Risk factors of ischemic cerebrovascular accident: an actual state inPhuTho General Hospital, Vietnam

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Abstract. Worldwide, each year the quantity of stroke death equal to5.5 million people. In South-East Asia, the proposed value is equal to 500 thousand people. In Vietnam the situation of ischemic strokes is critical. It leads to recently appeared and uncontrolled risk factors. The current work is devoted to the main risk factors of ischemic cerebrovascular accident.Investigating most important risk factors in ischemic stroke patients presented in PhuTho Provincial General Hospital. A prospectively observational study. Under propose research the application (Software SPSS 18.0 and STATA 10.0) had been initiated.TIA was seen at 13.0% of all cases and risk of progressing to severe or death with OR = 5.2; 63.5% of all patients appeared with hypertension had the risk of being severe or death with OR 3.2. Pre-exist of heart diseases was available in 28.1% cases with OR = 2.6 in the risk of getting worse or death. Hyperlipidemia rate was high, risk of deterioration with OR = 2.6. Alcohol and tobacco addiction was found in 72.6% patients and risk of becoming death or worse 2.4 times higher than alcohol and smoke-free patients.Some risk factors had good predictive prognosis value in ischemic stroke. The hypertension, cigarettes and alcohol abuse had been detected as one of the riskiest of the progress cerebrovascular accident. Most of the patients had pre-history addiction and diseases that can be one the cause of the Ischemic Cerebrovascular Accident (ICA). The ICA is the most health problems in Vietnam that need more attention.

Key words: Risk factors analysis, Ischemic stroke, Haemorrhagic stroke, ischemic cerebrovascular accident, stroke risk factors, PhuTho hospital

INTRODUCTION

In Europe, it has been estimated that about 1 million cases of cerebrovascular accidents are presented. In the United States of America (USA), the stroke rate is794/100.000 of population and only 400.000 patients are able to be discharged. Current researches shows that in the USA, one stroke happens every 40 seconds and it is approximately equal to 800 thousand accidents per a year (Nakajima and Chester, 2019). In Asia, the incidence of stroke is different between different countries. For example, in Japan the stroke rate is 303/100.000 of the populations, in China this value equals 115.6/100.000 in which 370/100.000 of the Beijing population only(Nguyen Minh Hien, 2013).

Nowadays, more and more people are taking notice about the stroke. The stroke's knowledge has been significantly improved, especially in fast and accurate diagnostic imaging techniques, pathology-based treatments and the widespread establishment of stroke centers. Many achievements were reached in stroke prevention and treatment. Nevertheless, a stroke modality is still high and stays in third place after cardiovascular diseases and cancer, and most commonly in neurological diseases, which contributed 20% of all internal medical conditions.

The solidus includes Acute Ischemic (AIS) and Acute Hemorrhagic (AHS) strokes. The AIS have a more common incidence, which value is about 80 - 85%. In the European Union (EU), the USA and other first developed countries, the AHS had been observed in a range of 10-15%. In Asia, the AHS could be increased, but never higher than AIS. In Vietnam, the researcher Le Van Thanh investigated 2962 stroke patients: 40.42% of them had the AHS and 59.58% the AIS. In another study of Hoang Khanh in Hue city, the AHS counted 39.42% and the AIS were about 60.58% (Trinh Viet Thang, 2011).

An average life expectancy in Vietnam is currently increased due to developed social-economic conditions, but unfortunately, at the same time more strokes are observed (Dao ThiBichHoa, 1996; Dang Quang Tam, 2005). Many studies were conducted by focusing on the AIS, but most of them were done in the national hospitals. Risk factors of AIS weren't noticed appropriately in accordance with a lack of money and bad habits (drinking alcohol, smoking) directly connected to its traditional and social factors. On the other hand, stroke patients are cared for in different facilities: the Intensive Care Unit (ICU), emergency room, Internal medicine wards, cardiology wards, neurology wards etc. Therefore, a study of the AIS in PhuTho was never conducted before and highly recommended being done to investigate the actual state of the AIS and to prepare resources in the diagnosis and treatment of the AIS.

The aim of the following work leads to evaluate all-important risk factors of the AIS in PhuTho Provincial Hospital.

MATERIAL AND METHODS

Between October 2014 and October 2016 years, more than 190 AIS patients received medical care in PhuTho provincial general hospital. The World Health Organisation (WHO) diagnostic criteria of the AIS in 1990: sudden symptoms (minutes to hours, days) which prolong more than 24 hours, with focal symptoms (belonging to impair arteries) without a correlation to a trauma (Roth et al., 2015). The Brain Magnetic Resonance Imaging (MRI) showing at least one of the 2signs:

Homogeneous intensity on T1W, a T2W hyperintensity n subcortical area and loss of differences between the parenchyma and cortex. A hypodense signal on T1W and a hyperintense signal on T2W (Hoang Duc Kiet, 2004). The Transient Ischemic Attack (TIA), ischemic stroke in a patient with the prehistory of head trauma or blunt trauma. Comorbidity of encephalitis, meningitis or brain tumor; ischemic stroke converted to haemorrhage; relapsed ischemic stroke or normal finding on MRI. Statistical Analysis: Software SPSS 18.0 and STATA10.0

RESULTS

The following section shows a practically obtained statistical data. An investigation of the issue has analysed the data of 192 patients. All respondents agreed on the process of the data in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000.

It is important to consider that AIS and AHS have similar risk factors, but there are some notable differences. Both types of stroke are characterized by non-modifiable and modifiable stroke risk. Non-modifiable risks similar for both types are age, gender, race and ethnicity (Boehme et al., 2017). Similar modifiable factors are Hypertension (HTN), Transient Ischemic Attack (TIA), genetic heritage, blood pressure, bad habits (alcohol, tobacco etc.) (Bhatt et al., 2008). Different factors that cause Ischemic stroke are heart diseases, hyperlipidemia, physical inactivity, diabetes (Boehme et al., 2017). In the following work, all of this risk had been analyzed in accordance to patienthistory.

A pre-history of an addiction

As it has been mentioned above, alcohol and tobacco initiate top cases of the Ischemic Cerebrovascular Accident (ICA) (Han and Berry, 2019). In the following work, the statistical data of the main factors that reveals the precursors of the ischemic disease had been collected and shown in Table 1.

Table 1. Tobacco and alcohol abuse

History	Group II (n = 64)		Group I (n = 128)		n (%) n = 192
	n	%	n	%	
Alcohol abuse	22	34.4	27	21.1	49 (25.8%)
Tobacco addiction	27	42.2	26	20,3	52 (27.4%)
Alcohol and tobacco addiction	17	25.5	21	16.4	37 (19.4%)

As it has been observed in Table 1, it is possible to conclude that in both groups the constituent part of the alcohol abuse equals to 25.8%. The Tobacco addiction is a bit higher and equals to 27.4%. Because of the death rate and morbidity related to bothtobacco and alcohol abuse, in Table 1 also addressed both addictions. The rate of both is lower and relates to 19.4% of the total number tested patients.

Other pre-medical history

In the course of the research, other diseases had been determined like: the HTN, the diabet, heart diseases and the TIA. The proposed data had been fulfilled in Table2.

Table 2. Pre-medical history playing role of risk factors

History	Group II (n = 64)		Group I (n = 128)		n (%) (n = 192)
	N	%	n	%	
Hypertension (HTN)	52	80,2	70	54.7	122 (63.5%)
Diabetes	12	19,8	18	14.1	30 (15.6%)
Heart diseases (Heart failure, AF,mitral valve stenosis)	21	33.3	33	25.8	54 (28.1%)

TIA	18	28.6	07	5.4	25 (13.0%)

Diagnostic results showed that a major risk rate corresponds to a patient group of heart diseases and equals to 28.1%. The intermediate and lower rates correspond to the patients with diabetes and the TIA. The critical risk factoring of 63.5% is associated with the HTN. The following results show that in Vietnam a real quantityof people with HTM disease is higher than it had been mentioned in statistical data received through the 2005 National Adult Obesity Survey by the Do Phi Phuong Ha (Do, 2014). A patient consultation was conducted in order to initiate lifestyle modification, promotion of physical exercises and healthy food during a day. In Table 3, a pressure measurement of the HTN group has beenfulfilled.

Table 3. Blood pressure measurement in HTN group

Blood pressure	Minimum	Maximum	Mean	SD
Systolic BP (mmHg)	140	180	152	10.2
Diastolic BP (mmHg)	70	120	94	8.9
Years of HTN	1	20	7	4.7

Also, all patients from the first and second groups had been qualified due to the risk factor number and the following data had been represented in the Table 4.

Table 4. Patients Classification based on risk factors number

		Number of risk factors						Total
		0	1	2	3	4	5	
Group II	n	4	14	12	9	15	10	64
	%	6.2	21.8	18.7	14.1	23.4	15.8	100
P		< 0.05						
Group I	n	11	45	38	12	15	5	128
	%	8.5	35.2	29.7	9.4	11.7	5.5	100

The predictive value of some risk factors: An expression of the likelihood that had been given on the basis of investigation, which correlates with the positive or negative test results of the mentioned diseases had been shown in Tables 5, 6 and 7.

Table 5. Patient distribution based on severity

	Number of patients, n	Ratio, %
Group I (mild and medium)	128	66.7
Group II (severe – death)	64	33.3
Total amount	192	100

Table 6. Predictive value of pre-medical historical risk factors

Diseases	Yes	No	Total
Hypertension			
Group II	52 (81.0%)	12 (19.0%)	64
Group I	71 (55.4%)	57 (44.6%)	128
OR = 3,2	95% CI = 1,3 – 7,8		p = 0,009
Heart diseases (Heart failure, AF, mitral valve stenosis)			
Group II	22 (34.3%)	42 (65.6%)	64 (100%)
Group I	34 (26.5%)	94 (73.5%)	128 (100%)
OR=26	95% CI = 1.1 – 6.1		p = 0.034
Diabetes			
Group II	13 (20.3%)	51 (79.7%)	64 (100%)
Group I	19 (14.8%)	109(85.2%)	128 (100%)
OR = 2.2	95% CI = 0.9 – 5.1		p = 0.073

TIA			
Group II	19(29.7%)	45 (70.3%)	64 (100%)
Group I	08 (6.2%)	120(93.8%)	128 (100%)
OR = 5.2	95% CI = 1.7 – 15.8		p = 0.004
Tobacco addiction			
Nhóm II	28(43.7%)	36 (56.3%)	64 (100%)
Nhóm I	24(18.8%)	104(81.2%)	128 (100%)
OR = 2,4	95% CI = 1,0 – 5,6		p = 0,044
Alcohol abuse			
Nhóm II	23(35.9%)	41 (64.1%)	64 (100%)
Nhóm I	28(21.9%)	100(78.1%)	128 (100%)
OR = 2,5	95% CI = 1,1 – 6,0		p = 0,038
Hyperlipidemia			
Group II	42 (65.6%)	22 (34.4%)	64 (100%)
Group I	53 (41.4%)	75 (58.9%)	128 (100%)
OR = 2.6	95% CI = 1.2 – 5.9		P = 0.02

Table 7. Predictive values of MRI finding

Severity	Size of ischemic area		n (%)
	< 3cm	≥ 3cm	
Group II	27 (42.2%)	37 (57.8%)	64 (100%)
Group I	81 (63.2%)	47 (36.8%)	128 (100%)
OR = 3.4	95% CI = 1.5 – 7.4		p = 0.002
Severity	Number of ischemic area		n (%)
	1	>1	
Group II	48 (75.0%)	16 (25.0%)	64 (100%)
Group I	94 (73.5%)	34 (26.5%)	128 (100%)
OR = 0.7	95% CI = 0.3 – 1.7		p = 0.536

DISCUSSION

In research were identified risk factors of ischemic cerebrovascular accident such as tobacco addiction, alcohol abuse, hypertension, diabetes mellitus, previous heart diseases and TIA.

Tobacco addiction

Smoking is becoming a crucial issue in modern societies. Vietnam is one of the countries in which the smoking rate is highest in all over the world: 50% of the adult male have a smoking habit, which is about 17 million smoking people. Many studies before show the strong correlation between smoking and stroke. In this study, 27.4% of patients smoked (table 1) which was higher than the results of Phan ThiHuong (16.0%, Dinh Van Thang 17.9%). These results from the smoking rate of

Vietnamese increased significantly recently.

Patients with a pre-social habit of smoking have an increased risk of converting to severe condition or death in AIS with OR = 2.4 (p = 0.044; CI: 1.02 – 5.6). The results are considered similar to other Vietnamese and international authors. In Le Quang Cuong study, in females smoking increased the risk of the AIS in 1.9 timesand2.5 times in males while Wolf P.A et al. (1988) concluded that smoking rose up the risk of stroke about 40% of male and 60% in females. The study ofWolfP.A. et al. conducted within 26 years shows that heavy addiction (more than 40 cigarettes a day) had a risk of stroke 2 times higher than lighter ones (less than 10 cigarettes a day) and this risk reduced greatly 5 years after the smoke quitting. Therefore, smoking is seriously considered a risk of AIS (Bui My Hanh et al., 2019).

Alcohol abuse

More than 25.8% of the study population is alcoholic which was similar to Le Ngoc Trong (26.9%) and Dang Quang Tam (31%); and higher than Pham Thi Thu Ha (6.62%) and Phan Thi Huong (7.06%) (Dang Quang Tam, 2005; Phan Thi Huong, 2004; Wolf P.A. et al., 1988).

The Odd ratio of alcohol abuse on severity and death was 2.5 (p = 0.038, CI = 1.1 – 6.0) compared to non-alcohol use. Many other studies impressed the role of alcohol in the deterioration of stroke. Zhang's study in China found that heavy alcoholic people had a 1.9 times higher risk of stroke than others (Zhang et al., 2014). Mukamalet al. (2003) observed alcohol addicts during 14 years expressed that the habit of drinking 10-29 gram ethanol a day, 3 – 4 days a week induced the lowest risk of stroke whereas people consumed more than 2 glasses of whiskey a day had the highest risk. Le Quang Cuong reported that ethanol consumption increased 10% in the population would raise the stroke morbidity up to 29% and mortality up to 16%(Nguyen and Hoang, 2018).

Because alcoholism significantly induced hypertension, increased platelet cell adherence, fulminant atrial fibrillation which all contributed to AIS. Hence, ethanol abuse, especially in such a long duration, had a bad effect on the severity of stroke, especially AIS.

Hypertension (HTN) history

In accordance with the results of the proposed investigation, the HTN was seen in 63.5% of the population that was higher than Dao ThiBichHoa (40%) (Dao ThiBichHoa, 1996). This result from the HTN became more popular, especially in developed countries. In a report by the WHO in 2000 year it is estimated that 972 million people had the HTN and this number was predicted to be 1.5 trillion people in 2025 (World Health Organization, 2003). In the United States of America, the medical system is considered the best in the world and only 77.6% people recognized the HTN. Since, the result was collected by asking the patients directly or their family member so that the actual number of the HTN in the proposed population should be much higher than 63.7% that in the proposed work had been mentioned.

Other studies show that both systolic and diastolic blood pressure independently induced different types of stroke (Webb et al., 2018). It had been found that systolic BP higher than 160 mm Hg and the BP diastolic is higher than 95mm Hg could in 3.1 times increase the risk of the AIS in men and 2.9 times in women. If the BP systolic stayed in the range of 140 and 159 mm Hg and the BP diastolic stayed in the range of 90 and 94 mm Hg would raise the risk of stroke up to 50%(Ngo Duc Vuong, 2010).

The longest duration with the HTN, the more severe symptoms of stroke patients could suffer. In the proposed study, the mean duration of the HTN is 7 years. Consequently, chronic HTN patients ought to pay a higher warning attention to the AIS. In accordance to the proposed findings, the HTN put the AIS patient at the risk of getting worse or even death 3.2 times higher than non-HTN with the CI: 1.3 – 7.8 and p = 0.009). Other authors estimated that a 10 mm Hg reduction in systolic BP in adults would decrease 30% in the risk of death due to heart diseases and also drop 40% risk of mortality due to the stroke. Hence, early recognition and regular treatment of the HTN and community education for this issue are extremely necessary. However, even in the United States of

America, only 67.9% in 73 million and only 44.1% of those were tightly controlled (Webb et al., 2018). So, the difficulty in the HTN management does not just belong to developing countries, but also of the developedones.

Diabetes mellitus

There has been a huge amount of trials worldwide affirmed that diabetes mellitus or diabetes is a crucial risk of atherosclerosis. It played an important role in embolism appearance and the AIS. In the United States in 1976-1980 years, diabetes patients had a risk of the AIS from 2.5 to 4 times higher than people who didn't have diabetes (Deshpande et al., 2008). In the Honolulu Cardiovascular Program, the Japanese Haiwaiee with diabetes had 2 times risk of the DVT compared to others without diabetes. In another investigation Framingham, although the most influence of diabetes was on microvascular diseases, although that still had a bad effect on coronary and cerebral vascular(Wolf et al., 1988).

In the study of proposed work, the Odd ratio of diabetes on the AIS is 2.2 but with condition when $p > 0.05$. It had been suggested that diabetes could increase the risk of getting the AIS or being worse with the AIS, however the p value suggested that it is possible to try with a larger population to confirm this number. Within the proposed AIS population, diabetes took 15.6%, which was higher than previous studies such as Phan Thi Huong 6.2% (Phan Thi Huong, 2004). One of the reasons was the diabetes rate in the proposed country increased in the last few years. The recent report found that diabetes morbidity rose from 8% to 20% annually putting Vietnam in the list of countries, which had a fastest increased number of diabetesworldwide.

Explaining the sharply elevated diabetes rate recently, it had been considered the highest standard of living, imbalance between nutrition and physical activities. These should be considerable factors to be strictly justified to reduce diabetes and the AIS morbidity.

Previous Heart Diseases

In the proposed study, the 28.1% of patients had previous heart diseases similar to result from Dang Quang Tam 21.2%, Dinh Van Thang 6.5%, and Nguyen Xuan Than 6.1%. Those patients had an increased risk of severe and death with OR = 2.6 (CI = 1.1
- 6.1; $p = 0.034$) (Dang Quang Tam, 2005). This factor had a high predictive value with $p < 0.05$. In a patient with pre-exist cardiovascular diseases, the risk of the AIS was higher and when they suffered from AIS, the possibility of deterioration was higher because cardiovascular conditions could appear embolism from the heart and reduced peripheral and cerebral perfusion. The Atrial Fibrillation (AF) was a common impairment and was a strong risk of the AIS, a well-cared for the AF therefore would prevent AIS's appearance effectively.

A Framingham study showed that there was a clear elevation of the AIS in the AF patients: 1.5% at the age of 50-59 and 23.5% at the age of 80-89. The author also impressed that 8% of men and 11% of women could have AIS within 6 years after an acute Myocardial Infarction (MI).1 Besides the AF, other cardiovascular conditions such as dilated Myocardiopathy (DMC), Mitral Valve Prolapse (MVP), Mitral Valve Stenosis (MVS), Heart Failure (HF), artificial heart valve, acute endocarditis and other congenital heart defects could induce the AIS with different risk level.

The proposed study didn't focus on the detailed diagnosis of heart diseases due to the small number of this group. Furthermore, heart disease has been just a limited part between other important factors needed to be investigated. However, from received limited data, the actual information from the patients who had previous heart diseases did improve the belief and efficacy in the treatment of AIS patients.

Previous Transient Ischemic Attack

The TIA is an important factor influenced on the risk of the AIS but also the severity of AIS,

especially the death risk in the first few days after the AIS on set. The TIA was combined with neurological deficits that existed only within 24 hours and recovered completely, but tended to relapse multiple times later. However, the TIA highly warned about a widespread atherosclerosis and it easily became worse, which could result in the AIS and Multifocal ischemic stroke. In Fleming et al. (2015) study, in the first month, 8% of the TIA patients suffered from actual AIS, 20% of these patients had a risk of acute MI, stroke or sudden death in the first 12months.

In proposed study it was found that the TIA equals 13.0%. It is similar to LeThiHoaBinh 12.8%, Le Van Thinh 11% and Dinh Van Thang 8.9% (Le Van Thinh, 2004). When apatient

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had the TIA, risk of the AIS severe was highest with OR = 5.2, p = 0.004). So then, if the patient has previous TIA, patients would have the risk of becoming severely or death 5.2 times higher than patients without the TIA before. The TIA was a clear sign of "nearly" obstruction in the cerebral vascular system, which raised up an important alarm of further poor-prognosis complications after.

In the studies of Fleming, the TIA had the highest risk of the AIS severe compared to all other risk factors such as the HTN, diabetes and heart diseases (Fleming et al., 2015). Because of this, TIA treatment could help to prevent the AIS in the future and was considered more crucial than reperfusion therapies after AIS happened already. From those results are strongly recommended investigating and closely observe the TIA signs to achieve an adequate diagnosis and treatment. Therefore, it could prevent poor-outcome, complications and reduce the AIS severe or death.

Total Number of Risk factors in a patient

In the mild and medium group, patients had only one or maximum two risk factors while in the severe or death group most patients had at least 3 risk factors, the difference was significant. Therefore, the more risk factors a patient had previously, the more severe symptoms patients could suffer. In the study of Le Thi Thanh Tuyen and Le Tu Phuong Thao, most patients had 2 risk factors, rarely worn, especially many patients brought 3 and more risk factors (Le Thi Thanh Tuyen, 2010). This rang an alarming notice because uncontrolled hyperlipidemia, the HTN, diabetes would contribute directly to the severity of the AIS. Each factor had a special effect on each other. For example, patients with a hyperlipidemia tend to have atherosclerosis and the HTN whereas uncontrolled diabetes surely increased atherosclerosis and therefore increased the risk of ischemicstroke.

CONCLUSION

The research shows that with the increasing number of diseases such as diabetes, hypertension, various heart diseases, as well as bad habits and inactive lifestyles can lead to the ICA. As it had been shown in proposed analysis, when more risk factors the patient have, more likely it had be fatal forhim.

The TIA was found in 13.2% of patients which could progress to a severe group with OR = 5.2. Hypertension was seen in 63.7% patients and had a risk of being severe 3.2 times higher than normotensive cases. Patients with heart diseases contributed 28.4% of the population and risk of getting worse with OR = 2.6. The highest rate of hyperlipidemia was caught with risk of deterioration with OR = 2.6). Cigarettes and alcohol abuse was 72.6%; smoke addiction had a risk of being worse with OR = 2.4 while the risk of alcohol abuse was with OR = 2.5. The problem is actual and needs furtherinvestigation.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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