

Knowledge of Stroke and Planned Response among Patients Living with Diabetes Mellitus and Hypertension in a Primary Care Unit

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ABSTRACT

Background: Stroke is an important worldwide public health problem. Lack of knowledge in prevention methods, warning symptoms and planned response of acute stroke are associated with a longer prehospital time, which affect the morbidity and mortality of patients.

Objective: The primary objective was to assess knowledge of stroke prevention methods and warning symptoms among patients living with diabetes and/or hypertension. The secondary objectives were to define planned responses when suspecting acute stroke, and identify associated factors with stroke knowledge scores and planned responses.

Materials and Methods: A cross-sectional study was conducted in patients living with diabetes and/or hypertension, who had continuous follow up at the primary care unit of Songklanagarind Hospital. The outcomes of this study were assessed by a questionnaire, which was developed from a literature review.

Results: This study included 312 participants. Median age was 64.0 years (Q1, Q3 = 58.0, 71.0), and 59.6% were female. Median score of knowledge of stroke prevention methods were 9, from 12 points (Q1, Q3 = 8, 10), and warning symptoms were 7, from 10 points (Q1, Q3 = 6, 8); with 80.1% of them knowing all 3 warning symptoms, according to the acronym FAST. Only 22.8% of participants would go to the hospital immediately, by calling an ambulance when they experienced symptoms of a suspected acute stroke. Participants who had income had statistically significant higher knowledge of stroke prevention methods; while participants under 60 years of age, who had a longer duration of diagnosed diabetes mellitus were associated with appropriate planned responses when suspecting acute stroke.

Conclusion: Patients living with diabetes mellitus and hypertension, who are at a high risk for developing cardiovascular diseases, still do not have enough knowledge about acute stroke and had little concern about developing a stroke; especially the elderly and those with a short duration of having been diagnosed with diabetes mellitus.

Keywords: acute stroke, knowledge, prevention methods, warning symptoms, planned response (Siriraj Med J 2022; 74: 75-84)

INTRODUCTION

Stroke is an important public health problem worldwide; because stroke is life threatening¹ and is the second leading cause of death and disability worldwide.² Risk factors of stroke are categorized as non-modifiable risk factors and modifiable risk factors; such as, underlying

diabetes mellitus (DM) and hypertension (HT); which are the highest risk factors of stroke (Odds ratio = 3.55 and 2.06, respectively).³ Although, various studies have shown that reducing risk factors can prevent stroke, only 27.0-37.0% of the population recognized stroke risk factors.⁴

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There are two types of stroke: ischemic and hemorrhagic stroke. When patients develop acute stroke they should receive appropriate treatment promptly in order to reduce mortality rate and disability.^{5,6} Public health systems realize the importance of receiving prompt treatment, and as such many hospitals worldwide have developed a stroke fast tract; including Songklanagarind Hospital. Although, the stroke fast tract can reduce the time for diagnosis of stroke and increases the usage rate of thrombolytic therapy in ischemic stroke⁷; only 14.9% of acute stroke patients in Thailand can arrived at the hospital in time to receive thrombolytic therapy.⁴ Lack of knowledge of stroke risk factors, warning symptoms and planned response when suspecting acute stroke were found to be reasons of delayed prehospital time in acute stroke.⁸⁻¹² Clinical practice guidelines recommend patients who have warning symptoms of stroke should go to the hospital immediately by calling emergency medical services (EMS)¹³; however, a study in Thailand found that only 5.0-16.0% of stroke patient used EMS as their transportation.¹⁴

The National Stroke Association, American Heart Association propagate the mnemonic abbreviation “FAST”, which stands for facial palsy, arm drip (which means weakness of upper and/or lower extremities), abnormal speech and going to the hospital in time; to make people easy to remember common warning symptoms of acute stroke and emphasize people who have warning symptoms of stroke should go to hospital without delay; or in time, as per the “T” in FAST.¹⁵ Beyond the 3 most common warning symptoms of stroke, included in the acronym FAST¹⁶, there are also a number of other warning symptoms of stroke.¹⁷ A previous population-based study found that 63.0-75.1% of participants could not recognize any stroke warning symptoms; however, 86.1% of them knew that they should go to the hospital if they had stroke warning symptoms.^{4,5}

Factors that related to good knowledge of stroke risk factors, prevention methods, warning symptoms and appropriate planned response when there is a suspicion of acute stroke were younger age, female, married, higher education, living in the city, being employed, sufficient income and underlying DM.^{4,7,18-20} While hypertensive patients may have more knowledge of stroke over a normotensive population¹⁹, some studies found that 77.0% of hypertensive patients could not identify any stroke risk factors or warning symptoms.²⁰

This study was developed with the primary objective being to assess knowledge of stroke prevention methods and warning symptoms among patients living with diabetes and/or hypertension, who are in the high risk group of

stroke, as there are currently few studies concerning this topic; especially in Thailand and in this specific group of patients. The secondary objectives were to define planned response when suspecting acute stroke, and identify associated factors with stroke knowledge scores and appropriateness of planned response when suspecting acute stroke.

MATERIALS AND METHODS

Study design

A cross-sectional study was conducted from; 1st May – 31st August 2019, amongst patients living with diabetes and/or hypertension who had continuous follow up at the Primary Care Unit (PCU) of Songklanagarind Hospital, Hat Yai, Thailand; this being a tertiary care hospital in Southern Thailand.

Study sample and sampling

This study included patients living with diabetes and/or hypertension who had continuous follow up at the Primary Care Unit (PCU) of at least 1 year, came for follow-up during the study period, had good consciousness and consented to participate in our research. We excluded patients who required emergency treatment, and whom were already diagnosed with stroke or transient ischemic attack. The sample size was calculated for the primary objective, by using estimate of the mean in the population formula; with standard deviation (S.D.) being calculated from the pilot study (S.D. = 3.3 and 4.5 for knowledge of stroke prevention methods and warning symptoms, respectively); and error (d) = 0.5. According to the maximum calculated value, 312 participants were required. We enrolled participants who were compatible with our eligibility criteria by convenience sampling method.

Variables

The outcomes were assessed by a questionnaire, which was divided into 3 parts: 1) knowledge of stroke, consisting of prevention methods (yes-no questions 12 items) and warning symptoms of stroke (yes-no questions 10 items); 2) planned response when suspecting acute stroke, assessed by an opened-end question: “If you have symptoms suspected to be acute stroke, what is the first thing you will do?”; and 3) factors associated with stroke knowledge scores and planned response, consisting of participant characteristics, general knowledge and attitude of stroke disease. The questions to explore knowledge of stroke and associated factors were applied from previous studies.¹⁹⁻²³ The questionnaire was verified for validity by 3 family physicians, and calculated Item Objective Congruence Index for each question. The results of all

questions were more than 0.5; however, we adjusted some questions according to the specialist's suggestion. Then we conducted a pretest in thirty patients living with diabetes mellitus and/or hypertension in another PCU; which was close to our study setting. Test-retest reliability was used to verify correlation coefficient of stroke knowledge scores in prevention methods and warning symptoms; the results were 0.9 and 0.7, respectively.

Data collection

Those patients who fit into our eligibility criteria were invited to participate in our research, and written informed consent was obtained. The participants completed the questionnaire by themselves; except for participants who could not read the questionnaire, in such cases the researcher helped by interviewing.

Data management and analysis

The data were entered in Epidata (version 3.1, Denmark), with double entry basis, and analyzed using the R program (R Core Team 2021, Vienna, Austria). Descriptive statistical analysis was used to report the sociodemographic characteristics of the participants, score and detail of answer. For variables in age of participants, we used the definition of age ≥ 60 years old to be cut-off point of elderly; according to United Nations and Thailand's Elderly Act. We presented categorical data in terms of frequencies and percentage; while continuous data were checked for normal distribution, and median with interquartile range (IQR) was used when normal distribution assumption was not met. We used multiple linear regression and multiple logistic regression to assess associated factors with stroke knowledge scores and appropriateness of planned response when suspecting acute stroke. Variables were eliminated in a stepwise model, until a final model resulted. Finally, significant factors were identified, based on adjusted coefficient (β) and adjusted Odds ratio, with 95% CI. A p-value < 0.05 was considered as significant.

Ethics statement

The study protocol was approved by the Office of Human Research Ethics Committee (HREC), Prince of Songkla University (REC 63-082-9-4). All participants signed informed consent forms after reading the participant information sheet.

RESULTS

The baseline characteristic of 312 participants are shown in Table 1; two thirds of them were elderly [age range from 30.0 to 93.0 years; median (Q1, Q3) = 64.0 years (58.0, 71.0)] and more than half of them were

female. Median duration from time of diagnosis to having diabetes and hypertension was ten years for both diseases.

Table 2 shows general knowledge and attitude about stroke disease in our participants; 20.5% of them had no prior knowledge of "stroke", and most of them thought that a stroke was preventable. Only 5.0% of patients living with diabetes and/or hypertension thought that they had a high risk of developing stroke, and about one third of the participants believed they had no risk of developing stroke. The participants were tested for 2 parts of stroke knowledge, consisting of: prevention methods and warning symptoms of stroke. Table 3 shows the details of the answers in each question concerning knowledge of stroke prevention methods (full score = 12 points). The median of score (Q1, Q3) was 9 points (8, 10), and most of them had the correct knowledge concerning a lifestyle that could prevent stroke. However, almost half of the participants are of the opinion that using herbal medication can prevent stroke. Table 4 shows the answers of each question concerning warning symptoms of stroke (full score = 10 points). The median score (Q1, Q3) was 7 points (6, 8), and more than half of them had correct knowledge in stroke warning symptoms; especially the 3 symptoms in the acronym FAST, by the National Stroke Association, American Heart Association.¹⁵ More than a third of participants did not know that sudden and severe unexplained headaches, sudden confusion as well as sudden trouble in seeing may be presenting symptoms of acute stroke. Details of action that participants undertook when having symptoms of suspected acute stroke are shown in Table 5. More than half of them would go to the hospital immediately by themselves or with family members, only 22.5% of them would go to the hospital immediately by calling EMS, and about 10.0% of them would not go to the hospital immediately; instead they first rested or used alternative medicine.

Multivariate analysis of factors associated with stroke knowledge scores and appropriateness of planned response when suspecting acute stroke are shown in Table 6. Participants who thought that they had a low chance of having a stroke, and who had income were significantly associated with a higher score of stroke prevention methods when compared with participants who thought that they had no chance of having a stroke, and whom did not have income ($\beta = 0.40$ and 0.57 , $p = 0.035$ and 0.04 ; respectively). Additionally, adult patients and those with a longer duration of being diagnosed with DM were significantly associated with an appropriate planned response when suspecting acute stroke (adjusted OR = 2.22 and 1.10; $p = 0.01$ and 0.02 ; respectively).

TABLE 1. Sociodemographic characteristics of participants (n=312).

Characteristics	
Age (years)	
< 60	106 (34.0)
≥ 60	206 (66.0)
Gender	
Male	126 (40.4)
Female	186 (59.6)
Occupation	
Unemployed	79 (25.3)
Employed	160 (51.3)
Retirement	73 (23.4)
Income	
No income	46 (14.7)
Having incomes	266 (85.3)
Highest level of education	
Primary education level	150 (48.1)
Secondary education level	76 (24.4)
Tertiary education level	86 (27.5)
Marital status	
Single	25 (8.0)
Married	271 (86.9)
Divorced/widow	16 (5.1)
Smoking status ^a	
Never	231 (74.0)
Ex-smoker	63 (20.2)
Current	18 (5.8)
Subgroup of participants	
DM alone	34 (10.9)
HT alone	170 (54.5)
DM with HT	108 (34.6)
Duration of diagnosed DM (year) [median (Q1, Q3)] (n=142)	10.0 (4.0, 15.0)
Duration of diagnosed HT (year) [median (Q1, Q3)] (n=278)	10.0 (5.0, 15.0)

Data are presented as n (%) unless indicated otherwise.

Abbreviations: DM : diabetes mellitus; HT : hypertension

^a Smoking status²⁴;

- never = participant who has never smoked, or smoked less than 100 cigarettes in their lifetime
- ex-smoker = participant who has smoked at least 100 cigarettes in their lifetime, but quit smoking at the time of interview
- current = participant who has smoked at least 100 cigarettes in their lifetime and is currently smoking

TABLE 2. General knowledge and attitude about stroke disease (n=312).

General knowledge and attitude	n (%)
Knowing about stroke before participating in the research	
No	64 (20.5)
Yes	248 (79.5)
Aware that stroke is a preventable disease	
No	11 (3.5)
Yes	301 (96.5)
The chance you could have a stroke	
No	91 (29.2)
Low	158 (50.6)
Moderate	50 (16.0)
High	13 (4.2)

TABLE 3. Knowledge on methods to prevent stroke (n=312).

Methods	Correct answer n (%)
Regular exercise at least 3-5 times/week	304 (97.4)
Well control of blood pressure, plasma glucose and serum lipid	303 (97.1)
Knowing risk factors of stroke and preventing them	300 (96.2)
Smoking cessation	282 (90.4)
Weight reduction in overweight or obese patients	281 (90.1)
Decrease consumption of salty foods	265 (84.9)
Increase consumption of unsweet vegetables and fruits	261 (83.7)
Decrease consumption of sweetened beverages	255 (81.7)
Decrease amount of alcohol drinking in alcoholic consumers	246 (78.8)
Using herbal medication ^a	179 (57.4)
Be careful of head trauma ^a	90 (28.8)
Drinking pure water ^a	58 (18.6)

^a lifestyles that cannot prevent stroke.

TABLE 4. Knowledge of the warning symptoms of stroke (n=312).

Question	Correct answer n (%)
Sudden numbness of unilateral face, arm or leg ^a	289 (92.6)
Sudden weakness of unilateral face, arm or leg ^a	287 (92.0)
Sudden trouble in walking/dizziness, loss of balance or coordination	280 (89.7)
Sudden trouble in speaking ^a	279 (89.4)
Sudden, severe headache with unknown cause	231 (74.0)
Sudden muscle strain of arm or leg ^b	195 (62.5)
Sudden chest pain ^b	190 (60.9)
Sudden confusion or misunderstanding	189 (60.6)
Sudden trouble in seeing (one or both eyes)	186 (59.6)
Sudden numbness or weakness of bilateral face, arm or leg ^b	53 (17.0)

^a 3 symptoms in the acronym FAST, by the National Stroke Association, American Heart Association¹⁵

^b symptoms that are not warning symptoms of stroke

TABLE 5. Planned response when suspecting acute stroke.

Planned response	n (%)
Go to hospital immediately by themselves or family members	210 (67.3)
Go to hospital immediately by calling emergency medical services ^a	71 (22.8)
Rest at home	20 (6.4)
Using alternative medicine	7 (2.2)
Go to hospital next day	4 (1.3)

^a appropriated planned response when suspecting acute stroke

TABLE 6. Factors associated with stroke knowledge scores and appropriateness of planned response when suspecting acute stroke.

	Stroke knowledge score				Appropriate planned response when suspecting acute stroke by calling EMS ^b	
	Prevention methods ^a		Warning symptoms ^a		adjusted OR (95%CI)	p-value
	β (95%CI)	p-value	β (95%CI)	p-value		
General knowledge and attitude of stroke disease						
Knowledge of stroke before participating in the research						
No	Ref.		Ref.		Ref.	
Yes	0.36 (-0.04,0.76)	0.076	0.29 (-0.14,0.73)	0.189	1.57 (0.75,3.31)	0.235
Aware that stroke is a preventable disease						
No	Ref.		Ref.		Ref.	
Yes	-0.09 (-0.94,0.77)	0.845	-0.21 (-1.14,0.73)	0.664	1.03 (0.20,5.23)	0.970
The chance you could have a stroke						
No chance	Ref.		Ref.		Ref.	
low chance	0.40 (0.03,0.77)	0.035*	0.19 (-0.21,0.59)	0.359	0.7 (0.36,1.35)	0.289
Medium chance	0.46 (-0.03,0.96)	0.068	-0.17 (-0.71,0.38)	0.543	0.55 (0.22,1.38)	0.202
High chance	0.55 (-0.3,1.39)	0.206	0.32 (-0.61,1.25)	0.497	0.84 (0.21,3.36)	0.806
Sociodemographic characteristics of participant						
Age (years)						
≥ 60	Ref.		Ref.		Ref.	
< 60	0.13 (-0.24,0.50)	0.493	0.31 (-0.09,0.72)	0.127	2.22 (1.18,4.17)	0.014*
Occupation						
Unemployed	Ref.		Ref.		Ref.	
Employed	-0.30 (-0.77,0.17)	0.205	0.10 (-0.41,0.61)	0.691	2.31 (0.87,6.18)	0.095
Retirement	-0.06 (-0.58,0.47)	0.831	0.26 (-0.31,0.83)	0.369	2.40 (0.82,7.04)	0.111
Income						
No income	Ref.		Ref.		Ref.	
Having incomes	0.57 (0.02,1.12)	0.041*	0.40 (-0.19,1.00)	0.184	0.92 (0.29,2.93)	0.888
Marital status						
Single	Ref.		Ref.		Ref.	
Married	0.15 (-0.74,0.45)	0.626	0.15 (-0.50,0.80)	0.647	0.44 (0.17,1.12)	0.085
Divorced/widow	-0.06 (-0.97,0.85)	0.897	0.03 (-0.97,1.02)	0.958	0.20 (0.03,1.22)	0.081
Subgroup of participants						
DM alone	Ref.		Ref.		Ref.	
HT alone	0.31 (-0.41,1.03)	0.401	0.08 (-0.71,0.87)	0.84	3.32 (0.89,12.41)	0.074
DM with HT	0.02 (-0.61,0.65)	0.956	0.10 (-0.59,0.80)	0.768	0.76 (0.24,2.40)	0.645
Duration of diagnosed DM (years)	0.04 (0,0.08)	0.076	0.02 (-0.02,0.07)	0.324	1.10 (1.01,1.19)	0.021*
Duration of diagnosed HT (years)	-0.02 (-0.05,0.01)	0.138	0.01 (-0.02,0.04)	0.475	0.96 (0.91,1.02)	0.173

Abbreviations: EMS : emergency medical services; DM : diabetes mellitus; HT : hypertension* statistical significant, ^a multiple linear regression, ^b multiple binary logistic regression

DISCUSSION

Most patients living with diabetes and/or hypertension, which are a high risk group for cardiovascular disease (CVD), could identify more than half of the stroke prevention methods and warning symptoms; especially in the income group. However, they still did not show enough awareness with regards to their attitude of concern in having a stroke. Additionally, they had an inappropriate planned response when suspecting acute stroke; especially the elderly and those with a short duration of being diagnosed with DM.

Our study was conducted in patients living with diabetes and/or hypertension, and most of our participants were elderly. This is in contrast with previous studies²⁵⁻²⁷, in which they were population-based survey's; therefore, reporting on younger aged participants. Women outweighed the proportion of men in this study, which is the same as in the previous studies.^{18,28} Almost half of the study participants graduated to the level of primary school; this is close to a previous study that reported their participants were of a low education level.²⁵

Most of the participants claimed that they knew of the disease, namely "stroke", before participating in our research, similar to a previous study in hypertensive patients²⁹; and knew that a stroke is preventable. However, we were surprised that our participants, who were in a high risk group for CVD, had little awareness about developing a stroke; this result was lower than that observed amongst hypertensive patients in Pakistan.²⁹ It may be due to our participants having a higher proportion of elder patients, and lower education levels.

Most of our study participants had appropriate knowledge with regards to the lifestyle measures to adopt for stroke prevention. This finding corresponds with a previous study.³⁰ This could be due to Thailand having emphasized the prevention of CVD for many years; such as, the campaign in reduction of CVD risk via various advertising media. However, more than half of our participants misunderstood that herbal medication can help to prevent stroke; it may be due to herbal usage being common in Thailand; including among the elderly who were the majority of participants in our research.³¹ Use of herbal medication may make people feel self-reliant³⁰; so it is common in patients with chronic diseases.^{32,33} With regards to knowledge of stroke warning symptoms; most of the participants had the correct knowledge concerning symptoms that may be a presentation of acute stroke. The results are in accordance with previous studies^{12,18,27-29,34,35}, and may be due to three out of four of them being an element in the acronym FAST, by the National Stroke Association, American Heart Association.¹⁵ Additionally,

this is well known worldwide in medical advertising for mnemonics in acute stroke symptom detection and early management by immediately going to the hospital. "FAST" is one of the more successful public campaigns in promoting knowledge of common stroke warning symptoms; as we found that most of our participants knew all 3 symptoms in "FAST", similar to a previous study.¹⁶ However FAST still has flaws, in that it does not include the less common stroke warning symptoms; as nearly half of our participants did not know that sudden trouble in seeing can be a warning symptom of stroke; this was similar to previous studies.^{18,20,30,36} Although, the 'T' in FAST makes mention that when a patient suspects an acute stroke they should go to the hospital immediately, it does not mention this should be done via EMS, according to guideline recommendations.¹³ The most common planned response when acute stroke was suspected, was to go to the hospital immediately by themselves, or with family members; while only a quarter of them have an appropriate planned response by calling EMS; this is in line with a previous study.¹⁹ Previous studies have shown that most people believed in the benefit of EMS; however, the low rate of EMS usage may be caused from a concern in the difficulty in its process and longer ambulance waiting times.^{37,38} Alternative medicine was still a choice of planned response when suspecting acute stroke, as was the case in previous studies.^{12,19,34} This may be due to Thai traditions and faith in alternative medicines.

This study shows that participants who have income had a statistically significant association with increasing of scores of stroke prevention methods; which is the same as a previous study.²⁸ However, the increasing score of 0.57 points may not have any clinical benefit. Adult participants and those with a prolonged diagnosed of DM have an appropriate planned response when having symptoms suspected of being an acute stroke when compared with elderly patients, and those with a shorter diagnoses of DM; these results correspond with previous studies.^{21,39} It may be due to cognitive impairment problems in the elderly, resulting in not retaining knowledge from their physicians or public advertising, or that they cannot call EMS by themselves.³⁸ For patients with longer diagnoses of DM, it may increase the patient's awareness and chance of receiving knowledge over time.

The strengths of this study consist of: firstly, our research is one of the few studies that evaluated knowledge of stroke in a high risk population. Secondly, we assessed participant's awareness of the chance of developing a stroke, which was a topic of little interest in previous studies. Thirdly, we asked for information

on planned responses when suspecting acute stroke; instead of assessing knowledge in early management. This was because knowledge is only just one factor that affects behavior, and different contexts of each person influences action; such as, ease of accessibility to a nearby hospital or ability to call EMS. In addition, this study is one of the few study's that explored planned responses by an opened-end question, instead of multiple-choice questions^{12,19,34}; in order to decrease a chance of bias from choosing the 'good answers' from choices. However, there were some limitations. Firstly, we did not explore the reason of planned response answers, for which the results could be used for developing a method to the solution of problems. For example; if their inappropriate planned response came from a lack of knowledge, the proper intervention would be education on the benefits of EMS usage. Secondly, this study was conducted in a primary care unit of a tertiary care hospital, so the results cannot be generalized to other hospital settings. Lastly, the sample size was calculated for the primary objective, so the number of the sample size may not be large enough to show significance in factors associated with stroke knowledge scores, and appropriateness of planned response. For future research, we suggest extending this to other health care settings, increasing the sample size for increasing statistical power of results, and adding another helpful topic for solving some problems directly; such as, reason of planned response as well as ability and barrier in using EMS.

CONCLUSION

Patients living with diabetes and/or hypertension still do not have enough knowledge of stroke. Additionally, they have a less than acceptable level of awareness in concerns to the risks of developing a stroke. The participants in this study had an inappropriate planned response when suspecting acute stroke. FAST is a successful public campaign for promoting knowledge of the most common warning symptoms of stroke.

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