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Stroke in Singapore – An Overview

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ABSTRACT

Stroke is Singapore's third leading cause of death. The number of deaths and admissions to Singapore hospitals for stroke has been rising; when standardised for age, however, mortality rates for stroke for both genders have fallen. There has been a fall in the prevalence of hypertension, smoking and hyperlipidemia in the general population, with a rise in the prevalence of diabetes mellitus. The frequency of haemorrhagic stroke is higher than among Caucasian populations. While stroke patients tend to arrive to hospital early, the level of stroke awareness among stroke patients is poor. Inpatient and outpatient rehabilitation services are available. Many stroke patients are still disabled after their stroke. A national-level support group has been established. Over the years, the number of stroke victims and disabled stroke survivors will continue to rise. There is a need to persist with public education programs and risk factor screening, and to further develop hospital and community resources to meet this challenge.

Keywords: cerebrovascular diseases, epidemiology, risk factors, mortality, outcome

INTRODUCTION

Singapore, our small multi-racial tropical island city state of 3 million people[1] boasts a robust economy and excellent health care facilities[2]. As of 1996, there were 26 public and private sector hospitals and medical institutions, providing 10,688 beds, and 21 government family health service clinics situated in various parts of the island; a laudable 6% of the total Government expenditure is spent on health[2].

Cancer and heart disease have been alternating as the leading cause of death in Singapore since 1970[3]. This paper reviews the problem of stroke, Singapore's third leading cause of death.

The Singapore population

The Singapore population has been growing steadily over the years: it rose 2.2% per annum between the years 1980 and 1990[1]. The median age has also been rising, from 24 years in 1980, to 30 years in 1990[1]. Ageing is a very important, but non-modifiable, risk factor of stroke[4,5]. The number and proportion of the elderly aged 65 years and above in Singapore is rising, from 69,400 in 1970, to 111,900 in 1980, to 164,100 in 1990, corresponding to 3.3%, 4.9% and 6.1% of the population in the respective years[1]. This is projected to reach 7.1% in 2000 and 20.1% in 2030[6] (Table I). The US Census Bureau has computed that Singapore has the second highest index of ageing among the 27 countries studied around the world.

With the rapidly growing elderly population, an explosion in the number of stroke patients can be expected early in the next century.

Stroke risk factors

There are a number of well-recognised modifiable stroke risk factors, of which hypertension, smoking, diabetes mellitus, and hyperlipidemia are the more common ones[7]. A number of large well-conducted national health surveys have been performed in Singapore since 1974. Despite their varying methodologies, they provide useful information on the prevalence and changing trends of stroke risk factors in our population.

Three large hypertension prevalence surveys[8-10] have been conducted in Singapore. They defined a case if he/she was a known hypertensive, or had study blood pressures exceeding 160/95 mmHg. They have shown that the prevalence of hypertension has fallen from 14.1% in 1974 to 13.6% in 1992; more importantly, the prevalence of previously undiagnosed hypertension fell from 8.7% to 3.5% over the same period.

The five prevalence studies of smoking[10-14] similarly defined a smoker as one who smoked at least one cigarette a day. However, they evaluated slightly differing age groups. Still, they showed that the prevalence of smoking fell from 27% in 1974 to 18% in 1992. In the 18 – 64 year age group, the fall was from 20% in 1984 to 18% in 1992[9,10].

The prevalence of hyperlipidemia, defined as a fasting total cholesterol equal or exceeding 6.2 mmo/L, was evaluated in two comparable studies in the 18 – 69 year age group. They showed a fall from 27% in 1984 to 19% in 1992[9,10].

There were three prevalence studies of diabetes mellitus[10,15,16]. The earliest study[15] used a 50g oral glucose load, while the latter two used a 75g oral glucose load. The prevalence of diabetes mellitus in 1975 was 1.9%. Comparable studies in the 18 – 69 year age group showed a rise from 4.7% in 1984 to 8.6% in 1992[9,10].

Obesity prevalence was assessed in 2 studies in the 18 to 69-year age group[9,10]. A subject was considered obese if the body mass index equalled

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Table I – Proportion of the elderly in Singapore

Year	Resident population ('000)	Number aged 65 years and above ('000)	%
1970	2,074	69.4	3.3
1980	2,282	111.9	4.9
1990	2,690	164.1	6.1
2000*	3,259	232.7	7.1
2010*	3,661	318.2	8.7
2020*	3,844	538.1	14.0
2030*	3,940	793.8	20.1

* refers to projected figures

Table II – Prevalence of stroke risk factors in Singapore, and population targets

Risk factors	Prevalence (%)		Population target (2000)
	1984	1992	
Hypertension	15.4	13.6	13.0
Smoking	20.0	18.0	13.0
Hyperlipidemia	27.0	19.0	20.0
Diabetes mellitus	4.7	8.6	7.0
Obesity	5.9	5.1	3.0

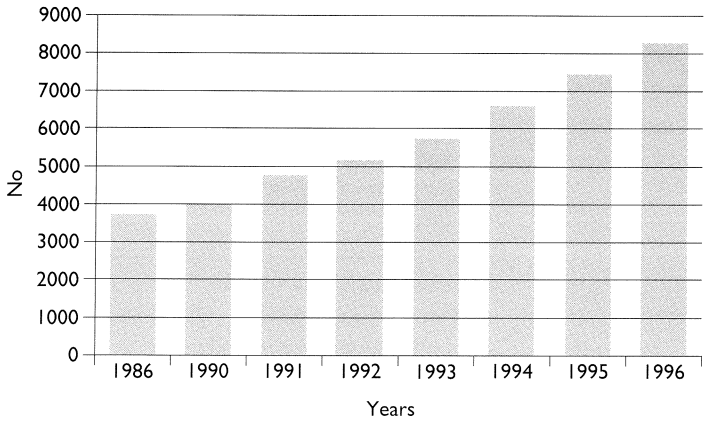

Fig 1 – Number of deaths and discharges for stroke from Singapore hospitals

or exceeded 30 kg/m2. These studies showed a fall in obesity from 5.9% in 1984 to 5.1% in 1992.

Risk factor control by public education and risk factor detection and treatment are important means of reducing the frequency of stroke in the population. The Ministry of Health has set population targets for prevalence of these risk factors by the year 2000[17]: 13.0% hypertension, 13.0% smoking, 20.0% hyperlipidemia, 7.0% diabetes mellitus, 3.0% obesity (Table II). In a local data bank of hospitalised stroke patients[18], a history of stroke risk factors was found as follows: 67.8% hypertension, 22.3% smoking, 6.3% hyperlipidemia, 39.7% diabetes mellitus, 22.3% previous stroke/transient ischemic attack.

Incidence, prevalence, hospital admissions for stroke

There is no data on stroke incidence or prevalence in Singapore. In predominantly Caucasian populations in developed countries, the respective data are 100 – 200/100,000 and 500 – 600/100,000 respectively[19]; data from developing countries is more varied, with incidence ranging from 26 to 250/100,000, and prevalence ranging from 58 to 690/100,000[20].

Data from hospital admissions show that the total number of deaths and discharges for stroke from Singapore hospitals has been steadily rising[21], with a more than two-fold increase from 3732 in 1986 to 8351 in 1996[22] (Fig 1). Stroke comprises an increasing proportion of hospital admissions[21,22]. With the ageing population, more strokes can be expected in the population, and rising hospital admissions over the coming years.

Mortality

As in most developed countries, stroke has been the third leading cause of death in Singapore, after cancer and heart disease[3]. It has held this position since 1970 except for 1995 when it slipped to fourth place behind pneumonia. Stroke accounts for 10% to 12% of all deaths. The actual number of patients dying from stroke has been rising, from 1,041 in 1970, 1,447 in 1980, 1,666 in 1990, 1,805 in 1996 (Fig 2). This rise will probably continue as the actual number of patients suffering from strokes continues to climb. The crude death rate from stroke has been fluctuating between 50 to 60/100,000.

Earlier reports show no change in stroke mortality from 1957 to 1978[23], while later reports show a fall in age-standardised mortality rates, particularly since the mid-70s[24,25]. This fall is seen both among males and females. Latest data shows a fall from 99/100,000 in 1976, to 50/100,000 in 1994 (Fig 3). This falling trend is seen in most developed countries. The reasons for this favourable trend are uncertain, but may be related to the falling prevalence of stroke risk factors in the Singapore population[25].

There are also ethnic differences in stroke mortality rates in Singapore. Malays have the highest rates compared to Chinese and Indians[26]. The reasons are unclear, but it may be related to the higher frequency of risk factors eg. smoking among the Malays[10]; another reason may be related to the observation that Malays comprise a lower proportion of hospitals admissions than would be expected from the composition of the Singapore population.

Outcome

There is little data on the outcome and morbidity after a stroke among Singaporeans. A few local studies have reported on the effectiveness of rehabilitation. In one study of 1310 patients[27], 91.9 % became fully or partly independent post-rehabilitation. Of two smaller studies involving the elderly, one[28] showed 70% improvement in the self care aspects of activities of daily living and 60% improvement in mobility; the other study[29] showed that at 3 months, 63.3% of patients were still moderately or severely disabled. Rehabilitation has been found to be beneficial in brainstem stroke[30] and young stroke patients[31]. Depression was found in 55% of a rehabilitation stroke population[32], but this decreased to 28.6% by the time of discharge from the centre[33].

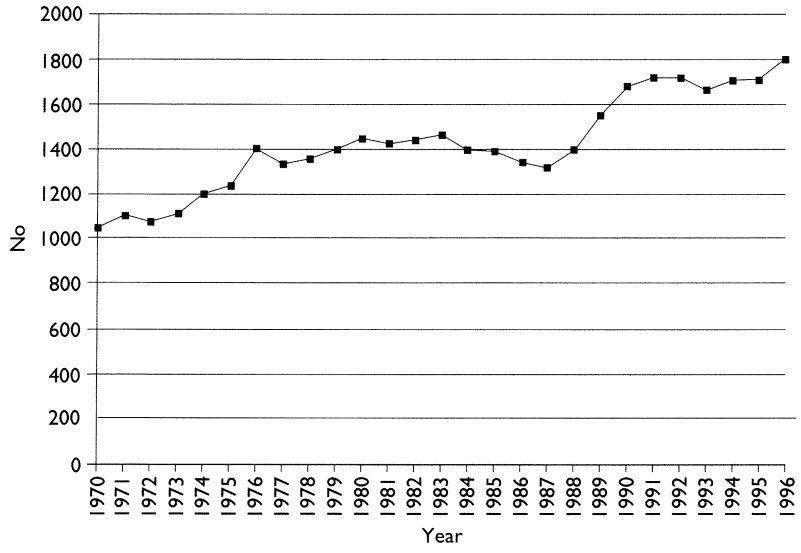

Fig 2 – Number of deaths from stroke in Singapore.

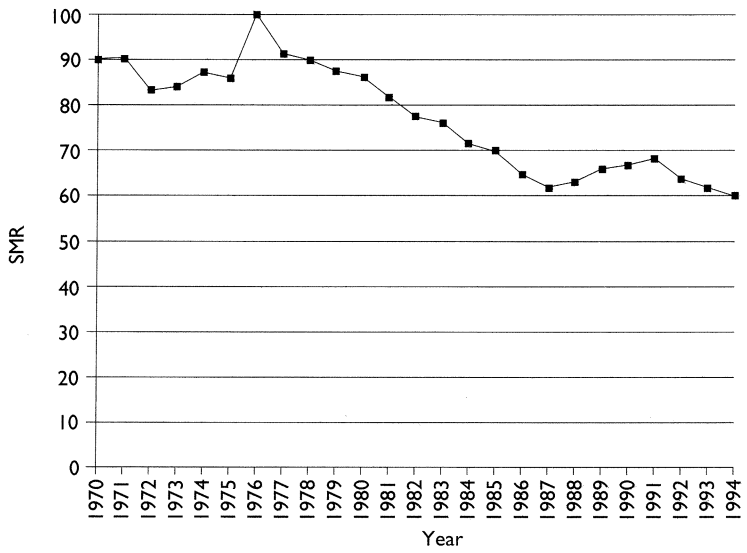

Fig 3 – Age and sex-standardised mortality rates (SMR) per 100,000 for stroke in Singapore.

The data, when combined with expected rise in the number of stroke patients in Singapore, suggests that the number of disabled stroke survivors will rise in Singapore. In addition, financial resources of the family (and of the Health budget) may need to be diverted to the aftercare of these patients; family members may withdraw from the workforce or hire foreign workers to take care of the patient at home. These changes will have important social and economic implications.

Stroke subtypes

Data from predominantly Caucasian populations show that 7% of stroke are due to subarachnoid haemorrhage(SAH), 12% intracerebral haemorrhage (ICH), 73% cerebral infarct (CI), with 8% ill-defined; comparable data from Japan is 8%, 23%, 58% and 11% respectively[34]. The frequency of haemorrhagic stroke among other Oriental populations is 23% in Taiwan[35], 27.1% in Hong Kong[36], and 46% in China[34].

Previous studies on stroke subtypes in Singapore were performed in the pre-CT era[37,38]. A recent CT-based study of a hospitalised stroke population[18] shows that 1.8% are due to SAH, 24.2% to ICH, 74.0% infarct (39.0% lacunar, 34.0% non-lacunar). The frequency of haemorrhagic stroke is thus higher than among Caucasian populations, and similar to other Oriental populations. Interestingly, for uncertain reasons, the frequency of haemorrhagic stroke was lowest among the Indians in Singapore[39]. Procoagulant states and cardioembolism are important mechanisms among the young stroke patients[40].

The different stroke subtypes have differing mortality, morbidity and pathophysiological mechanisms. Stroke patients should thus be appropriately evaluated so as to prognosticate the outcome and to offer cost-effective treatment. The impact of the inter-racial differences in stroke subtypes, when viewed with the differing stroke risk factors in the various races in the general population[9,10], needs further study. There may be a need for focused risk factor control efforts specifically targeting different risk factors in the various races.

Stroke awareness

For many years, the Ministry of Health, Singapore has conducted numerous health education activities, in the form of public talks and exhibitions, and in the media.

A recent study of 150 stroke patients[41] evaluating their awareness of stroke risk factors, stroke symptoms and stroke preventability yielded an alarmingly high level of misconceptions and ignorance. Hypertension and smoking, two potent modifiable stroke risk factors, were identified as risk factors by only 66% and 38% respectively. Only 16.7% knew that stroke was due to a disease process affecting the brain. While 72.0% identified slurred speech as a stroke symptom, unilateral numbness or weakness was identified by 67.3% and 52.0% respectively. Only 40% felt that stroke was a preventable disease.

Thus, an education program on stroke is needed among stroke patients, and probably among the general public in Singapore as well.

Arrival times to hospital

Hospitals in Singapore are located in parts of the island that are easily accessible by roads. The emergency ambulance services rush cases to the nearest available hospital.

Hospitals in the US report[42] that 59% of their stroke patients arrive in hospital within 3 hours of onset of stroke symptoms. Data from Europe[43] shows that 40% to 56% arrive within 6 hours. A recent Singapore study[44] shows that 41.4% arrive within 3 hours, 54.5% within 6 hours, and 68.5% within 12 hours. This is similar to a Hong Kong report[45] of 63% arriving within 12 hours.

This suggests that patients are arriving reasonably early after onset of stroke symptoms in Singapore, but with the good system of roads and ambulance services, these numbers could be improved. There may even be a need to enhance the skills of ambulance teams in the pre-hospital management of stroke patients, on-site and while on-route to the nearest hospital Emergency Room.

Health care facilities and services

Singapore is amply provided with a large University and several teaching hospitals, and a number of privately-run hospitals[2]. Strategically placed in various parts of the island, they are able to provide secondary-level and emergency care to stroke patients from the surrounding community and further afar. These hospitals have 24-hour emergency department, medical and surgical specialities, and the services of neurologists and neurosurgeons for the acute care of stroke patients. All of them have CT brain scan facilities. Stroke units have been shown to reduce mortality, morbidity, institutionalisation, hospital stay and hospital costs[46]; and these have been established in Tan Tock Seng Hospital[47] and Singapore General Hospital.

Inpatient stroke rehabilitation services are available at Tan Tock Seng Hospital, Mount Elizabeth Hospital, Ang Mo Kio Community Hospital, St Andrew's Community Hospital, St Luke's Hospital for the Elderly, as well as some nursing homes. Outpatient rehabilitation is available at all Senior Citizen Health Care Centres (SCHCCs) located in most public housing estates, and in some privately-run centres. The Home Nursing Foundation as well as other privately-run and charitable organisations provide various services that may include home help, meals, day care, social, medical and other services. There are a number of nursing homes for short term and long term institutionalisation. A Directory of Services for the Elderly lists these services[48].

A previous study has shown that elderly stroke patients are able to reach independence through a community rehabilitation program[49,50]. This suggests that appropriate and efficient use of these services would provide the opportunity to improve the stroke patient's status and level of care after they return home from hospital. There are numerous family physicians in government clinics and private practices scattered throughout the island for primary level care and follow-up of the stroke patient.

Stroke support

The Singapore National Stroke Association (SNSA) was registered in 1996. It is a national-level support group for stroke patients and carers. It conducts social and educational activities for its members, counsels stroke patients, and has a public education program. It seeks to generate community support for stroke patients and carers, and is supported by the hospitals and the Ministry of Health.

The public needs to understand that the stroke patient should not be viewed as a curiosity or a liability, but accepted as part of society. All buildings, streets and other structures should be 'friendly' to the disabled, with ramps, toilets and facilities appropriately configured to meet their needs. The efforts directed at employment and re-employment of the economically active stroke patient needs to be further supported; attitudes of employers may need to be assessed and modified.

Problems and possible solutions

There are a number of problematic issues in stroke, requiring a multi-pronged approach to address these areas.

1. Greater efforts need to be made in the primary prevention of stroke. There is a lack of knowledge among stroke patients about their illness – the general public may not be any more enlightened. The prevention program should include educational programs about stroke risk factors, stroke symptoms and the need to seek early treatment, as well as screening of populations at risk. The public needs to realise that stroke can be prevented.
2. Hospitals need to be geared-up to cope with the expected increase in stroke load. Stroke units should be set-up in all hospitals.
3. Rehabilitation facilities need to be increased to handle post-stroke rehabilitation.
4. The many and diverse community services available for the stroke patient need to be reviewed and centrally co-ordinated to avoid duplication, and to allow the provision of adequate services to regions in the counts lacking them. The physical environment needs to be made more friendly to the disabled. The work environment needs to address employment of stroke survivors.

CONCLUSION

There have been many advances in the management of stroke[51]. Stroke should be viewed as a public health issue. It has many facets – risk factor detection and treatment, public education, appropriate hospital care, post-stroke rehabilitation and community support. The establishment of a National Stroke Council would aid in the co-ordination and cohesion of the many disparate organisations all nobly seeking to serve the stroke patient better. These efforts need to be initiated now to combat an illness which will predictably reach epidemic proportions in the very near future.

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