

# FACTORS AFFECTING KNOWLEDGE TOWARDS STROKE RISKS AND EARLY SYMPTOMS IN EMERGENCY DEPARTMENT

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## ABSTRACT

**Background:** The knowledge about stroke risks and early symptoms is pivotal to minimize the arrival delay in the hospital and maximize the effective treatments.

**Objective:** Investigating the factors affecting the knowledge about stroke risks and early symptoms in emergency department (ED).

**Methods:** The study employed cross sectional design by means of prospective approach. Samples were taken by consecutive sampling technique recruiting in total of 58 respondents. The respondents were the family or relatives of acute ischemic stroke patients who happened to know and directly involved in taking the patients to the ED. Data analyzed by utilizing univariate analysis, independent t-test, and one-way ANOVA to determine the differences in the knowledge of every respondent based on several characteristics. Multivariate analysis was used to investigate the factors affecting the knowledge about stroke risks and early symptoms.

**Results:** The average age of the 58 respondents was 34 – 57 years old. 46.5% of whom were graduating from primary school; 51.7% have never been equipped with the necessary information about stroke; 55.2% are female; and 50% of whom were unemployed. There were differences in the knowledge about stroke risks based on the prior information about stroke and education background. As for stroke early symptoms, there were differences towards occupations, prior information about stroke, and education background. The most affecting factor towards the knowledge of stroke risks is education background ( $p=0.000$ ); while the knowledge about stroke early symptoms was mostly affected by prior information about stroke ( $p=0.012$ ) and education background ( $p=0.000$ ).

**Discussions :** Most respondents were less equipped with the necessary knowledge about stroke risks and symptoms. The respondents' knowledge about stroke risks and early symptoms was considered less, while education background was the affecting factor towards the knowledge about stroke risks and symptoms.

**Key words:** Knowledge, risk factors, stroke early symptoms, ED, Indonesia

## Introduction

Acute ischemic stroke is caused by the decrease of blood flow towards the brain due to blockage of the blood vessel<sup>1</sup>. The longer and the lower the blood flow towards the brain, the broader the ischemic area will be, both the reversible and the irreversible ones.<sup>2</sup> In acute ischemic stroke, the duration determines the degree of brain cell damage,<sup>3</sup> resulting in time being the decisive factor.<sup>4</sup> Research indicates that first aid for treating acute ischemic stroke works effectively when given within 3-4.5 hours after the first attack and that time is the key for successful treatment.<sup>5,6</sup> The main goal of first hour treatment management after the attack is to prevent permanent larger brain damage,<sup>3,6,7</sup> so that it can improve the neurological function and clinical outcome which eventually lessen the chance of impairment caused by the stroke.<sup>7,8</sup>

One of the factors to maximize the efficiency of intervention in acute ischemic stroke is minimizing the delay in treatment

especially within the time the stroke attacks until being taken to the ED.<sup>9</sup> The result of this research states that the lack of knowledge about stroke risk factors and early symptom warning is one of the factors that causes the delay in taking the patient to the ED, resulting in losing the chance to provide effective treatment.<sup>10,12</sup> It is essential that family members understand the early symptom warning of stroke so that they can respond to stroke attack by directly taking the patient to ED.<sup>13</sup> Fang *et al*<sup>9</sup> put it that the patient's and family's knowledge about stroke and the understanding of the importance of obtaining medical help influence the actions taken. Moreover Faiz,<sup>7</sup> Kaddumukasa *et al*<sup>14</sup> and Yadav *et al*<sup>15</sup> suggest that knowledge, including the identification of risk factors and effective management of stroke, determines the prevention of stroke by modifying the risk factors which are proven to lessen the risk of stroke. In RSUD Ngudi Waluyo's ED, located in Blitar, stroke places second in the top ten monthly illnesses. According to the data at this hospital, 60% of the family members who knew and

participated in taking the patient to ED are not equipped with the knowledge about early symptoms of stroke. Some of the family members of the patients known to have the

history of hypertension, diabetes mellitus, and heart attack do not even know that these are the risk factors causing stroke. Moreover, the hospital also learned that 60% of the family members who took the patient to ED were their children or husband/wife aging 30-60 years old, 52% of whom were primary school educated and unemployed, and 70% of them never receive information about stroke before.

The knowledge is determined by factors including age, gender, education, occupation, and prior knowledge of stroke. Jones *et al*<sup>16</sup> state that age factor determines the knowledge, especially the age range of 75 years old and above. This age group is unable to mention risk factors or the early symptom warning of stroke. This is supported by Chang *et al*<sup>17</sup> who suggest that people of older age tend to be lacking of knowledge about risk factors and early symptom warning of stroke compared to younger age group. In contrast, Yadav *et al*<sup>15</sup> state that younger age group (below 40 years old) tends to be more educated and are capable of obtaining information easily so they have better knowledge about risk factors and early symptoms of stroke. This finding is in line with the research conducted by Hickey *et al*<sup>8</sup>, Sundseth *et al*<sup>18</sup> and Pandian *et al*<sup>19</sup> who state that the better knowledge about risk factors and early symptom warning of stroke is closely related to younger aged respondents.

The same thing goes with education, which according to the preliminary study, 52% of the patient's family members is primary school educated. Education affects individual's knowledge of risk factors and warning symptoms of stroke. Jones *et al*<sup>16</sup> indicate that the lack of knowledge about the factor risks and early symptom warning of stroke is influenced by low education level. Education determines how an individual perceives new information and influences the individual's motivation of doing something better.<sup>20</sup> Education also makes it easier for an individual to receive information and to understand knowledge obtained, resulting in individual's increased general knowledge.<sup>21</sup> The fact that the majority of the patient's family members are primary school educated results in the lacking of awareness and knowledge of risk factors and symptoms of stroke. In contrast, an individual with higher level of education tends to be able to receive knowledge and obtain information easier than the previous one. This statement agrees with the findings obtained from Obembe *et al*<sup>20</sup>, Gongora-Rivera *et al*<sup>12</sup> and Gutierrez-Jimenez *et al*<sup>22</sup> who state that the level of knowledge about stroke risk factors and early symptom warning is influenced by the level of education.

Apart from age and education, there is another factor that might influence individual's knowledge of stroke; prior knowledge. According to the preliminary research, 70% of the family members have never received any information about stroke. The information can help to improve the patient's and family's knowledge about risk factors and symptom warning of stroke.<sup>16</sup> Information given repeatedly and clearly as well as specific and focused details given to the patients and family members will form new opinion which develops into knowledge.<sup>23</sup> Gutierrez-Jimenez *et al*<sup>22</sup> also states that prior information about stroke obtained within 6 months can improve knowledge and understanding about risk factors and early symptom warning of stroke. In contrast,

those who do not receive any information about stroke will not be able to identify its risk factors and symptoms. Fogle<sup>24</sup> supports this claim by mentioning that health educations for general citizens by means of radio, television, and newspaper or magazines are proven to boost knowledge and awareness of symptom warning in those aging 45 years old and older.

Due to the fact that stroke risk factors and early symptom warning are determined by the aforementioned factors, a research is needed in order to investigate the factors which affect the knowledge of stroke risk factors and early symptom warning in the ICU of RSUD Ngudi Waluyo Wlingi.

## Methods

This research employed cross sectional design. It was conducted at the ED of RSUD Ngudi Waluyo Wlingi from May 13 - June 10, 2016 with research sample involving family members of patients suffering from acute ischemic stroke who knew and participated in taking the patient to the ED within 72 hours after the attack. The sampling technique used was consecutive sampling with the total acute ischemic stroke patients obtained were 58 patients, resulting in total sample of 58 members of family (nuclear family/grandchildren/relatives) of acute ischemic stroke patients. The inclusive criteria of family members of acute ischemic stroke patients who knew and participated in taking the patient to the ED in within 72 hours after the attack are: respondents aging  $\geq 18$  years old and are in perfect health and capable of communicating both orally and in written form. The exclusive criteria are family members who knew and participated in taking the patients to ED in RSUD Ngudi Waluyo Wlingi. The patients were diagnosed with hemorrhagic stroke (ICH, SAH), TIA, malignancy and having stroke attack history within the previous 6 weeks.

The instrument to find out the risk factors and stroke symptoms was closed questionnaire consisting of two parts. Part A contained sample characteristics of the research covering age, gender, education, and occupation. The second part (B) consisted of questions asking for information about family's prior knowledge of stroke and series of questions about stroke risk factors and symptoms.

Regarding about risk factors of stroke, there are 10 stroke risk factors and 7 non risk factors. Meanwhile, regarding the questions about stroke symptoms, there are 9 stroke symptoms and 8 non symptoms. The first questionnaire criteria is stroke risk factors and non risk factors. The respondents were asked to identify stroke risk factors by giving them checklist of risk factors. For each correct answer, the respondents were given 1 point and 0 for wrong answer. The second criteria is stroke symptoms and non stroke symptoms. The respondents were asked to identify what qualify as stroke symptoms by giving them checklist of symptoms. They were given 1 point for each correct answer and 0 for wrong answer. Univariate analysis was used to describe the characteristics of each variable by using mean, median, minimum-maximum, percentage, and deviation standard values. Knowledge about stroke risk factors and stroke symptom warning based on the characteristics of the respondents was observed using Independent Sample T-Test and One Way ANOVA with the requisites that data were normally distributed and possessed different data variants. If significant differences are found in One Way ANOVA test, the research proceeds with Post Hoc One Way ANOVA



The average of respondents' knowledge about the early symptom warning of stroke was  $3.72 \pm SD 2.109$ . The most common response for question about early symptom warning for stroke was weakness (hemiparesis) in one side of the body (63.8%), followed by speech impairment/slurred speech and difficulty in walking (53.4%), losing balance when walking (46.6%), disorientation (37.9%), severe headache (34.5%), and vision impairment (20%).

The most common early symptoms, such as weakness/paresthesia in half of the body, speech impairment, and confusion were only answered correctly by 13.8% of the respondents. Weakness in half of the body and speech impairment were answered by 20.7% respondents. In table 4, the results obtained show that the respondents' knowledge about stroke risk factors has indicated that there was no difference based on gender ( $p=0.447>0.05$ ), age difference ( $p=0.134>0.05$ ), and occupation ( $p=0.100>0.05$ ).

**Table 4.** Knowledge about Stroke Risk Factors and Early Symptom Warning based on the Respondents' Characteristics

Characteristics	n	Knowledge					
		Risk Factors			Stroke Early Symptom Warning		
		Mean $\pm$ SD	95% CI	p	Mean $\pm$ SD	95% CI	p
<b>Gender</b>							
Male	26	4.31 $\pm$ 2.379	3.35-5.27	0.447*	4.15 $\pm$ 2.148	3.29-5.02	0.135*
Female	32	3.78 $\pm$ 1.996	3.06-4.50		3.38 $\pm$ 2.044	2.64-4.11	
<b>Age</b>							
<40 years old	16	4.88 $\pm$ 2.156	3.73-6.02	0.134**	4.00 $\pm$ 2.129	2.87-5.13	0.232**
40-60 years old	37	3.78 $\pm$ 2.175	3.06-4.51		3.81 $\pm$ 2.119	3.10-4.52	
>60 years old	5	3.00 $\pm$ 1.581	1.04-4.96		2.20 $\pm$ 1.643	0.16-4.24	
<b>Occupation</b>							
Employed	30	4.47 $\pm$ 2.460	3.55-5.39	0.100*	4.23 $\pm$ 2.208	3.41-5.06	0.05*
Unemployed	28	3.54 $\pm$ 1.732	2.86-4.21		3.18 $\pm$ 1.887	2.45-3.91	
<b>Information about Stroke</b>							
Yes	28	5.11 $\pm$ 2.331	4.20-6.01	0.000*	4.89 $\pm$ 2.166	4.05-5.73	0.000*
No	30	3.00 $\pm$ 1.414	2.47-3.53		2.63 $\pm$ 1.351	2.13-3.14	
<b>Education</b>							
Primary	27	2.56 $\pm$ 1.050	2.14-2.97	0.000**	2.63 $\pm$ 1.245	2.14-3.12	0.000**
Junior High	13	4.08 $\pm$ 1.656	3.08-5.08		3.46 $\pm$ 1.941	2.29-4.63	
Senior High	12	5.83 $\pm$ 1.337	4.98-6.68		4.92 $\pm$ 1.730	3.82-6.02	
University	6	6.83 $\pm$ 2.927	3.76-9.90		6.83 $\pm$ 2.317	4.40-9.26	

Source: Primary data 2016, \* independent t-test, \*\* One-Way Anova

In contrast, there were significant differences in the knowledge of stroke risk factors based on prior information about stroke received by the respondents ( $p=0.000<0.05$ ) and education background ( $p=0.000<0.05$ ).

**Table 5.** Post-hoc LSD Analysis Results regarding Difference of Knowledge about Stroke Risk Factors based on Education Background

	Mean Difference	95% CI		P
		Minimum	Maximum	
Primary vs Junior High	0.143	0.051	0.235	0.003
Primary vs High School	0.247	0.153	0.342	0.000
Primary vs University	0.249	0.126	0.372	0.000
Junior High vs High School	0.104	-0.005	0.213	0.061
Junior High vs University	0.105	-0.029	0.240	0.122
High School vs University	0.001	-0.135	0.137	0.985

Source: Primary data 2016

Based on table 5, there was difference in the knowledge of risk factors between the respondents with primary school and junior high school education background ( $p=0.003<0.005$ ), primary school and high school education background ( $p=0.000<0.05$ ), and primary school and university education background ( $p=0.000<0.05$ ). Whilst, based on table 6, there was difference of knowledge about stroke symptoms between

the respondents with primary school and high school education background ( $p=0.001<0.005$ ), primary school and university education background ( $p=0.001<0.05$ ), and junior high school and high school education background ( $p=0.043<0.05$ ), and junior high school and university education background ( $p=0.012<0.05$ ). Those can be seen on Table 6.

**Table 6.** Post-hoc LSD Analysis Results regarding Difference of knowledge about Stroke Early Symptom Warning based on Education Background

	Mean Difference	95% CI		P
		Minimum	Maximum	
Primary vs Junior High	0.061	-0.051	0.174	0.279
Primary vs High School	0.199	0.083	0.314	0.001
Primary vs University	0.275	0.124	0.425	0.001
Junior High vs High School	0.138	0.004	0.271	0.043
Junior High vs University	0.213	0.049	0.377	0.012
High School vs University	0.075	-0.091	0.242	0.365

Source: Primary data 2016

Based on the linear regression analysis, the result has shown that the factor affecting the knowledge of stroke risk factors was education background ( $p=0.000<0.05$ ). On the other hand, age, gender, occupation, and prior information about stroke risk factors were not significant in determining the



level of knowledge of stroke risk factors, with the value respectively ( $p=0.067>0.05$ ), ( $0.939>0.05$ ), ( $0.291>0.05$ ) and ( $0.180>0.05$ ). Meanwhile, for stroke early symptom warning, the affecting factors were education background ( $p=0.000<0.05$ ) and prior information about stroke ( $0.012<0.05$ ). Age, gender, and occupation, however, did not contribute significant effect on the knowledge about early symptom warning, with the values respectively ( $p=0.422>0.05$ ), ( $p=0.114>0.05$ ) and ( $p=0.742>0.05$ ). The details are as follows on Table 7.

The result of knowledge about stroke risk factors and early symptom warning was then compared to understand the difference of respondents' knowledge of risk factors and early symptom warning. The result of Independent Test T-Test has shown that there was no difference between the knowledge of risk factors and the knowledge of early symptoms of stroke ( $p=0.439>0.05$ ). The details are as follows on Table 8.

**Table 7.** Factors Affecting the Knowledge about Stroke Risk Factors and Early Symptom Warning

Variables	Stroke Risk Factors		Stroke Early Symptom Warning	
	Beta	Significance	Beta	Significance
Age	-0.181	0.067	-0.083	0.422
Gender	0.015	0.939	-0.159	0.114
Education	0.651	0.000	0.469	0.000
Information	0.147	0.180	0.300	0.012
Occupation	0.101	0.291	0.070	0.742

Source: Primary data 2016

**Table 8.** The Knowledge Difference between Risk Factor Group and Early Symptom Warning Group

	n	Mean±SD	Mean difference (IK 95%)	p
Risk factors	58	1.93±0.54	0.078 (-0.12-0.277)	0.439
Early symptom warning	58	1.85±0.54		

Source: Primary data 2016

## Discussion

The success of acute ischemic stroke treatment management is crucially dependent on time; the sooner first aid is given, the better the clinical outcomes are achieved<sup>25,26</sup>. One of the factors that determines the arrival delay at the ED is the lack of knowledge about risk factors and early symptom warning.<sup>7,10,11,27</sup> Knowledge, which is the result of one's capability of perceiving certain objects through the possessed senses, is one of the crucial factors to shape one's overt behaviour. This knowledge comes out as behaviour towards situation which triggers reaction. So to say, a change in one's knowledge facilitates the change in one's behaviour.<sup>16,28</sup> Faiz<sup>7</sup> mentions that in order that patients come in within less than 3 hours after stroke attack, patients' family members need to possess a good knowledge about stroke risk factors and early symptom warning and use this knowledge as the basis of any needed prevention and reaction.

This research has shown that the average knowledge of the respondents about stroke risk factors was  $4.02 \pm \text{SD } 2.172$ , as much as 63.8% of the respondent has had knowledge score below the average ( $<4.02$ ), showing that the majority of the respondents possessed little knowledge about stroke risk factors. This agrees with the previous researches conducted by Das *et al*<sup>29</sup>, Falavigna *et al*<sup>30</sup>, and Amen<sup>31</sup> which show that the little knowledge that the people have about stroke risk factors determines the lack of prevention and reaction measures, especially when they possess the stroke risk factors. The lack of knowledge about stroke risk factors is found not only in the patients/family members who possess the history of stroke/TIA, but also the family members who possess stroke risk factors.<sup>20</sup>

The ED of RSUD Ngudi Waluyo Wlingi has recorded that 29.2% of the patients possess the history of hypertension, 22% high cholesterol, and 13.1% smoking. The respondents, however, did not know that hypertension, high cholesterol level, and smoking habit are the factors that cause stroke. From the three main risk factors of acute ischemic stroke such as hypertension, smoking, and diabetes mellitus<sup>18</sup>, each was answered correctly by respondents respectively at 74.1%, 46.5%, and 34.5%, but only 17.2% respondents were capable of correctly answering all three factors. This confirms Sundseth *et al*<sup>18</sup> research which states that only 14% respondents can correctly identify the three stroke risk factors; this has supported the claim of people's lack of knowledge about stroke risk factors.

The similar result goes with the respondents' knowledge about stroke early symptom warning which has shown  $3.72 \pm \text{SD } 2.109$ , as much as 55.4% respondents scored below the average ( $<3.72$ ). It means that majority of the respondents did not possess ample knowledge about stroke early symptom warning. This finding is in line with Amen<sup>31</sup> who suggest that most patients were lacking in knowledge about stroke early symptoms and having difficulties in identifying stroke early symptoms. The most commonly identified early symptom is weakness (hemiparesis)<sup>15,16,18,20,31,32</sup> and inability to speak.<sup>15,18,31</sup> Confusion, severe headache, paresthesia and vision impairment are hardly identified as stroke symptoms.<sup>8,20,33</sup> It is seen from the research result that the identification of early symptom warning of stroke mostly relied on the capability to detect weakness on one side of the body (63.8%), followed by speech impairment or slurring (53.4%), and walking impairment (53.4%). Weakness on one side of the body is the most commonly identified factor since this factor is the clinical manifestation of stroke which is often seen by members of family and felt by the patients.<sup>20,32</sup>

The knowledge about stroke early symptoms which are hardly identified such as confusion, severe headache, paresthesia and vision impairment were identified to score 37.9%, 34.5%, 32.8% and 20% respectively. These findings are in line with the findings of Hickey *et al*<sup>8</sup>, Obembe *et al*<sup>20</sup>, Saengsuwan *et al*<sup>33</sup>, Pandian *et al*<sup>34</sup> stating that only minority of their respondents identified confusion, severe headache and vision impairment as the stroke early symptoms. In contrast, their knowledge about the three elements of FAST, namely Facial drooping, Arm weakness, and Speech disturbance, in this research were correctly identified by as many as 13.8% respondents. There were 17% respondents who were capable of identifying all three elements of FAST, indicating that only small number of respondents have known

about FAST elements as the important identifications for stroke. In the ED of RSUD Ngudi Waluyo Wlingi, the majority of the respondents (63.8%) scored below the average, portraying the lack of knowledge about stroke risk factors. This situation was influenced by various factors, including the education background of the respondents. According to the research conducted in the ED of RSUD Ngudi Waluyo Wlingi, almost half of the total number of the respondents (46.5%) were primary school educated and only 10.4% of them were university graduates. From the regression analysis, it was found that knowledge about stroke risk factors was influenced by education background ( $p=0.000<0.05$ ). This confirms the finding of Obembe et al<sup>20</sup> which show that the lack of knowledge about stroke risk factors and early symptom warning was tied to the low education level. Education influences one's perception about new information and motivates them to do better. The presence of education will enable one to obtain information and understand knowledge so that one can possess more knowledgeable information.<sup>21</sup> The regression coefficient showing positive mark has suggested that the lower the education level one possesses, the lower one's knowledge is. Supported by Brenner et al<sup>35</sup>, an individual with higher education level can easily identify hypertension and diabetes mellitus which are stroke risk factors. This sort of knowledge modifies the correct prevention and handling for stroke risk factors.

According to the research of Gongora-Rivera<sup>12</sup>, Gutierrez-Jimenez<sup>22</sup>, and Obembe et al<sup>20</sup>, Falavigna et al<sup>30</sup>, Monaliza et al<sup>36</sup>, Duque et al<sup>37</sup>, Vincent-Onabajo & Moses<sup>38</sup>, one possesses better knowledge about stroke risk factors due to better education background. This has supported by post-hoc analysis which shows the difference between the knowledge of the respondents with primary education background and those of junior high school education background, and among those with primary, high school, and university education background. This is due to the fact that higher education background enables one to know and access information about stroke better so as to improve the knowledge to identify stroke risk factors.<sup>20</sup>

According to this research finding, age did not show any significant factor in determining the knowledge about stroke risk factors. It does not go in line with research findings of Jones et al<sup>16</sup>, Monaliza et al<sup>36</sup> and Nicol & Thrift<sup>39</sup> who state that older age groups tend to have less knowledge about stroke risk factors. In contrast, Sundseth et al<sup>18</sup>, Obembe et al<sup>20</sup>, Monaliza et al<sup>36</sup>, and Nieu et al<sup>40</sup> indicate that younger age respondents tend to possess better grasp on knowledge. Younger age enables the individual to name all risk factors correctly because they can acquire more information needed. On the contrary, this current research has found that majority of the respondents who took the patients to the ED were the patients' children whose ages range from 40-60 years old. There was, however, no difference in terms of the knowledge of ages < 40 years old from those of older ages.

Occupation also has shown no significant influence towards the knowledge of stroke risk factors. According to the finding, the majority of the respondents who took the patients to the ED were employed; however, there was no difference in the knowledge of the employed and unemployed respondents. There was no difference of knowledge because majority of the respondents work in the farm as farmers, not

allowing them to access information about stroke. It is different from the previous study where Gutierrez-Jimenez et al<sup>22</sup> state that occupation, especially those who work as medical staff, influences the knowledge about stroke risk factors.

The same way goes with gender, which has shown no significant influence in determining the knowledge about stroke risk factors because, according to the research finding, there was no difference in the knowledge of stroke risk factors between female and male respondents. This is confirmed by the research finding of Falavigna et al<sup>30</sup>, Saengsuwan et al<sup>33</sup> which has indicated that there was no correlation between gender and knowledge. In contrast, Amen et al<sup>31</sup>, Chiamaka and Hemamalini<sup>41</sup>, Stroebele et al<sup>42</sup> state that females are the predictors for knowledge about stroke risk factors. Prior information about stroke also did not influence the knowledge of stroke risk factors much, despite there was a difference between those with prior information about stroke and those who were without. Despite the fact that 48.3% respondents obtained prior information about stroke, 46.5% of respondents were in lower education level, which might imply that the respondents were unable to answer the questions correctly.

Departing from the findings of this current research, education and prior information about stroke have affected the respondents' knowledge about stroke early symptom warning. Obembe et al<sup>20</sup> find that the most common source of information is television, followed by newspaper and magazine. This finding is in accordance with the previous research by Fogle et al.<sup>43</sup> Miyamatsu et al<sup>44</sup> mention that television is the most effective media which can give education about stroke, proven by the research finding which declares television as an effective media to improve knowledge about stroke early symptom warning. Television is the combination of visual and audio aids in relaying information so that one can remember details of messages given through health education by as much as 50%.<sup>45</sup>

Health education can be carried out regularly through mass media (radio or television) and printed media (poster, magazine, newspaper and handbills), using particular language which can assure that the message can be understood easily by general public. Health education programs can also be given at schools (in elementary, junior and senior high schools), churches, mosques, social organisations, and other communities. Educations in schools are also given to younger generations who will guide their elderlies at home. Meanwhile, health education given at churches, mosques, and social organisations are directed to those who are over 60 years old-age groups which are more susceptible to suffer from stroke despite having very low knowledge and understanding about stroke. By means of health education, we can minimize and prevent permanent impairment in stroke patients and most importantly allow the patients to be taken into the ICU earlier.<sup>20</sup>

## Conclusion

Education influence the knowledge about risk factor of stroke and warning symptom. So that education is very important for improve knowledge. It is recommended that health education about stroke risk factor and warning sign can be

carried out regularly through mass media and printed media or health education programs can also be given at schools

## Declaration Author's Contributions

Research entitle "Factors Affecting the Knowledge about Stroke Risks and Early Symptoms In Emergency Department East Java - Indonesia" authored by Dewi Rachmawati, Dewi K. Ningsih and Sri Andarini had met qualify for authorship. All those who qualify have been listed. Each author has participated sufficiently in the work to take public responsibility for appropriate portions of the content. Authorship take responsibility for the integrity of the work substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; and final approval of the version to be published.

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