STROKE IN ASIANS

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Stroke is the main cause of adult disability and the third most common cause of mortality in the world. It is known that stroke incidence, prevalence and mortality vary widely in different populations. Studies such as the World Health Organization's MONICA (Monitoring of Trends and Determinants of Cardiovascular Disease) Project have shown that relative to Caucasians, Asians have a higher prevalence of stroke.[1] The burden of stroke in Asia is predicted to increase, both in absolute terms and as a proportion of total disease burden, due to rapid population aging and lifestyle changes. This review article aims to illustrate the current status of stroke in Asia and relates how features of stroke in Asia are different from the West.

EPIDEMIOLOGY

Incidence of stroke ranges from 100 to 200 per 100,000 in Caucasian populations[2]; this may rise to 300-500 per 100,000 in the 45-84 year age group.[3] The age-adjusted incidence of stroke in the West is 100-300 per 100,000 people per year, depending on the method of assessment, country of origin, and structure of the population in question.[4]

Incidence of stroke ranges from 182 to 342 per 100,000 population in Asia.[2] Stroke incidence is relatively lower in Europe compared to the Chinese (in Beijing) in the WHO MONICA project.[1] Intraregional, geographical variations and differences are documented as well. Prominent variation is seen in China - mean age-adjusted stroke incidence in the northeastern city of Harbin at 486.[4] per 100,000 is about 6 times higher than in Shanghai (81 per 100,000) which is in the south.[5] Stroke prevalence data provides the best measure of total burden of stroke in any population. In the early 1980s, prevalence rates of stroke were around 500-700 per 100,000 in Caucasian populations 2 and 900 per 100,000 in Asia.[6]

Mortality rate varies with stroke subtype and the incidence of the disease. An estimated 3.5 million of the 5.5 million deaths from stroke each year occur in developing countries.[7] In developed countries with predominantly white populations, crude death rate is 50-100 per 100,000 per year.[7] In one report, the age-standardized, gender-specific stroke mortality rate was 44 to 102.6 per 100,000 for Asian males, compared with only 19.3 for Australian white males.[8]

HOW IS ASIA DIFFERENT?

Strokes can be classified as ischemic strokes, intraparenchymal hemorrhage, or subarachnoid hemorrhage. Ischemic strokes are the most prevalent and can be further classified according to the TOAST (Trial of ORG 10172 in Acute Stroke Treatment) criteria. Many studies, especially those incorporating hospital-based registries, have been particularly successful in identifying the peculiar clinical features of stroke in Asia. These include the relatively high prevalence of intracerebral haemorrhage, lacunar infarction, intracranial atherosclerosis, and stroke in young patients. Also reported is a lower prevalence of cardio-embolic cerebral infarction in Asian populations. An important study that outlines differences between Asian and Caucasian populations is a prospective comparative study between two hospital registries - at University Hospital in Malaysia (Asian population) and the Austin Hospital in Melbourne (Caucasian population).[8]

INTRACEREBRAL HEMORRHAGE

It has been established at least in Western Europe that between 8 and 15% of strokes in whites are due to cerebral hemorrhage.3 Primary intracerebral hemorrhage accounted for 66 of 675 (9.8%) patients in the Oxfordshire Community Stroke Project.[9] In the Lausanne Stroke Registry in Switzerland, 109 of 1000 (10.9%) strokes were due to intracerebral hemorrhage.[10] The

prevalence of intracerebral hemorrhage in a population-based cohort study of 8,562 people followed up for 4 years in Taiwan is 22%.[11] One community-based prospective cohort study conducted in 2006 showed that hemorrhagic stroke represented a large proportion of all strokes, especially among women (29%), in Yao City, Japan.[12]

The Asian-Caucasian comparative study revealed intracerebral hemorrhage to be more common in Asians - 71/413 (17.2%) versus 44/375 (11.7%).[8] Hypertension was the commonest cause of intracerebral hemorrhage in both populations, seen in 83.9% of Asians versus 71.8% of Caucasians, a difference that was statistically significant.[8]

LACUNAR INFARCTION

In the Perth Community Stroke Study, only 10% of all first-ever strokes were due to lacunar infarction.[13] In the Harvard Cooperative Stroke Registry, an estimated 18% of 756 consecutive cases were lacunar infarction.[14] In a study done in 1991, in a hospital-based stroke registry in Taiwan 21.7% of strokes were lacunar infarctions.[15] In the Shatin stroke registry in Hong Kong, 18.5% of strokes were due to lacunar infarction.[16]

In contrast, in the Aga Khan University Hospital stroke registry in Pakistan, lacunar infarctions comprised 42.7% of ischemic strokes.[17] This high number was attributed to high levels of uncontrolled hypertension and diabetes mellitus. In the Hisayama study done in a Japanese population in 2000, lacunar infarction was the most common subtype of cerebral infarction and had a greater variety of risk factors, including not only hypertension but also ECG abnormalities, diabetes, obesity, and smoking, than did atherothrombotic infarction or cardioembolic infarction.[18]

The Asian versus Caucasian comparative population study confirmed that lacunar infarction was more common in the Asian study group: 28.1% versus 18.4%.[8] However, there was no significant difference in the prevalence of hypertension between the two groups, challenging the association of hypertension and lacunes.8 Diabetes mellitus, hypercholesterolemia, hypertriglyceridemia and smoking were more common risk factors in the Asian study group; however, on multivariate analysis none of these risk factors came out to be significant.[8]

Another interesting study done in Japan in 2006 shows that, in the Japanese population, the incidence of lacunar infarction has steadily declined over the last 40 years.[19] It was implied that improved hypertension control and decreased prevalence of smoking seen in the Japanese population might be responsible for this trend.[19] Hypertension prevalence had remained constant but mean blood pressure levels decreased.[19]

INTRACRANIAL ATHEROSCLEROSIS

Various studies have reported the higher frequency of intracranial arterial stenosis in Asian populations.[20,22] On the other hand, extracranial carotid stenosis is less frequent in Asia.[23] It has been proposed that this increased frequency of intracranial arterial stenosis is an important area for genetic studies. In a study in Beijing in 1997, 51% of 96 patients who presented for TIAs had intracranial stenosis or occlusion, as opposed to only 19% with extracranial disease.[24] In a similar study done in Hong Kong, 33% of 66 ischemic stroke patients had intracranial occlusive disease while only 6% had extracranial disease.[25]

STROKE IN THE YOUNG

Many studies done in Asia have shown an increased prevalence of stroke in the young (usually taken as age at onset of less than 45 years).[26,27] A number of factors have been postulated to account for this high prevalence in Asia: (i) cardioembolic stroke[26,27,28] due to cardiac diseases such as rheumatic heart disease; (ii) acclerated intracranial atherosclerosis;[26,29] (iii) arteriovenous malformations;[28,30] and (iv) increased prevalence of diseases such as Takayasu's and Moya-moya.[30,31]

An extensive study was done in 2005, in Japan, comprising 7,245 acute stroke patients admitted to 18 hospitals, with the aim of establishing a stroke data bank for young adults.[30] Of patients admitted within the first 7 days of stroke, 8.9% were aged less than 50.[30] Smoking habits and patent foramen ovale were more frequent in the young than in the non-young.[30] Brain hemorrhage (20.8% versus 32.1%, $p < 0.01$) and subarachnoid hemorrhage (7.3% versus 26.1%, $p < 0.01$) were more frequent in the young.[30] Causes of stroke in the young was often atypical, such as cerebral arterial dissection, Moya-moya disease, anti-phospholipid antibody syndrome, and arteriovenous malformation.[30]

Another recent (2004) study done in India revealed that stroke in young patients accounted for 13.5% (127 of 940) of all stroke cases over a period of 9 years.26 Within the group of young patients, 85.8% had ischemic stroke, while 14.2% had spontaneous intracerebral hemorrhage.[26] Major risk factors for stroke in these young patients were hypertension, hypercholesterolemia,

Table 1: Comparison of Specific Stroke Subtypes and Patterns between Asian & Caucasian Populations

CLINICAL FEATURE	ASIAN POPULATION	CAUCASIAN POPULATION
Intracerebral Hemorrhage	22% (Hu HH et al. 1992)[11]	9.8% (Boonyakarnkul et al. 1993)[9]
	26% men, 29% women (Kitamura A et al. 2006)[12]	10.9% (Bogousslavsky J et al. 1998)[10]
	17.2% (Wai Keong et al. 1998)[8]	11.2% (Wai Keong et al. 1998)[8]
Lacunar Infarction	21.7% (Hsu LC et al. 1997)[15]	10% (Anderson CS et al. 1990)[13]
	18.5% (Kay R et al. 1992)[16]	18% (Mohr JP et al. 1978)[14]
	42.7% of ischemic strokes (Syed et al. 2003)[17]	21% (Bamford J et al. 1987)[32]
	28.1% (Wai Keong et al. 1998) [8]	18.4% (Wai Keong et al. 1998)[8]
Cardioembolic Stroke	10.9% (Wai Keong et al. 1998)[8]	20.8% (Wai Keong et al. 1998)[8]

All percentages represent proportion of all strokes (ischemic, hemorrhagic and SAH), unless stated otherwise.

hyper-triglyceridemia, and smoking.[26] Oral contraceptives, alcohol, and illicit drug use were infrequent risk factors, in contrast to Western studies.[26] Cardioembolic stroke (29.4%) and atherosclerotic occlusive disease (22%) were the most common causes of ischemic stroke.[26]

CARDIOEMBOLIC INFARCTION

The Asian versus Caucasian comparative population study revealed that cardioembolic stroke is less common in Asians - 10.9% vs. 20.8%.[8] The most common cause of cardioembolic stroke among patients in both groups was non-valvular atrial fibrillation.[8] As the prevalence of non-valvular atrial fibrillation increases with age, the higher incidence of cardioembolic infarction may be explained by the fact that the Caucasian study group's mean age was 10 years higher than the Asian study group.[8]

CONCLUSION

Stroke in Asians shows a rising trend. In comparison with Western populations, stroke in Asians appears more likely due to small-vessel (lacunar) disease, intracranial athero-occlusive stenosis, and spontaneous intracerebral hemorrhage. Public health measures are mandatory to introduce risk factor intervention and appropriate primary and secondary prevention measures.

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