

EPIDEMIOLOGIC STUDY IN CEREBROVASCULAR DISEASE

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Abstract: Four hundred twenty five stroke patients who were admitted to medical department Maharat Nakhon Ratchasima Hospital between September 1995 and February 1996. Of this group, most patients were male (60.7%) and the average age was 60 years. Positive risk factors were identified in 62.3% most in hypertension and diabetes mellitus. In clinical profile, 36.2% suffered some disturbance of consciousness, most in hemorrhagic stroke, 75.8% suffered motor disturbance, aphasia or dysphasia in 14.4%, cerebellar ataxia in 6.3%, hypalgesia in 2.3%. The distribution of the type of stroke was 37.9% brain infraction (nonembolic) 4.5% cerebral embolism, 37.6% hemorrhagic stroke, and 20% unspecified stroke. CAT brain scan was done in 59.3%. The mortality rates were 38.6%, most patients who died died of brain herniation (56.1%) and pneumonia (17.1%). Functional prognosis, after 6 months, 50.6% of the surviving patients were fully independent.

INTRODUCTION

Cerebrovascular disease is the most common in neurologic diseases. It is a major medical and social problem because of its marked degree of disability and high mortality rate. In 1995 there were 846 cases of cerebrovascular disease who were admitted to medical department, Maharat Nakhon Ratchasima Hospital (8.4% of in-patient cases). The mortality rates were 17% of total patient-death (39% of stroke patients).

The purpose of this study is to probe into epidemiology of stroke patients especially aged, sex, risk factors, duration of symptoms before admission, neurological conditions, types of stroke, outcomes and causes of death.

MATERIALS AND METHODS

Datas were collected by gathering the in-patient medical charts between September 1995 and February 1996 in medical department, Maharat Nakhon Ratchasima Hospital who were diagnosed cerebrovascular disease by WHO criteria. Transient ischemic attacks were excluded. In all cases of death within 6 months of stroke, the cause of deaths were recorded. All surviving patients were followed and neurological examinations were performed after 3 weeks, 3 months and 6 months with Modified Rankin Scale. Patients who were later proved to have nonvascular brain lesions were excluded from the final datas.

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Criteria for inclusion

In accordance with WHO criteria, A stroke was defined as rapidly developing clinical of a localized (or generalized) disturbance of brain function, persisting for > 24 hours or leading to death, in the absence of possible causes other than those of vascular origin. The following classifications were used.

Brain infarction (nonembolic). Abrupt or gradual development of localized signs, partial disturbance of consciousness, and absence of blood in the cerebrospinal fluid.

Cerebral embolus. Sudden development of focal neurologic signs in the presence of a possible source of arterial embolus.

Intracerebral hemorrhage. Rapid development of focal neurologic signs, rapid and progressive disturbance of consciousness, signs of meningeal irritation, blood pressure elevation, headache frequently blood in the cerebrospinal fluid and CAT brain scan was found hematoma.

Subarachnoid hemorrhage. Sudden development of intense headache, disturbance of consciousness presence of meningeal signs, blood in cerebrospinal fluid, absence of focal neurologic signs and CAT brain scan was found blood in subarachnoid space⁽¹⁾.

Possible intracerebral hemorrhage. The clinical profile was the same as intracerebral hemorrhage or subarachnoid hemorrhage but CAT brain scan was not done.

Ischemic stroke. This means brain infarction (nonembolic) or cerebral embolus.

Hemorrhagic stroke. This means intracerebral hemorrhage and/or subarachnoid hemorrhage and/or intraventricular hemorrhage or possible intracerebral hemorrhage.

Unspecified stroke. This category was used when there was insufficient data for precise classification. A mixed type of stroke was classified based on predominance of the characteristics of one of the above classifications⁽¹⁾.

Motor disturbance was classified into mild, moderate, severe and undetermined. Mild was defined as motor power grade ≥ 4 , patients were able to walk without support. Moderate, motor power grade 3, patients were not able to walk alone. Severe, motor power grade 0-2, patients were totally dependent on a wheel-chair. Undetermined, were not able to evaluate because patients didnot response to pain stimuli.

Heavy smoking was defined when patients smoked more than one pack of cigarettes per day for more than 20 years.

Diagnostic methods

In order to assess the diagnosis, the clinical and/or CAT brain scan were used.

Evaluation of Functional Impairment

The neurological signs were assessed and recorded at the time of admission. These recorded findings were level of consciousness, motor, sensory speech, and cerebellar disturbances. All surviving patients were followed and assessed by Modified Rankin Scale at 3 weeks, 3 months and 6 months after stroke (Appendix A).

There were 425 cases of stroke-patient were assessed and recorded by the following

1. The patients age and sex at the time
2. Risk factors of stroke, duration of symptoms before admission, initial neurological conditions
3. Types of stroke, outcomes and causes of death

RESULTS

There were 425 patients (258 or 60.7% men, 167 or 39.3% women) entered into study between september 1995 and february 1996. Of this group, most (76.7%) were in the age group 41-70 years, they were shown in Table I. The average age was 60 years (22-93 years).

TABLE I. Distribution by age and sex

Age group (years)	Male		Female		Total	
	n	%	n	%	n	%
21-30	2	0.5	2	0.5	4	1
31-40	12	2.8	2	0.5	14	3.3
41-50	60	14.1	10	2.4	70	16.5
51-60	77	18.1	58	13.6	135	31.7
61-70	75	17.7	46	10.8	121	28.5
71-80	20	4.7	31	7.3	51	12
>80	12	2.8	18	4.2	30	7
Total	258	60.7	167	39.3	425	100

The distribution of risk factors and types of stroke were shown in Table 2. A positive risk factors were obtained from more than 50% (55.8%) of all strokes patients. In hemorrhagic stroke, percentage of no risk factor (47.5%) and hypertension (32.9%) were found more than in ischemic patients (27.4% for no risk factor, 24.9% for hypertension), but percentage of diabetes mellitus (6.7%) heavy smoking (4.5%) and atrial fibrillation (0%) were found less than ischemic patients (15.2% for diabetes mellitus, 8.1% for heavy smoking, 8.4% for atrial fibrillation). Other risk factors such as hyperlipidemia, rheumatic heart diseases, ischemic heart diseases and previous stroke were not different from ischemic stroke to hemorrhagic stroke.

TABLE 2 Distribution by risk factors and types of stroke

risk factors	hemorrhage stroke		ischemic stroke		unspecified stroke		total	
	n	%	n	%	n	%	n	%
No	85	47.5	65	27.4	38	45.8	188	37.7
Hypertension	59	32.9	59	24.9	14	16.9	132	26.5
Diabetes mellitus	12	6.7	36	15.2	10	12.1	58	11.6
Hyperlipidemia	8	4.5	14	5.9	3	3.6	25	5
Heavy smoking	8	4.5	19	8.1	2	2.4	29	5.8
Atrial fibrillation	0	0	20	8.4	5	6	25	5
Rheumatic heart diseases	0	0	4	1.7	2	2.4	6	1.2
Ischemic heart diseases	0	0	6	2.5	5	6	11	2.2
Previous stroke	7	3.9	14	5.9	4	4.8	25	5
Total	179	100	237	100	83	100	499	100

Duration of symptoms before admission were shown in Table 3, most (62.6%) have had symptoms for 1-3 days.

TABLE 3 Duration of symptoms before admission

Durations	n	%
< 24 hours	145	34.1
1-3 days	266	62.6
> 3 days	14	3.3

Clinical signs observed in the acute phase of stroke were analysed, of the initial patients, more than half of all patients were fully awake. 36.2% (154 patients) suffered some disturbance of consciousness. Of those 154 patients, 15.6% were drowsy, 35.1% stuporous and 49.3% comatose (shown in Table 4)

TABLE 4 Level of consciousness at the time of admission

	n	%
Normal of consciousness	271	63.8
Alter of consciousness	154	36.2
Drowsy	24	5.6
Stupor, response to pain, purposfully	20	4.7
, response to pain, flexion withdrawal	34	8
Comatose, decorticate response	4	0.9
, deoerebrate response	16	3.8
, no response	56	13.2

Analysis of the distribution of level of consciousness by outcome showed that more than 90% in the dead group had decreased level of consciousness at onset of stroke, and disturbed consciousness was much more frequent in hemorrhagic stroke (66.2%) (2.6% cerebral embolus, 7.8% brain infarction, 23.4% unspecified stroke). Of the initial 425 patients, third-fourths had signs of motor disturbances (21.1% mild motor deficit, 25.8% moderate, 53.1% severe), 14.1% undetermined motor deficit, 10.1% had no motor deficit, 6.3% ataxia. Aphasia or dysphasia were identified in 14.4% and sensory disturbance in 2.3% (shown in Table 5)

TABLE 5 Neurological conditions at the time of admission

	n	%
Motor disturbance	322	75.8
mild	68	16
moderate	83	19.6
severe	171	40.2
undetermined	60	14.1
No motor disturbance	43	10.1
Cerebellar ataxia	27	6.3
Aphasia or dysphasia	61	14.4
Hypalgesia	10	2.3

The distribution of the type of stroke was 37.9% brain infarction (nonembolic), 4.5% cerebral embolus, 37.6% hemorrhagic stroke (13.6% intracerebral hemorrhage, 2.3% intracerebral hemorrhage with intraventricular hemorrhage, 0.5% subarachnoid hemorrhage, 0.5% intraventricular hemorrhage, 20.7% possible intracerebral hemorrhage), and 20% unspecified stroke (shown in Table 6).

TABLE 6 Types of stroke

		n	%
Ischemic stroke		180	42.4
Brain infarction	161	37.9	
Cerebral embolus	19	4.5	
Hemorrhagic stroke		160	37.6
Intracerebral	58	13.6	
Intracerebral with intraventricular	10	2.3	
Subarchnoid	2	0.5	
Intraventricular hemorrhage	2	0.5	
Possible intracerebral hemorrhage	88	20.7	20
Unspecified stroke			

59.3% of patients were checked by CAT brain scan, 34.1% normal or atrophic brain, 37.3% infarction were demonstrated, and 28.6% hemorrhage were demonstrated (shown in Table 7)

TABLE 7 Results of CAT brain scan

		n	%
Normal		61	24.2
Atrophic brain		25	9.9
Infarction		94	37.3
Basal ganglion	54	21.4	
Thalamus	4	1.6	
Brainstem	7	2.8	
Cerebellar	7	2.8	
Subcortical	16	6.3	
Territory of middle cerebral artery	4	1.6	
Multiple infarction	2	0.8	
Hemorrhage		72	28.6
Basal ganglion	35	13.9	
Thalamus	12	4.8	
Subcortical	8	3.1	
Brainstem	3	1.2	
Basal ganglion with intraventricular	10	4	
Intraventricular hemorrhage	2	0.8	
Subarachnoid	2	0.8	

During the acute stage, convulsion was developed 5.4%, most in hemorrhagic type (91.3%) (8.7% in cerebral embolus) but did not find in brain infarction.

The magnitude of the stroke problem is strongly reflected in the case-fatality or survival rates. The mortality rate of the initial 425 patients (38.6%) appeared that most dead occurred within the first 3 days (67.1%). Most (91.5%) disturbed consciousness at the time of admission. 65% of those with hemorrhagic stroke died during the acute stage (hemorrhagic stroke in 63.4%, ischemic stroke in 12.2% and unspecified stroke in 24.4%). Analysis of mortality showed that, before 72 hours, most patients died of brain herniation which represented 43.9% of all deaths while after 72 hours, the remaining deaths were caused by brain herniation (12.2%) and pneumonia (14.6%) (shown in Table 8). In hemorrhagic stroke, most patients died from brain herniation (84.6%) and pneumonia (11.5%), comparing with ischemic stroke, most died from infection (50%) (brain herniation in 20%, stroke in 20%)

TABLE 8 causes of death

(admission)	Within 72 hours (admission)		After 72 hours	
	n	%	n	%
Brain herniation	72	65.5	20	37
Stroke	6	5.5	2	3.7
Pneumonia	4	3.6	24	44.5
Sepsis	0	0	2	3.7
Urinary tract infection	0	0	2	3.7
Upper GI bleeding	0	0	2	3.7
Unknown	28	25.4	2	3.7

Follow-up after the acute stage was studied in 261 patients. Modified Rankin Scale (M.R.S.) was used (shown in Table 9).

TABLE 9 Outcomes by M.R.S. after stroke

Scale	3 weeks		3 months		6 months	
	n	%	n	%	n	%
5	109	41.8	44	16.9	14	5.4
4	64	24.5	81	31	51	19.5
3	24	9.2	48	18.4	64	24.5
2	37	14.2	37	14.2	64	24.5
1	7	2.7	31	11.9	41	15.7
0	20	7.6	20	7.6	27	10.4

Functional prognosis

For patients who have survived the acute phase of a stroke, the most important questions are to what extent they will recover physically and mentally and whether they will eventually be able to return home and take up former activities.

Disability grade

At the time of the first follow-up (3 weeks after stroke) only 24.5% of patients were fully independent in self care. 33.7% were partially dependent and remaining 41.8% were completely incapacitated. Over the following months this pattern gradually changed, so that after 6 months, 50.6% were independent in self care, and only 5.4% were still totally dependent on other people.

Return work

Only 10.3% of the survivors at 3 weeks were back in gainful work. At 6 months the number of patients who had resumed work had almost tripled (26.1% were capable of returning to their previous work performance).

DISCUSSION

In this study, most stroke patients were male (60.7%) and predominated in 41-70 year-age group, as shown also by others (3,8), whereas in Schmidt et al stroke study (1) there was a female preponderance (57.5%) but the average age was the same as this study (60 years) and it usually occurred in old aged patients.

About risk factors, no risk factor was obtained in 37.7% of the patients, hypertension in 26.5%, diabetes mellitus in 11.6%, rheumatic heart disease in 1.2%, ischemic heart disease in 2.2%, hyperlipidemia, heavy smoking, atrial fibrillation and previous stroke were obtained at the same rate (about 5%). In WHO collaborative study (2), no risk factors and diabetes mellitus were known at the same rate, but hypertension, myocardial infarction were higher (hypertension in 40-50%, myocardial infarction in 6-9%). In Sweden stroke study (3), positive risk factors were obtained from more than 50% of all stroke patients, 40% had known hypertension, diabetes mellitus in 7.5%, myocardial infarction in 8.6% and previous stroke in 10%. In Copenhagen stroke study, hypertension is the major risk factor in cerebrovascular disease (40%), myocardial infarction in 11%, diabetes mellitus in 13% and previous stroke in 55%. In this study, no risk factor and hypertension were present more often in patients with hemorrhagic stroke than in ischemic stroke but diabetes mellitus, heavy smoking, atrial fibrillation, ischemic heart disease, rheumatic heart disease and previous stroke more often in ischemic stroke. In Sweden stroke study (3), patients with intracerebral hemorrhage tended to have the highest frequency of previously known hypertension.

According to duration of symptoms, almost all patients (96.7%) early came to the hospital because cerebrovascular disease was a big burden and highly concern for patient's relatives but different in John Marshall and David A. Shaw's study (4).

Clinical manifestation in the acute phase, in this study, 36.2% suffered some disturbance of consciousness. Of those 154 patients, 15.6% were drowsy, 35.1% stuporous and 49.3% comatose. 66.2% of patients who altered of consciousness were hemorrhagic stroke as shown also by Sweden stroke study ⁽³⁾. In Moscow stroke study ⁽¹⁾, 47% suffered some disturbance of consciousness, 37.2% were somnolent, 23.5% semicomatose and 39.3% comatose. In WHO collaborative study ⁽²⁾, one-fifth were comatose, about 30% were either somnolent or semicomatose and most of comatose patients had cerebral hemorrhage.

Neurological condition, in this study, 75.8% suffered motor disturbance, aphasia or dysphasia for 14.4%, cerebellar ataxia for 6.3% and hypalgesia for 2.3%. In other studies ^(1,3,5), most involved motor function, but speech disturbance were more than this study.

Types of stroke, 42.9% were ischemic stroke, 37.6% were hemorrhagic stroke and 19.5% unspecified stroke as shown also by others ^(3,6), but differed from Moscow stroke study and previous knowledge. In this study, datas were collected from stroke patients who only admitted and almost patients were serious so hemorrhagic strokes were increasing.

In CAT brain scan, 59.3% were checked, 34.1% were normal or atrophic brain, 37.3% demonstrated infarction, most in basal ganglion and 28.6% demonstrated hematoma subarachnoid hemorrhage or intraventricular hemorrhage.

Convulsion was developed in 5.4% and most in hemorrhagic stroke (91.3%) and cerebral embolus (8.7%).

The mortality rate was 38.6%, most occurred within the first 3 days (67.1%). 91.5% of death patients disturbed consciousness and 63.4% were hemorrhagic stroke as shown also by others ^(1,2,3). The causes of death were brain herniation (56.1%) as shown also by Moscow stroke study. pneumonia in 17.1%, stroke in 4.8% and unknown in 18.3%. The mortality depends on age, type of stroke, severity of concomitant diseases ⁽¹⁾ and disturbance of consciousness ^(3,7).

Outcome after stroke, by Modified Rankin Scale, surviving patients were gradually improvement by time as shown also by others ^(1,2,3,5). Three weeks after onset, the number of patients with unable to walk alone had been reduced to 173 or 66.3% of those survivors at that time, after 6 months, patients with unable to walk alone was still present in 65 patients (24.9%), in contrast, the number of patients with able to carry out all usual activities rose steeply to 27 (10.3%) at 3 weeks, and subsequently to 68 (26.1%) at 6 months. This is comparable to 50% of survivors worked or performed household activities one year after stroke in Harmsen's study ⁽³⁾, to 41% in Marquardsen's study ⁽⁸⁾, to 60% in Sorensen's study ⁽⁵⁾, to 30% of survivors returned to work at 3 months in Aho's study ⁽⁹⁾, whereas in the WHO collaborative stroke study ⁽²⁾, only 20% of European stroke survivors in work before stroke returned to work. In Moscow stroke study ⁽¹⁾, improvement occurred more frequently during the first year following stroke, but the rate of recovery decrease after 3 years.

CONCLUSION

Cerebrovascular disease is the major health problem in Thailand. To decrease the incident, improve prognosis and outcome, we should develop the proper health care system to control risk factor, awareness of transient ischemic attack, early diagnosis and proper management, also rehabilitation.

APPENDIX A

Modified Rankin Scale

0 = No disability

1 = No significant disability : able to carry out all usual activities

2 = Slight disability : unable to carry out some previous activities but able to look after own affairs without assistance from others

3 = Moderate disability : able to walk and transfer without assistance from others, well enough to be independent in toileting, but requiring help with other essential activities such as dressing

4 = Moderately severe disability : unable to walk without active assistance and/or attend to own bodily needs ; may or may not be incontinent

5 = Severe disability : bedfast or chairfast ; usually but not necessarily incontinent, but requiring constant nursing care and attention

6 = Comatose

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