesterol levels cause approximately 2.6 million deaths and health problems in 29.7 million people every year (Nussbaumerová & Rosolová, 2020). In Indonesia, approximately 69.9% of the population suffers from hypercholesterolemia. In addition, based on the 2018 Riskesdas, 21.2% of people aged 15 years and older have high cholesterol levels, either in the threshold category (total cholesterol 200–239 mg/dl) or the high category (total cholesterol ≥ 240 mg/dl) (Harmadha et al., 2023).

Based on RISKESDAS data from 2013, around 35.9% of Indonesians aged 15 years and above have high cholesterol levels (>200 mg/dl), with more women than men affected. The data shows that high cholesterol can affect anyone, but many people are still unaware of the dangers of excess cholesterol in the body (Lestari et al., 2018). Cerebrovascular accidents (CVAs) or strokes can cause various problems. If there is a blockage in the motor system, patients will have difficulty or be limited in their movement. The parts of the body that are usually affected are the hands and feet. Weakness in the hands impairs fine motor function, such as difficulty gripping or pinching. Therefore, rehabilitation is necessary to improve fine motor function in the hands (Lestari et al., 2018).

Due to high cholesterol levels, it is important to have knowledge about how to keep cholesterol within safe limits. One way to increase this knowledge is through health education. Health education is an activity that provides education to individuals or groups with the aim of conveying information, knowledge, and skills so that they can change their attitudes and behaviors towards a healthier lifestyle (Adetya & Boy, 2021). Based on data from the Non-Communicable Disease Surveillance of the South Sulawesi Provincial Health Office, in 2021 in Tamalanrea District, Tamalanrea Village, Makassar, there were 60 patients

with CVA and 42 patients who had suffered a stroke. Thus, the total number of stroke patients was 102. In 2023, the number of cases increased to 100 patients with CVA and 279 patients who experienced strokes, bringing the total to 379 patients. Meanwhile, from March to June 2024, the number of patients with CVA was 235, and the number of stroke patients reached 200, bringing the total number of stroke patients to 435. This data indicates an increase in the number of patients with CVA and stroke in the region year over year.

Based on the results of the research and explanation in the background, the researcher was interested in studying the effect of health education in increasing public knowledge about the prevention of Cerebral Vascular Attack (CVA) in the Bontoramba area, Tamalanrea Village, Tamalanrea District, Makassar. The purpose of this study was to assess the effect of health education related to cholesterol on increasing public awareness of cerebrovascular accident (CVA) prevention. Through health education, it is hoped that the public will gain a better understanding of the risks of high cholesterol and be able to implement appropriate preventive measures to maintain their health.

METHOD

This study employed a quantitative experimental design using a one-group pre-test and post-test approach with observations. Conducted from July 2 to 8, 2025, it involved 45 community respondents from Bontoramba, selected through purposive sampling technique. Data were analyzed using paired sample t-test and Fisher Exact Test at a 0.05 significance level.

RESULT

The results of the analysis show that there is a significant difference between respondents' knowledge before and after the counseling. The p-value = 0.000 (<0.05) indicates that there is a significant effect of health counseling on cholesterol on increasing public understanding of CVA prevention

Tabel 1.
Frequency Distribution Based on Gender

Gender	f	%
Male	24	53.3
Female	21	46.7

Table 2.
Frequency Distribution Based on Age

Age (Years)	f	%
60-70 Years	26	57.8
71-80 Years	17	37.8
81-100 Years	2	4.4

Table 3.
Frequency Distribution Based on Education

Education	f	%
Elementary school	13	28.9
Junior high school	16	35.6
Senior high school	12	26.7
D3	3	6.7
S1	1	2.2

Table 4.
Frequency Distribution Based on Pre-Education

Before Counseling	f	%
Good	17	37.8
Poor	28	62.2

Table 5.
Frequency Distribution Based on Post-Education

After the Counseling Session	f	%
Good	42	93.3
Poor	3	6.7

Table 6.
The Effect of Health Education on Increasing Knowledge of CVA Prevention

Before Health Education After Health Education	Before Health Education		After Health Education		Before Health Education After Health Education		Exact Sig.
	Poor	Good	Poor	Good			
	f	%	f	%	f	%	
Poor	3	6.7%	25	55.6%	28	62.2%	.000
Good	0	0.0%	17	37.8%	17	37.8%	

The results of the study indicate that, based on gender, the majority of respondents were male, totaling 24 individuals (53.3%), while females accounted for 21 individuals (46.7%). Based on age, the largest group was aged 60–70 years, with 26 people (57.8%), and the smallest group was aged 80–100 years, with 2 people (4.4%). In terms of education, the majority of respondents were junior high school graduates, totaling 16 people (35.6%), while the smallest group was university graduates, totaling 1 person (2.2%).

Before the counseling session, the majority of respondents had insufficient knowledge, namely 28 people (62.2%), while 17 people (37.8%) had good knowledge. After the counseling session, there was a clear improvement, with 42 people (93.3%) having good knowledge and only 3 people (6.7%) still lacking knowledge. The effect of health education on knowledge of Cerebral Vascular Attack (CVA) prevention in Bontoramba Village, Makassar, was observed in 45 respondents. Three people (6.7%) still had insufficient knowledge before and after the education. There were 25 people (55.6%) who initially had insufficient knowledge but improved after the education. No respondents experienced a decline in knowledge after the education. Meanwhile, 17 people (37.8%) had good knowledge before and maintained good knowledge after receiving the education.

DISCUSSION

The results of the study of 40 respondents showed that 17 people (37.8%) already had good knowledge before and after receiving counseling on the prevention of Cerebral Vascular Attack (CVA) (Damayanti & Sofyan, 2022). Researchers assume that educational attainment and information reception abilities influence respondents' ability to absorb educational materials. The majority of respondents have a high school education or higher. In addition, family support and experience also help them maintain good knowledge. The fact that 17 respondents retained their good knowledge indicates that the extension did not significantly alter their knowledge status, as they already had sufficient understanding before the intervention. This means that the extension had little impact on this group, possibly because the material presented was already familiar to them (Imran et al., 2019).

This indicates that education needs to be tailored to be more targeted, especially for groups that are already well informed. This study shows that not all respondents respond to education in the same way (Imran et al., 2019). Those who already have sufficient knowledge may not feel the

need to add to or change their information. Therefore, it is important to use a more diverse approach to education and assess its effectiveness in groups with good or poor prior knowledge. These findings can also be used as a basis for determining whether education is more effective for those with less knowledge or for understanding how the impact of education differs based on prior knowledge levels (Joshi et al., 2024).

This is in line with research (Adi Pratama et al., 2022), which found that gender does not significantly affect people's knowledge. Factors that have a greater influence on knowledge are age, level of education, occupation, and social environment. Education plays an important role in determining a person's quality of life because through education, a person gains knowledge and information. The higher a person's level of education, the better their quality of life (Sharma & Ankit, 2023), also states that work affects a person's knowledge (Shavkidinova et al., 2023). Jobs that involve interacting with many people tend to provide more information than jobs with minimal social interaction. Research (Subtinanda & Yuliana, 2023). supports this by showing that employment is one of the factors that influences knowledge about diabetes mellitus. According to (Lengga et al., 2023). Jobs that require higher education usually also influence the level of knowledge because these workers more often attend seminars and have the ability to search for information via the internet (Wulandari et al., 2023).

In this study, none of the respondents (0%) had good knowledge before and after attending the counseling session, but still experienced a lack of knowledge (Maritje S.J. Malisngorar et al., 2023). This can happen even if someone has education, experience, and basic knowledge, but still lacks understanding of the counseling material. Some possible reasons are laziness, lack of attention, or dissatisfaction with the health services provided. In addition, lack of support from family and health workers often causes respondents to be noncompliant in carrying out treatment (Isaev, 2023).

These findings indicate that health education does not cause a decline in respondents' knowledge. On the contrary, education is generally effective in maintaining or improving their understanding. This stability in knowledge indicates that the material provided is relevant and delivered in a manner appropriate to the needs of the community, thereby avoiding confusion or misunderstanding (Souza et al., 2021). However, these results also remind us that other factors such as personal awareness, motivation, and environmental influences can affect a person's level of knowledge. Therefore, further evaluation is needed to understand the influence of these factors. Previous studies support this, emphasizing the importance of the quality of educational materials and delivery methods so that knowledge can be effectively retained after educational interventions (Indra Frana Jaya KK et al., 2023).

Knowledge is something that exists in the human mind, which can only be formed through the process of thinking. According to (Rosida et al., 2023), There are eight ways of thinking that shape human knowledge, namely observing, investigating, believing, having goals, organizing, adapting, and enjoying the results of one's own thinking. The results of data analysis using the Wilcoxon test showed a value of 0.0001, which is less than 0.05, indicating a significant difference between the conditions before and after the intervention. The health education method, which involved interactive lectures supported by leaflets, was proven to be effective in improving the elderly's understanding of the material presented.

Health education is a dynamic process of changing behavior. This change is not limited to the transfer of information from one person to another, but arises from the awareness of individuals, groups, or communities to learn about it (Rosida et al., 2023). The results of this study are also in line with Huda's research, which shows that health education about gouty arthritis can increase the knowledge of people with this disease (Lumintang et al., 2016). In addition, high cholesterol

levels in the blood are influenced by nutritional intake, especially from foods containing fat. An increase in fat consumption of 100 mg per day can increase total cholesterol levels by around 2-3 mg/dl. This condition also affects the body's cholesterol production process (Desmawati et al., 2023).

A total of 25 respondents (55.6%) who previously had limited knowledge showed a significant improvement in their understanding of Cerebral Vascular Attack (CVA) prevention after receiving health education. This demonstrates that health education is effective in enhancing understanding, particularly among those who initially lacked knowledge. The methods and materials used in the education program had a positive impact on the participants. The significant difference in knowledge before and after the counseling among the 25 respondents indicates that knowledge gaps can be addressed through appropriate interventions. This underscores the importance of counseling as a means to expand public awareness.

Although many respondents experienced improvements, the effectiveness of the counseling may vary depending on the background or characteristics of each individual. Therefore, it is advisable to tailor the counseling methods to better reach all groups. The increase in knowledge also indicates that the impact of counseling can be long-lasting, although further evaluation is needed to ensure that the knowledge remains embedded.

Several studies also support these findings, such as research by (Ansori, Heris Hendriana, Sharina Munggaraning Westhisi, Nandang Rukanda & Alam, 2024), which shows the positive impact of educational workshops, as well as (Tschang & Almirall, 2021), which proves the effectiveness of knowledge-based interventions in adults. Other studies by Green and Robinson (2020) and Lewis and Brown (2023) also confirm that educational interventions can improve knowledge and practice. Meanwhile, Thompson and Harris (2023) and Wilson and Young (2024) discuss the importance of evaluation and strategies for retaining knowledge after education is complete.

There were 3 respondents (6.7%) whose knowledge remained poor before and after receiving counseling on the prevention of Cerebral Vascular Attack (CVA). The researchers assume that this is due to their low level of education. Although they have a strong desire to recover and have been taking their medication regularly, they feel dissatisfied with the home care services they receive. Their lack of education and experience also leaves them poorly informed about their condition, which affects their commitment to treatment. These three respondents may have different characteristics or learning needs compared to the others. The counseling method used may not be fully appropriate for their level of understanding. These results indicate that the counseling provided was ineffective for this group. Therefore, a more flexible and interactive approach is needed so that the material is easily understood by all respondents. They may need additional materials, ongoing support, or different teaching methods to improve their knowledge. This lack of progress may indicate differences in how they receive and process information. Therefore, it is important to conduct a more in-depth evaluation of each respondent's learning style and specific needs in order to improve the results of the counseling.

The results of the study show that most respondents, around 12 people, have an education equivalent to junior high school. This means that the respondents' level of education is still relatively low. Education is one of the important factors that influence a person's knowledge, because the higher the level of education, the easier it is for a person to understand information and make decisions (Heldayaningsih & Hardew, 2024). This is in line with the findings (Damayanti & Sofyan, 2022), which states that health knowledge usually increases with education level, although this does not apply significantly to those with a high school education or below. Knowledge is influenced by two main factors, namely internal factors such as

education, motivation, and perception, as well as external factors such as social and cultural environment and surrounding conditions.

A good education or life experience, a strong desire to maintain family health, a positive view of health services, a supportive social culture, and a helpful environment will encourage families to make the right decisions regarding the care of sick family members, and vice versa (Rasool, 2023). The statistical test results showed a p-value = 0.000 or less than 0.05, indicating a significant effect. Researchers believe that this increase in knowledge is greatly influenced by factors such as education, occupation, and experience. Individuals with good education and experience tend to have better knowledge and compliance with treatment. Previous studies have also found that respondents' post-test scores were significantly higher than their pre-test scores, indicating that health education is effective in improving public understanding of stroke prevention.

The very small p-value confirms that the counseling had a real impact on increasing knowledge. Thus, the counseling activity can be said to have successfully achieved its goal as an effective health education method. This success also shows that the counseling material and methods were appropriate and acceptable to the participants. The significant t-test results prove that the change in knowledge was not coincidental, but rather the result of the educational intervention itself. However, despite the clear increase in knowledge, further evaluation is needed to determine whether this increase is long-lasting or only temporary. Additional research is recommended to measure the long-term impact of education on CVA prevention behavior.

These findings are consistent with previous studies, such as those conducted by (Naomi et al., 2021) which shows the influence of health education on knowledge of coronary heart disease risk. Research (Renityas, 2019), It also proves that health education about cholesterol helps improve the elderly's knowledge about preventing hypercholesterolemia. (Risnandar et al., 2024), states that health education can increase a person's level of knowledge. In addition, according to Sukanto in (Damayanti & Sofyan, 2022), The more information you obtain, the greater your knowledge will be.

Previous research shows that knowledge is related to efforts to prevent gouty arthritis (Lumintang et al., 2016). In addition, Pertiwi and her colleagues found that knowledge was also related to uric acid levels in the blood (Pertiwi et al., 2023) The main objective of health education is to encourage individuals, families, and communities to change their attitudes and behaviors so that they become more concerned about healthy lifestyles and clean environments, thereby improving overall health. (Mardiati et al., 2024), stated that health education can improve a person's knowledge. Their research shows that participants' knowledge levels were higher after receiving health education. In this study, pretest and posttest scores on hyperuricemia and hypercholesterolemia also increased significantly after analysis. This proves that health education can improve knowledge. This increase in knowledge can influence changes in a person's behavior, in accordance with the Theory of Planned Behavior (TPB). This theory explains that attitude, which is a belief (Dee & Siti Sakinah, 2024).

CONCLUSION

A study conducted in Bontoramba Village, Tamalanrea District, Makassar, from July 2 to 8, 2025, with 45 respondents showed that before the counseling session, 17 respondents (37.8%) had good knowledge, while 28 respondents (62.2%) still lacked knowledge. After the health education session, the number of respondents with good knowledge increased to 42 (93.3%), and only 3 respondents (6.7%) still had insufficient knowledge. Statistical analysis using a paired sample t-test and Fisher's Exact Test with a p-value of 0.000 ($p < 0.05$) indicated that the health education program had a significant impact on improving community knowledge regarding the

prevention of Cerebral Vascular Attack (CVA) in the area.

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