Factor influencing Pre-hospital Delay among Acute Ischemic Stroke Patients in Rajavithi Hospital

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Abstract

Background and objective: Treatment of patients with acute ischemic stroke (AIS) is time related, delay in treatment may warrant adverse prognosis. Thus, an objective of the present study was to identify factors influencing pre-hospital delay among patients with AIS in Rajavithi Hospital.

Materials and Methods: Between June and November 2015, a cross-sectional study was carried out in 86 patients admitted with AIS at Rajavithi hospital. All patients were interviewed with a questionnaire focused on socio-demographic, clinical, situational, type of transfer and cognitive factors. Patients were classified by stroke onset time, within 4.5 hours group and > 4.5 hours group. Data were analyzed to identify the factors influencing pre-hospital delay [> 4.5 hours after stroke onset].

Results: In total, 86 patients were enrolled in the study, 60.5% patients arrived after 4.5 hours of onset. Patients with diabetes [crude OR = 3.24], gradual onset [crude OR = 16.88], awakening with symptoms [crude OR = 10.33], onset location at home [crude OR = 10.33], considered any kind of the symptoms as not severe [crude OR = 4.97], not using the emergency number [crude OR = 6.58] and not recognizing the problem as stroke [crude OR = 10.93] had a significantly more delay in arriving to the hospital.

Conclusion: Our findings emphasize the importance of cognitive factors on the decision-making process and pre-hospital delays. Health care providers can educate the public on AIS, enabling recognition the signs and symptoms of AIS correctly and realize the benefits of early treatment.

Keywords: acute ischemic stroke, pre-hospital delay, prevalence (J Thai Stroke Soc. 2019;18(1): 5-13)

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ปัจจัยที่มีผลต่อความล่าช้าก่อนถึงโรงพยาบาลในผู้ป่วยโรคสมองขาดเลือดเฉียบพลันในโรงพยาบาลราชวิถี

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บทคัดย่อ

ความเป็นมาและวัตถุประสงค์: การรักษาที่ล่าช้ามีผลกับการพยากรณ์โรคที่แย่ลงในผู้ป่วยโรคสมองขาดเลือดเฉียบพลันการศึกษานี้จึงต้องการค้นหาปัจจัยมีผลต่อความล่าช้าก่อนถึงโรงพยาบาล

วัสดุและวิธีการ: ศึกษาไปข้างหน้าภาคตัดขวางโดยใช้แบบสอบถามเก็บข้อมูลผู้ป่วยสมองขาดเลือดเฉียบพลันทั้งหมดที่มารับการรักษาในโรงพยาบาลราชวิถีตั้งแต่มิถุนายน – พฤศจิกายน 2559 จำนวน 86 ราย เกี่ยวกับข้อมูลทั่วไปของผู้ป่วย, ที่อยู่อาศัย, เศรษฐสถานะ, ลักษณะอาการ, การนำส่งผู้ป่วยมาโรงพยาบาล เช่น ผู้ที่ตัดสินใจนำผู้ป่วยมาโรงพยาบาล, วิธีการนำส่ง

ผลการศึกษา: จากผู้เข้าร่วมวิจัยทั้งหมด 86 ราย มารับการรักษาล่าช้า (> 4.5 ชั่วโมง) จำนวน 52 ราย (60.5%) ปัจจัยเสี่ยงที่ทำให้มารักษาล่าช้าอย่างมีนัยสำคัญ ได้แก่ โรคประจำตัวเบาหวาน [crude OR = 3.24], มีอาการหลังตื่น [crude OR = 10.33], อาการเป็นแบบค่อย ๆ เพิ่มขึ้น [crude OR = 16.88], คิดว่าอาการไม่รุนแรง [crude OR = 4.97], เป็นขณะอยู่ในที่พักอาศัยของตนเอง [crude OR = 10.33], ไม่ใช้เบอร์โทรฉุกเฉิน [crude OR = 6.58], ไม่ทราบว่าเป็นอาการของหลอดเลือดสมอง [crude OR = 10.93]

สรุป: การตระหนักถึงอาการของโรคสมองขาดเลือดเฉียบพลันและกระบวนการตัดสินใจในการนำผู้ป่วยมาโรงพยาบาลเป็นปัจจัยหลักที่ส่งผลต่อความล่าช้าก่อนถึงโรงพยาบาล ดังนั้นการมุ่งเน้นให้ความรู้กับประชาชนเกี่ยวกับอาการและความสำคัญของโรคนี้จึงมีความสำคัญเป็นอย่างมาก

คำสำคัญ: สมองขาดเลือดเฉียบพลัน, ความล่าช้าก่อนถึงโรงพยาบาล, อุบัติการณ์ (J Thai Stroke Soc. 2019;18(1):5-13)

Introduction

In 2014, the World Health Organization (WHO) indicated that strokes are one of the main causes of death and disability amongst non-contagious diseases (Noncommunicable Diseases)[1] worldwide. Acute Ischemic stroke (AIS), caused by thrombotic or embolic occlusion of a cerebral artery, is the most common type of stroke[2], in line with the situation in Thailand according to annual report published by the Bureau of Non-Communicable Diseases Department of Disease Control in 2015[3]. The current standard treatment for acute ischemic stroke, intravenous thrombolysis with recombinant tissue plasminogen activator (rt-PA), has been proven to be highly effective in preventing death, reducing irreversible damage of brain, and improving long-term prognosis[4] but its efficacy is limited to the time window for medication administration after disease onset[5–7].

Although, we have a medication that is proven to be efficacious, most patients do not benefit from these medical advances due to pre-hospital delays, particularly as people are

unaware of the warning signs and symptoms of stroke including, but not limited to, limb weakness, blurring of vision, sudden slurred speech and ataxia. An immediate recognition of these warning signs is imperative in order to minimize the delay to hospital presentation. Recognizing the critical role of timely thrombolytic therapy for AIS patients, numerous researchers worldwide have examined the patterns and factors associated with treatment delays[8–10]. However, there is limited data and studies on delays in thrombolytic treatment for patients with AIS in Thailand.

Hence, the aim of the present study is to identify factors influencing pre-hospital delay among patients with AIS in Rajavithi Hospital, Thailand.

Material and methods

Study design

This research is a cross-sectional study. Following an approval by the Research Ethics Committee in Rajavithi Hospital, the study was performed from June to November 2015. Inclusion criteria were diagnosis of AIS made within seven days of onset, age at the time of presentation above eighteen years old and diagnosis must be identified and confirmed by clinical examination and neuroimaging, with the patients having undergone either CT (Computed Tomography) or Magnetic Resonance Imaging (MRI).

Patients with transient ischemic attack and those with symptom onset at Rajvithi hospital or nursing homes were excluded.

Data Collection

All patients and their caregivers were interviewed by using a questionnaire, supplemented by data from medical record review.

The questionnaire consisted of five parts: demographic characteristics, medical history, caregiver's behavior after symptom onset, with emphasis on the decision-makers who initiated the decision for hospital presentation, patient's knowledge of stroke and circumstance of onset.

To determine pre-hospital delay for a patient, we asked the patient when symptoms were first noticed, who made the decision to go to hospital and time of presentation to hospital and location of symptom occurrence. From then, we calculated the distance using Google Maps and estimated the time. If the time reported by the patient was different from the time we calculated (based on medical records), patient's reported time would be preferred. Additionally, the time was categorized into ≤ 4.5 hour and > 4.5 hour.

Following study protocols, interviews were performed in hospital by researchers or trained neurology resident (trained by the researcher). When it was not possible to communicate with a patient (due to aphasia, low level of consciousness or language barrier), caregiver or family members of the patient were interviewed.

Explanatory Variables

We defined pre-hospital delay measure into within 4.5 or more than 4.5 hours of delay after stroke onset. It is widely known that rt-PA treatment is efficacious for AIS patients treated within the 4.5 hours window[5–7]. Thus, we concluded a pre-hospital delay greater than 4.5 hours would miss the thrombolytic therapy.

Most of the variables were self-explanatory, but a few needed explanations. Based on the overall income level in Thailand, we divided per capital monthly household income into 2 categories; < 100,000 THB/year and

≥ 100,000 THB/year. Patient may have come to the current hospital directly or visited a community health center, which, due to lack of AIS treatment capacity, transferred the patient to the current hospital. Accordingly, patients were classified as admitted directly and transferred from community health centers. As for patient's medical history, coronary artery disease included both myocardial infarction and angina. Lastly, any stroke-suspected symptoms were included : numbness or weakness of the face and/or limbs on one side of the body, blurred vision in one or both eyes, difficulty in speaking or understanding speech, dizziness, difficulty in walking, loss of balance, or coordination, unconsciousness or fainting, or severe headache with unknown cause.

Statistical analysis

All the statistical analyses were performed using SPSS (Ver 16.0, SPSS Inc., USA). P <0.05 was considered statistically significant.

Descriptive statistics were used to describe percentage, mean, standard deviation, median, minimum value and maximum value.

Inferential statistics, the quantitative data comparison uses the independent t-test in the case of normal distribution and Mann-Whitney U test in case of abnormal distribution. The qualitative data compare by using Chi-square test/ Fisher Exact test. P-value of < 0.05 was considered a significant risk factor from univariate analysis and was put in multiple logistic regression analysis.

Result

Our sample included 99 AIS patients treated in Rajavithi hospitals. Of these 99 patients initially screened for eligibility, 13 (10.1%) were excluded because of various reasons, including a final diagnosis that was not stroke or the stroke was not of recent onset (9.1%) and other reasons (4%).

A total of 86 patients were therefore included in our analysis. Figure 1 shows the frequency distribution of pre-hospital delay for patients with AIS. Overall, 39.5% of AIS patients had within 4.5 hours of delay in arriving at hospital and 60.5% had more than 4.5 hours of delay.

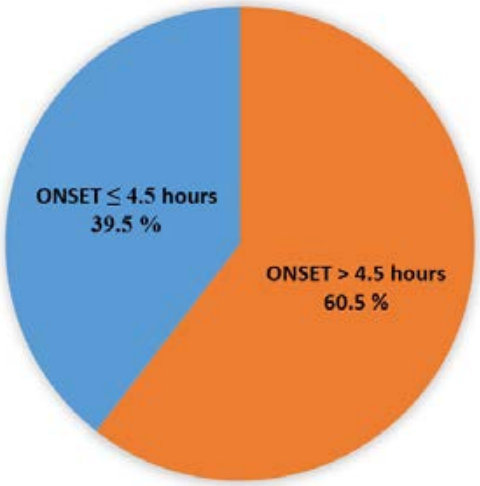

Figure 1. *Distribution of Pre-hospital delays*

Mean age was (62.50 ± 12.79) years in all patients. Majority of patients were male (58.1%). The demographic, clinical, situational and cognitive characteristics of the patients are summarized in Table 1.

Table 1. Pre-hospital delay by patients' characteristics.

Characteristics	Total (n = 86)		Onset				P-value
			Delayed > 4.5 hr (n = 52)		Delayed < 4.5 hr (n = 34)		
	n	%	n	%	n	%	
Age (years): mean ± S.D.	61.93 ± 12.79		64.12 ± 12.07		58.59 ± 13.32		0.0495
Gender: male	50	58.10	30	57.70	20	58.80	0.917
Underlying disease							
hypertension	56	65.10	35	67.30	21	61.80	0.598
diabetes	37	43.00	28	53.80	9	26.50	0.012
hyperlipidemia	25	29.10	18	34.60	7	20.60	0.161
arrhythmia	7	8.10	4	7.70	3	8.80	1.000
old ischemic stroke	27	31.40	16	30.80	11	32.40	0.877
Onset location at home	60	69.80	44	84.60	16	47.10	<0.001
Distance: median (IQR)	9.45 (3.18-17.00)		13 (6.05-20.00)		3.6 (3.00-9.93)		<0.001
Who is decision-maker							0.008
patient	24	27.90	16	30.80	8	23.50	
relative	56	65.10	36	69.20	20	58.80	
someone else	6	7.00	0	0	6	17.60	
Mode of transportation							0.001
private car	33	38.40	27	51.90	6	17.60	
EMS service	18	20.90	6	11.50	12	35.30	
refer from other hospital	3	3.50	0	0	3	8.80	
public service or taxi	32	37.20	19	36.50	13	38.20	
Considered any kind of the symptoms as severe							0.003
severe	57	66.30	28	53.80	29	85.30	
not severe	29	33.70	24	46.20	5	14.70	
First reaction							<0.001
called 1669	15	17.40	3	5.80	12	35.30	
went to hospital directly	2	2.30	1	1.90	1	2.90	
contacted relative/acquaintance	30	34.90	12	23.10	18	52.90	
cannot call for help	5	5.80	4	7.70	1	2.90	
observe	34	39.50	32	61.50	2	5.90	
Recognized the problem as stroke	7	8.10	1	1.90	6	17.60	0.014

Notably, patient with older age (P = 0.0495), history of diabetes (P = 0.012), gradual onset (P ≤ 0.001), awakening with symptoms (P < 0.001), onset location being at home (P ≤ 0.001), longer distance to hospital (P ≤ 0.001), decision-maker for hospital presentation being a relative (P = 0.008), using a private car (P = 0.001), considering any kind of the symptoms as not severe (P = 0.003), patient's initial reaction when symptoms first occurred being observation (P < 0.001), not using emergency number (1669) (P = 0.001) and patients not recognizing the problem as stroke (P = 0.014) had significantly higher rates of delay. Table 2 (index) shows the results of logistic regressions on potential risk factors for pre-hospital delay.

Table 2. *Multiple Logistic regression model of potential determinants for delay (n = 86).*

Factor	Crude OR	95%CI	P-value
Age (years)	1.04	0.99 – 1.07	0.054
Diabetes	3.24	1.27– 8.27	0.014
Symptom: gradual	16.88	5.09 – 55.92	<0.001
Symptom onset: on awakening	10.33	2.81 – 38.06	<0.001
Onset location: at home	6.19	2.25 – 17.00	<0.001
Distance: median (IQR)	1.11	1.04 – 1.19	0.003
Considered any kind of the symptoms as not severe	4.97	1.66 – 14.85	0.004
Used emergency number (1669): no	6.58	2.09 – 20.73	0.001
Recognized the problem as stroke: no	10.93	1.25 – 95.39	0.031

Age is a factor that is associated with pre-hospital delay, however, when we calculated the odd ratio, the results showed no statistical significance (p = 0.54). Additionally, we found other factors that statistically prolong pre-hospital delay, including, have diabetes [crude OR = 3.24, 95% CI (1.27–8.27); P = 0.014], gradual onset [crude OR = 16.88, 95% CI (5.09–55.92); P < 0.001], symptom occurred on awakening [crude OR = 10.33, 95% CI (2.81–38.06); P < 0.001], symptom occurred at home [crude OR = 10.33, 95% CI (2.81–38.06); P < 0.001], every 1 km longer distance to hospital [crude OR = 1.11, 95% CI (1.04–1.19); P = 0.003], "considering any kind of the symptoms as not severe" [crude OR = 4.97, 95% CI (1.66–14.18); P =0.004], not using emergency number (1669) [crude OR = 6.58, 95% CI (2.09–20.73); P = 0.001], not recognizing the problem as stroke [crude OR = 10.93, 95% CI (1.25–95.39); P = 0.031].

Discussion

Recognition of stroke symptoms is a very important factor that reduces pre-hospital delay.[14] Early symptoms might be very subtle, and hard to detect by patients or care-givers, developing into more severe illness over time. It was verified in this study that gradual onset is a high impact factor that prolongs pre-hospital delay [crude OR = 16, 95% CI (5.09–55.92), P < 0.001].

We found that many risk factors of stroke such as hypertension, hyperlipidemia, coronary artery disease and cardiac arrhythmia did not show any association with pre-hospital delay, except diabetes which was concordant to previous studies.[15] We hypothesized that stroke symptoms

can mimic abnormal blood sugar symptoms that confuse patients who tend to self-treat before seeking medical attention when initial management fails to alleviate symptoms.

Other factors in our study, including awakening with symptoms, onset location being at home, longer distance to hospital, using private car, considering any kind of the symptoms as not severe, patient's initial reaction when symptoms first occurred being observation and not using emergency number (1669), have a relationship with pre-hospital delay in the same fashion with previous study.[11-14]

In contrast to many previous studies, we found that less severe patients (NIHSS ≤ 4) did not present to hospital later than the more severe group[15-20]. This result may have been caused by a small number in each group, thus, we were unable to reach statistical significance.

Moreover, our study considered decision-makers for hospital presentation and we found that most deciders were relatives (which may be due to cultural issues), which influenced pre-hospital delay. However, when calculated the crude odd-ratio, it was found that 95% confidence interval was very broad. Hence, a further study with a bigger sample group to identify a more obvious relationship is to be considered.

In conclusion, public education about symptoms of stroke is an important policy especially in diabetic patients and their relatives. This study has many limitations, such as small sample groups and small data-collecting period, thus, we were unable to identify the influence of some factors. Furthermore, this study was performed at Rajvithi hospital, which is merely a single tertiary level hospital, thus, the results could not be the representatives of a nation-wide population.

Conclusion

Gradual onset of symptom and unawareness of stroke symptom have strong influence in prolonged pre-hospital delay. Other factors that also prolong pre hospital delay are history of diabetes, awakening with symptoms, onset location being at home, longer distance to hospital, decision-makers for hospital presentation being a relative, using private car, considering any kind of symptoms as not severe, and not using emergency number (1669).

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Originality and body of knowledge

1. What is new?
   - This is the first, large, cross-sectional study of Rajavithi hospital, tertiary hospital in Bangkok, Thailand, indicates that prehospital delays of acute ischemic stroke patients are relatively common.
   - In most cases, relatives are the person who decided to bring the patients to the hospital.
   - Most of the patients' initial reactions when the symptoms occurred were observations.
   - We also found that acute ischemic stroke patients who had less severe stroke (NIHSS < 4) tend to come to the hospital later than the patients with more severe stroke.
2. What is relevant?
   - Based on the results of this study, educational campaigns which emphasize

on recognition of stroke and perception of stroke as an emergency situation should be implemented to increase stroke awareness and reduce delayed time to the hospital.

3. Summary
   - Prehospital delays after AIS are common in Rajavithi hospital and future educational campaigns should focus on public awareness and appropriate responses when stroke occurs.

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