ORIGINAL ARTICLE

A community-based participatory approach to increase public knowledge of stroke among ethnic minorities in the northern mountains of Thailand

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ABSTRACT

This study examines a stroke education program about knowledge of stroke among community partners that aims to increase the public knowledge of stroke in ethnic minorities. A one-group pre-test/post-test experimental design based on a community-based participatory approach was used in four steps following established community collaboration, planned intervention, community partner recruitment and training, implementation, and evaluation. The study was conducted between September 1, 2019 and February 28, 2020 in Chiang Rai province of Thailand. Purposive sampling was used to select 50 community partners, and cluster random sampling was used to select 419 participants from ethnic minorities. The 50 community partners already trained by researchers in the stroke education program proffered their knowledge of stroke to the ethnic minorities over a period of 1 month. A stroke knowledge questionnaire was used to test stroke knowledge among ethnic minorities before intervention (baseline) and 1 month later (post-intervention). At post-intervention, 60.6% of ethnic minorities could correctly recall more than 3 warning signs of stroke, while 51.3% correctly identified more than 3 risk factors for stroke. The score differed among 159 participants who could not speak Thai pre-intervention (mean=0.03, SD=0.39) and post-intervention (mean=7.52, SD=1.33). There were significant differences in pre-intervention and post-intervention overall stroke knowledge scores of 4 major ethnic groups (mean 0.57, SD=1.63 versus mean 7.62, SD=1.39; t=–67.38, p<.001). The stroke educational program based on community-based participatory research can increase public stroke knowledge and help to overcome cultural and language barriers in ethnic minorities.

Key words:
Nos stroke education program; ethnic minorities; public stroke knowledge; community partners; community-based participatory research

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INTRODUCTION

Stroke continues to be a major emergency health problem. Ischemic stroke is the most common type of stroke in Thailand, for which the current gold-standard treatment is to receive reperfusion therapy within 4.5 hours after the time of onset.[1] The literature has indicated that lack of knowledge and awareness of stroke in the public domain is associated with pre-hospital delays worldwide.[2–5] However, public knowledge of stroke is reported to be high in the general population but tends to be low in ethnic minorities.[6,7] The northern region of Thailand accommodates approximately 1.14 million inhabitants from ethnic minorities who have migrated from the southern region of China to the border of Thailand. Because of the remote location, this population experiences difficulties in reaching healthcare centers.[8,9]

The literature indicates that language and socioeconomic status are potential barriers to stroke knowledge among ethnic minorities.[10] In Thailand, discrimination and the language barrier remain significant problems for ethnic minorities in accessing healthcare services and receiving health information. This is complicated by each ethnic minority having its own language, culture, and lifestyle, which may play an essential role in appreciating the response to emergency illness and an individual's perception of illness.[8,10] The likeliness that ethnic disparities in stroke care mainly result from a lack of knowledge is related to the possibility of ethnic minorities taking no action or not visiting hospital after the presentation of stroke symptoms.

Community-based participatory research (CBPR) has demonstrated the effectiveness of community engagements that can solve community health problems.[4,10-14] In Thailand, the village health volunteers (VHVs) are community healthcare partners who are bilingual residents in ethnic communities. Although VHVs can translate the warning signs of stroke to another language, linguistic validity without losing the concept of rapid action might be difficult to achieve for diverse ethnic groups.[5]

A stroke education program among ethnic minorities in Thailand that can overcome culture and language barriers needs to be developed and tested. The delivery of the message should emphasize to the patient and relatives, as well as witnesses, the need to feel confident in their ability to respond to acute stroke.[3,15-16] Therefore, to address this problem, this study aimed to evaluate the community partnership based on CBPR to increase public knowledge of stroke among ethnic minorities in northern Thailand.

METHOD

This study used a one-group pre-test/post-test experimental design and was conducted between September 1, 2019 and February 28, 2020 in Wa-Wee sub-district of Chiang Rai province. Use and analysis of participants' data were approved by the local ethics board (code: CRPPHO 11/2019). Data collection was carried out after the participants gave written informed consent. For participants with Thai language inadequacy, the informed consent was translated into the target language by their village headman.

Sample size and Sampling Strategies

The 419 participants in this quasi-experimental study were the adult representatives of 4 major ethnic minorities in Wa-Wee sub-district, Chiang Rai Province, northern Thailand. The population older than 20 years in Wa-Wee sub-district amounted to 7,000 people. A minimum required sample size of 364 samples was obtained from the Krejcie and Morgan table. The sample size was increased by 15% (55 persons) to cover attrition. The participants were selected using a two-stage cluster random sampling

process. Thirteen villages were randomly selected from the list of all 25 villages, and 419 households were then randomly selected from these 13 villages. The participants in each household were eligible for study based on the following criteria: (1) aged over 20 years, (2) living and intending to stay in the study area for at least 3 months, (3) being Akha, Lahu, Lisu, and Yao ethnic minorities, and (4) gave their consent to partake in the study.

Intervention

The intervention was developed according to the community-based participatory approach and consisted of four steps as follows.

Step 1: Establishing community collaboration and planning intervention

As a means of relationship building, the researchers relayed the objectives and scope of the study to the community stakeholders, including local healthcare providers, VHVs, village headsmen, subdistrict chiefs, and the chief executive of the subdistrict administrative organization. Researchers enlisted a focus group with the community stakeholders to brainstorm about ways of contributing to the message, cultural barriers, and solutions in terms of stroke education. The results from the focus group guided the development of the stroke educational program and training, while the VHVs and the village headsmen were assigned to conduct training during the program.

Step 2: Recruitment and training of community partners

In this study, the headsmen and VHVs were designated the community partners. The recruitment of community partners was carried out using purposive sampling, and the inclusion criteria were (1) can read, write, and speak the Thai language and (2) were able to speak one or more languages (including Akha, Lahu, Lisu, and Yao).

During community partner training, the researchers established the stroke education program. Three experts verified the content validity index (CVI) of the stroke education program to be 0.90. They specifically addressed the following: (1) stroke knowledge (pathophysiology, risk factors for stroke, and stroke warning signs); (2) treatment of stroke; (3) delivery of stroke knowledge; and (4) appropriate response when someone in the community is affected by stroke. The community partners took part in three 7-hour training sessions for 2 days. The first session covered sharing and discovering reality, with discussions regarding the roles and responsibilities of community partners. The second session included a description of stroke knowledge, treatment, and appropriate response. In the third session, the community partners translated their knowledge of stroke into Akha, Lahu, Lisu, and Yao languages and translated it back to the Thai language. During this session, the community partners provided appropriate images and used simultaneous forward and reverse translation of stroke knowledge into the target language from Thai, which was then reviewed by 2 focus groups and the research team. Researchers used follow-up telephone calls from community partners in the third and fourth week after training, the purpose of which was to remind community partners about the warning signs of stroke.

Step 3: Implementation

The community partners who had been trained in the stroke education program conveyed their knowledge of stroke to the participants between November 1 and 30, 2019 in Wa-Wee sub-district. The stroke knowledge education included risk factors for stroke, stroke warning signs (balance, blurred vision, face drooping, arm weakness, speech difficulty, and appropriate response time), and emergency medical service (EMS) phone number, contributed over a period of 1 month. Given that there were

approximately 28,500 residents in the study area, the community partners designed multiple means of communication, including local radio stations, transmission masts in each community, and face-to-face conversation. In this step, the researchers were facilitators who provided opportunities for capacity building and self-confidence among community partners while using optimal communication resources.

Step 4: Evaluation

Two-stage cluster random sampling was used to select the participants in ethnic minorities that included Akha, Lahu, Lisu, and Yao ethnic groups. In this step, the participants received stroke knowledge from the community partners and answered the demographic and stroke knowledge questionnaire at the beginning of and after the program.

Instrument for data collection

The demographic and stroke knowledge questionnaire was developed by researchers based on a literature review. The stroke knowledge questions were close-ended questions consisting of stroke risk factors, stroke warning signs, and appropriate responses to acute stroke. For example, in answer to the question, "Can you tell me what the stroke warning signs are?", the answer consists of 5 items, namely balance, loss of vision, face drooping, arm weakness, and speech difficulty (scoring: 1 point for each correct item and 0 points for the wrong answer or did not know). The maximum score of stroke knowledge questions was 12. The level of stroke knowledge was divided into three levels: low knowledge level with a score ranging from 0 to 4; medium knowledge level with a score from 5 to 8; and high knowledge level with a score between 9 and 12. The questionnaire was developed in Thai by all research members and then translated into Akha, Lahu, Lisu, and Yao by community partners. Four bilingual research assistants reviewed and translated this back into Thai for linguistic and conceptual accuracy. The content validity of the questionnaire was 0.88. The reliability was conducted among 20 ethnic minorities: 5 each in Akha, Lahu, Lisu, and Yao, with an internal consistency of 0.84.

The 4 research assistants were bilingual residents from the ethnic minority community and were trained by the researchers on how to use the demographic and stroke knowledge questionnaire. Pre-intervention was conducted before community partners conveyed stroke knowledge to ethnic minorities, and post-intervention was conducted by telephone approximately 1 month after the implementation. For the participants who did not understand Thai, the questionnaire was translated into the target language, albeit the terminology remained the same as that in the stroke educational program.

Statistical analysis

Descriptive statistics were used to analyze demographic information of community partners, while the comparison of stroke knowledge scores in three periods was examined by repeated-measures analysis of variance (ANOVA) and post hoc test. Regarding pre- and post-intervention, the demographic information of participants and the stroke knowledge including risk factors for stroke, stroke warning signs, "golden period" time, EMS phone number, and level of stroke knowledge were analyzed by a descriptive statistic. The overall stroke knowledge scores were compared by paired *t*-test, and a *p*-value of less than .05 was considered statistically significant. The differences in stroke knowledge mean score between groups of ethnic minorities, education level, level of Thai speaking skill, and level of Thai reading skill were tested using one-way ANOVA.

RESULTS

Characteristics of community partner and training stroke education program

Most of the community partners trained in the stroke education program were female, and the average age was 43.16 years; 40.4% of them were educated at the secondary school level and 34.6% at the primary school level. After following the stroke education program, the community partners had stroke knowledge mean scores higher than before training. There was a significant difference between the stroke knowledge score of community partners in the three stages of the tests (F=2023.54, $p<.001$). Using a post hoc test, we found significant differences in pre-test, immediate post-test, and follow-up at 4 weeks ($p<.001$, $p<.001$, and $p<.001$, respectively).

Characteristics of participants and stroke knowledge among ethnic minorities pre- and post-intervention

The demographics profile of participants is presented in Table 1. There were 215 male and 204 female respondents with a mean of age of 43.08 (SD=14.46) years. Most participants finished primary school (37% or 155/419) or had no informal schooling (30.1% or 126/419). A total of 234 (55.8%) participants had no underlying diseases. More than half of the participants reported poor Thai language skills, including reading, writing, and speaking skills.

Pre-intervention, most of the participants did not know about stroke symptoms, risk factors, and "golden period" time. Only 5% or 21 of 419 participants could answer at least 1 stroke symptom correctly, and few participants (5.7% or 24/419) were able to provide the EMS phone number. Post-intervention, more than half of the participants (60.6% or 254/419) identified 3 symptoms of stroke and 13.1% (55/419) knew more than 3 symptoms of stroke. More than half of the participants named 3 risk factors, while 22.7% (95/419) knew more than 3 factors (Table 2). In addition, most of the participants (76.9% or 322/419) had knowledge of stroke on the medium level (SD=1.3, range 3–12; Table 3). The overall stroke knowledge score was significantly different between pre-intervention and post-intervention ($t=-67.38$, $p<.001$; Table 3).

Table 1 Characteristics and demographics of participants (n=419)

Variable	n (%)	Mean ± SD
Sex		
Male	215 (51.3)	
Female	204 (48.7)	
Age (range, years)	(20–78)	43.08±14.46
Ethnic group		
Lahu	117 (27.9)	
Akha	109 (26.0)	
Lisu	102 (24.3)	
Yao	91 (21.7)	
Education		
No formal schooling	126 (30.1)	
Primary school	155 (37.0)	
Secondary school (Grade 6–8)	73 (17.4)	
Secondary school (Grade 7–12)	54 (12.9)	
Bachelor degree	11 (2.6)	

Variable	n (%)	Mean ± SD
Occupation		
Agriculture	152 (36.3)	
Worker	179 (42.7)	
Entrepreneur	7 (1.7)	
Civil servant	12 (2.9)	
Housework	69 (16.5)	
Health status		
Diabetes mellitus	43 (10.3)	
Hypertension	94 (22.4)	
Dyslipidemia	29 (6.9)	
Comorbidities	19 (4.5)	
Unknown	234 (55.8)	

SD, standard deviation

Table 2 Public knowledge of stroke among participants (n=419)

Question	Pre-intervention	Post-intervention
	n (%)	n (%)
Stroke warning signs (Overall 5 symptoms)		
At least 1 symptom correct	21 (5.0)	17 (4.1)
2 symptoms correct	9 (4.3)	87 (20.8)
3 symptoms correct	0	254 (60.6)
More than 3 symptoms correct	0	55 (13.1)
Unknown	389 (92.8)	25 (6.0)
Risk factors for stroke (Overall 5 factors)		
At least 1 factor correct	15 (3.6)	8 (1.9)
2 factors correct	15 (3.6)	87 (20.8)
3 factors correct	15 (3.6)	215 (51.3)
More than 3 factors correct	0	95 (22.7)
Unknown	374 (89.3)	14 (3.3)
Golden period time (3 hours)		
Correct	18 (4.3)	284 (67.8)
Wrong	401 (95.7)	135 (32.2)
Number of emergency medical service (1669)		
Correct	24 (5.7)	403 (96.2)
Wrong	395 (94.3)	16 (3.8)

Table 3 Comparison of pre-intervention and post-intervention stroke knowledge score (n=419)

Level of stroke knowledge	n (%)	Min.–max.	Mean ±SD	Level of mean knowledge difference		
				df	*t*	*p*-value
Pre-intervention (0-12)		0–8	0.57 ±1.63			
Low (0-4)	400 (95.5)					
Medium (5-8)	19 (4.5)					
High (9-12)	0					
Post-intervention (0-12)		3–12	7.62 ±1.39			
Low (0-4)	11 (2.6)					
Medium (5-8)	322 (76.9)					
High (9-12)	86 (20.5)					

Level of stroke knowledge	n (%)	Min.–max.	Mean ±SD	Level of mean knowledge difference		
				df	*t*	*p*-value
Compared mean between pre and post-intervention				18	−67.38	<.001*

*SD, standard deviation; *p<.05. Paired t-test was used to analyze the data*

Table 4 Comparison of the results based on ethnic group, education, and language skills (n=419)

Variables		Pre-intervention				Post-intervention			
Possible score 0–12	**n (%)**	**Mean ±SD**	**MS**	**F**	***p*-value**	**Mean ±SD**	**MS**	**F**	***p*-value**
Ethnic group									
Lahu	117	0.26± 0.09				7.56±1.26			
Akha	109	0.20±1.04				7.67±1.39			
Lisu	102	0.99±2.12				7.66±1.49			
Yao	91	0.54±1.75				7.60±1.44			
Between groups			13.71	5.89	<.001*		.30	.15	.92
Education									
No formal schooling	126	0.39±1.17				7.51±1.45			
Primary school	155	0.31±1.31				7.62±1.32			
Secondary school (Grade 6–8)	73	0.52±1.90				7.55±1.69			
Secondary school (Grade 7–12)	54	0.77±1.55				7.64±1.47			
Bachelor degree	11	3.27±1.73				7.87±1.28			
Between groups			22.82	9.21	<.001*		1.26	.65	.62
Level of Thai speaking skill									
Excellent	64	1.33±2.08				7.48±1.43			
Good	74	1.19±2.76				7.80±1.47			
Intermediate	55	0.36±0.88				7.79±1.34			
Fair	67	0.09±0.67				7.68±1.42			
Poor	159	0.03±0.39				7.52±1.33			
Between groups			30.37	13.20	<.001*		1.71	.83	.47
Level of Thai reading skill									
Excellent	61	1.31±2.07				7.64±1.47			
Good	53	1.08±2.65				7.91±1.35			
Intermediate	57	0.09±0.66				7.49±1.39			
Fair	74	0.60±1.18				7.53±1.42			
Poor	174	0.03±1.55				7.60±1.36			
Between groups			28.48	14.02	<.001*		1.62	.88	.50

*MS, mean squared; SD, standard deviation; *p<.05. One-way ANOVA was used to analyze the data*

DISCUSSION

The stroke educational program is effective in increasing the knowledge of stroke among community partners. This identification of knowledge as a mediating factor for community partners in the study population is significant because it provides evidence of increasing knowledge of stroke in the public domain among ethnic minorities. The major strengths of the stroke education program were the self-efficacy and self-confidence of community partners who continued to develop aspects of their role during their instruction of stroke knowledge. The recognition of contributing stroke knowledge was high because community partners were aware of the need to reduce the disparity of stroke care in their communities. The training session on sharing and discovering reality was designed to help them perceive the healthcare problems, their capacity, and their roles in responding when someone in their community is affected by stroke. A study by Choowong et al. found that CBPR can develop the competencies of VHVs in the ethnic community to help solve their community health problems.[17] Vatcharavongvan and Kummabutr reported that the empowerment of VHVs to share their needs and concerns could help them reflect on their capacity and roles in their communities. It also provided an opportunity for the VHVs to learn new skills.[18] Moreover, the community partners in our study shared their experience during the provision of stroke knowledge, implementing early detection and providing an appropriate response. Learning from previous experience may encourage other community partners to engage continuously and may also improve their self-confidence.[17,18]

According to our analysis, most participants pre-intervention were ignorant of the symptoms of stroke, its risk factors, the "golden period" time, and EMS phone number (low level of stroke knowledge; rage 0-4; mean=0.57, SD=1.63). These results are consistent with those of Skolarus et al. (2016), Krishnamurthi et al. (2020) and Mszar et al. (2020).[12,19-20] The study by Krishnamurthi et al. (2020) found that Pacific ethnicity in New Zealand has the lowest level of stroke awareness among the local population. The Pacific people were less likely to correctly identify the risk factors for stroke in comparison with New Zealand Europeans (odds ratio=0.42, 95% confidence interval 0.26, 0.66).[12] This finding does not compare favorably with that of Pothiban et al. (2018), who reported that knowledge and awareness of stroke, its warning signs and risk factors, and early management of the local people in northern Thailand were high.[21]

The stroke educational program is appropriate for community partners who are bilingual residents in ethnic minority communities, with community collaboration playing an essential role in solving the culture and language problems in ethnic minorities.[7,8,12,22] However, a study conducted in Riyadh, Saudi Arabia indicated that there was no statistically significant relationship between education level and level of stroke awareness among minority(p= .334).[23] According to pre-intervention, the result of this study has shown that the knowledge of stroke score was significantly different among participants in relation to education level (F=9.21, p<.001). After the stroke educational program was delivered to participants by community partners, knowledge of stroke among participants in relation to the ethnic minority group (F=.15, p=.92), education level (F=.65, p=.62), level of Thai speaking skill F=.83; p=.47), and level of Thai reading skill (F=.88; p=.50), as measured by ANOVA, was at a similar medium level of stroke knowledge. The score differed among participants who could not speak Thai pre-intervention (mean=0.03, SD=0.39) and post-intervention (mean=7.52, SD=1.33). A similar study conducted by Visaria et al.

(2020) provided culturally appropriate stroke education to a South Asian population in the United States who cannot speak English.[6] The community health volunteers who could speak English and South Asian languages were trained to teach stroke knowledge. Their results showed a statistically significant increase of knowledge score, from a mean pre-score of 20.9 (SD=6.4) to a post-score of 23.7 (SD=5.5) (p<0.0001).[6] The present study also found that successful intervention may arise from community partners designing multiple ways of communication to transmit the stroke message. Thus, ethnic minorities may pick up information many times; for example, the community partners might insert pieces of stroke information into an everyday conversation when possible. The main feature of the CBPR approach was that the research team received strong support from community stakeholders because of a recognized disparity in stroke care in their communities.[24] The study of Choowong et al. (2020) found that in Thailand, the CBPR can develop competencies of VHVs in the ethnic community to deal with their community health problems.[17] Furthermore, the role of the village headman in reinforcing stroke awareness might increase participants' concern about the impact of stroke on their lives because the socio-cultural bond between the headman and the community could help address any conflict between cultural beliefs and modern medicine regarding health literacy.[24-26] In addition, the stroke awareness of ethnic minorities in the same community as the patients who suffer from stroke might be increased, since such patients are usually monitored and supported by neighbors or relatives as much as possible before accessing healthcare services.[21] Such experiences might change their perception of stroke in terms of the severity of symptoms and its effect on their lives.

CONCLUSION

This study evaluated a Thai stroke education program designed to increase public awareness and knowledge of stroke in ethnic minorities. Pre-intervention, ethnic minorities lacked stroke knowledge in terms of warning signs, risk factors, and appropriate responses to symptoms. The stepped design of the CBPR approach encourages community partners to educate ethnic communities to recognize and undertake action against stroke. Using community partners who have been trained in the stroke education program can increase the knowledge of stroke among ethnic minorities.

Strengths and limitations of the study

The major strengths of this study were the participants' representation of diverse ethnic minorities in northern Thailand and the accuracy of translation of stroke knowledge from Thai to the target language by the community partners. The stroke knowledge in the target version was reviewed by 2 focus groups and the research team. However, the study does have limitations. First, participants with cardiovascular risk were not excluded from this study. These responders might already have received information about stroke repeatedly from their healthcare providers. Second, the study was designed to collect data immediately after the start of the intervention and thus did not take into account the effect of short-term memory loss. The evaluation of pre-hospital delays among patients with stroke is not included in this study because the number of patients with stroke was limited.

RECOMMENDATION

Stroke education programs with a culturally diverse and linguistic approach potentially provide pre-hospital prevention

of delay among minority populations, especially those at risk of stroke. Future research should focus on the maintenance of stroke knowledge, the evaluation of stroke education programs and their possible clinical outcomes, and the number of patients with acute ischemic stroke who receive reperfusion therapy within the time recommendation.

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