Stroke: An Indian Perspective

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Abstract : *Stroke is a very common disorder affecting older people. Community surveys of different parts of the country indicate a crude prevalence of stroke of 203/1, 00,000 populations above 20 years which is much lower than that reported from the west. The causes of low prevalence of stroke in India are predominance of young population in India in which stroke is less prevalent and high early mortality leaving behind fewer survivors. The mortality rate due to stroke in India is 7.3/ 1, 00,000. Thus, deaths due to stroke are 22 times higher than malaria, 1.4 times that due to tuberculosis and 4 times that due to rheumatic heart disease. About 10-15 % of stroke occurs in population < 40 year old. Certain risk factors evaluated in Indian centers are hyperhomocystienemia, elevated anticardiolipin antibody, and elevated lipoprotein, in addition to hypertension, smoking and diabetes mellitus. Most centers show the ratio of ischemic to hemorrhagic stroke as 10-15% to 90- 85 %. As regards the vascular involvement both intracranial and extra-cranial involvement occurs in Indian patients. On the other hand in west <5% have intracranial disease and in the Far East <5% have extra-cranial disease.*

INTRODUCTION

Stroke is a very common disorder affecting older people. However a small sub group of stroke in young has been identified. Until recently stroke used to be the 4th most common cause of death world wide, but over the years it has the dubious distinction of becoming the 3rd common cause of death. In India there are certain differences as compared to other western countries among the stroke population. In this review we shall highlight these.

INCIDENCE AND PREVALENCE

Stroke epidemiological data of 9 Asian countries (2000) that there is good data available from Hong Kong, Taiwan, South Korea and Singapore; moderate data from Philippines, Malaysia, Thailand and Indonesia and only fair data was available from India[1]. Problems in epidemiological studies from India are large population size, poor income and limited health care resources. Another problem with proper epidemiological study is lack of knowledge about stroke. Pandian et al[2] studied awareness about stroke among Indian population in Punjab, India, the study revealed that 45% did not know which organ is affected in stroke 23% did not know a single warning symptoms of stroke, 21% could not identify a single risk factor, 7% believed oil massage would improve symptoms (Pandian et al 2005)

Epidemiologic data with regard to incidence and prevalence for the whole population of stroke is not available. Community surveys of different parts of the country indicate a crude prevalence of stroke of 203/1, 00,000 populations above 20 years. This means about 1 million cases are affected at any given time. This is less as compared to the prevalence reported worldwide which ranges between 400-800/ 1,00,000 population.

Various community based prevalence studies from India are tabulated below (Table 1)

The Rotterdam Study (population based Cohort study) had showed that the prevalence of stroke differs in different age groups. In the Rohtak study where overall prevalence rate was low; it was found to be significantly more in persons >70 (356/ 1,00,000). No separate age wise studies are available from India.The reasons which may explain the low prevalence of stroke in India are :

1. Predominance of young population in India in which stroke is less prevalent, which dilutes the overall stroke prevalence figures.
2. By definition, prevalence includes the number of patients who are alive at the given time; mortality due to stroke is high in India, so it reduces the numbers.

Table1: Crude prevalence rate by survey of hemiplegia :

Zone	City	Subjects	Prevalence/1,00,000
North	Kashmir	63645	145
	Rohtak	79046	44
	Ballabhgarh	4786	125
West	Mumbai (Parsi)	14010	843
	Mumbai	318552	222
	Mumbai	14546	220
South	Vellore	258576	57
	Gowribadunur	57600	52
East	Malda	37286	126
	Kolkata	50291	147
	Kolkata	14200	270

The first population based study for stroke incidence in India was conducted in Vellore in 1967-71 and it revealed an incidence of 1/ 1,00,000/year. Incidence over a similar period from Rohtak in 1971-74 was 33/ 1,00,000/ year. Incidence in a recent study in 1998-99 (Kolkata) was 105/ 1,00,000/year.

As compared to western countries, stroke incidence in India is lesser but it is registering an upward trend in the last few decades. On the other hand incidence in western countries is showing a striking decline.

BURDEN OF STROKE

Worldwide, about 20 million people suffer from stroke each year, 5 million die of it, 5 million of the remaining 15 million survivors are disabled due to stroke. The Global Burden of Disease Study

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in 1990 reported 9.4 million deaths in India of which 61,900 were due to stroke and the Disability Adjusted Life Years (DALY) loss amounted to 28.5 million, nearly 6 times that due to malaria[2]. India faces an enormous socio-economic burden to meet the cost of rehabilitation of stroke victims. Hence *stroke prevention planning* is a necessity now, but it requires reliable epidemiologic information of pattern of disease, exposure to risk factors and morbidity and mortality trends for the disease in specified well defined populations which are not available at present[2,3].

STROKE IN YOUNG

Stroke in you is another common phenomenon in the Indian scene. Most studies in India show that 10-15 % of stroke occurs in population < 40 year old. Stroke in young in India much higher than that reported from other countries. These figures are higher as compared to other countries. This could be due to many local etiologic factors. The common risk factors of stroke in young, especially pertaining to India are :

a. Puerperal cortical venous thrombosis.
b. Rheumatic heart disease associated cardioembolic strokes.
c. Coagulation disorders (hypercoagulable states)
d. Atherosclerosis
e. Subacute tuberculous meningitis with vasculitis.
f. Meningovascular syphillis (rare now).

Another study by Mehndirata et al (2004) has shown stroke in young accounts for 13.5% all strokes admitted under Neeurology care. Major risk factors for stroke in young among their cohort were hypertension, elevated serum cholesterol and low triglyceride levels. Smoking, use of oral contraceptive pills, alcohol and drugs were not so common.

STROKE RISK FACTORS IN INDIA

Risk factors considered for stroke are largely parallel to those for other vascular diseases such as coronary artery disease and peripheral vascular disease. These may be modifiable and non modifiable (table 2).

Table 2: Stroke Risk Factors

Modifiable	Non modifiable
Hypertension	Age
Smoking	Sex
Cardiac disease	Race
Altered lipid profile	Family history
Alcohol	

Diabetes mellitus is an intermediate risk factor which can be treated effectively but there is no evidence that its treatment reduces the risk of stroke. In an ICMR conducted study (1989) hypertension, Diabetes mellitus, tobacco use, low hemoglobin were important risk factors in both sexes. Another study by WHO Task force on stroke (1989) also identified similar risk factors in India. A Chennai study (1984) identified hypertension, heart disease, diabetes mellitus, smoking, and low HDL cholesterol as important risk factors.

Certain *specific risk factors* for stroke have been evaluated in some centers in India.

1. Recently various studies published from India have looked into the following other risk factors associated with stroke: (a.) *Hyperhomocystienemia*[4]. (b.) *Elevated Anticardiolipin antibody*[5]. (c.) *Elevated lipoprotein (a).*
   In a study by *Prabhakar et al*[5], serum. homocystiene levels were significantly higher in stroke patients compared to controls. A strong correlation was observed between hypertension, smoking and high homocystiene levels[5]. In another study by *Nagaraja et al*, anticardiolipin antibody was present in 23 % of patients with stroke in young as compared to 3.2 % in controls. The anticardiolipin antibody positive patients had more frequency of prior TIAs, ischemic retinopathy and asymptomatic infection[4].
2. In a selective study of stroke cases occurring at high altitude areas, long term stay at high altitude was associated with higher risk of stroke. Although all types of stroke are seen, ischemic stroke was the commonest. Massive infarcts were common and polycythemia was an important risk factor[6].
3. For cardioembolic ischemic strokes, rheumatic heart disease and ischemic heart disease seem to be the dominant risk factors in India.
4. Nagaraja et al[7] had sought to evaluate preceding infection as a risk factor of stroke. Evidence of infection was noted in 43.3 % of stroke patients compared to 6 healthy controls.
5. In a study from Wardha, India, squatting position during toilet was incriminated as an important triggering factor for stroke in India by causing increase in the blood pressure[8].
6. There have been few case reports of acute strokes triggered by snake viper envenomation[9].

STROKE SUBTYPES IN INDIA

There is not enough information on the proportion of ischemic and hemorrhagic strokes from India. *Table 3* gives the hospital based data of two common subtypes.

Table 3 : Hospital based data of Stroke types : (1)

Reference	Place	Number	Infarct(%)	Bleed (%)
Dubey1943-62	Agra	480	82.7	15.2
Padmavaty1954-59	Delhi	453	57.3	22.7
Gupta1957-60	Patiala	260	79.2	9.6
Bharucha1961-63	Mumbai	926	70.5	17.2
Naik 1961-65	Hyderabad	866	75.5	18.2
Misra 1961-65	Lucknow	454	82.5	13.6
Wadia 1974-75	Mumbai	216	25.7	26.3
Dalal 1963	Mumbai	127	72.5	17.3
Abraham 1967-72	Vellore	850	77.0	5.9
Nagaraja 1979-83	Bangalore	2279	77.0	7.5

Clinical bed side examination is not foolproof in identifying stroke sub-type, there may be an error of 15-20% on bedside clinical diagnosis of stroke type. In the Stroke registry of Nizam's institute , Hyderabad[10] in which more than 1000 stroke patients were reuited, 85 % patients had ischemic stroke[3]. There are not many studies on this aspect. However, a few reports available show that 70-85 % stroke cases are of ischemic stroke. In the stroke registry of Nizam's 2000-01, all ischemic stroke patients were further classified as : (a) *large artery atherosclerosis 41 %,*

(b) *lacunar infarcts 18 %,* (c) *cardioembolic10%,* (d) *other determined 4 %,* (e) *undetermined 27 %*[9].

INTRCRANIAL VS. EXTRACRANIAL DISEASE

The most notable difference from Western registries was the predominance of intracranial rather than extracranial location of large artery atherosclerosis. Among atherosclerotic ischemic strokes, many studies have shown that there are significant racial ethnic differences in the distribution of the atherosclerotic lesions. Chinese, Japanese, Hispanics and blacks have greater preponderance of intracranial atherosclerosis while whites have more cases of extracranial carotid disease. Both vascular involvement patterns are seen in India and this has been referred to many as "the Indian pattern". Whereas in the west <5% have intracranial disease, in Far East <5% have extracranial disease. On the other hand both types are seen in Indian patients.

In a study using MR angiography done prospectively in acute stroke patients Padma et al observed operable lesions (significant extracranial carotid stenosis) in only 11 % patients.

In a study of lacunar infarcts by Kaul et al[12] common risk factor included hypertension, Diabetes mellitus, smoking, cardioembolism and cryptogenic. However patients with lacunar infarcts have higher frequency of diabetes mellitus and absence of significant extracranial carotid disease. The presenting syndrome included : (a) Pure motor hemiparesis (45%), (b) Ataxic hemiparesis (18 %), (c) sensorimotor stroke (18%), (d) dysarthria, clumsy hand syndrome (14%)

This study suggests that the clinical spectrum of lacunar stroke in India is similar to that in western countries[12].

STROKE MORTALITY

According to WHO Survey in 1990, out of 9.4 million deaths in India 6,19,000 were due to stroke. Thus, mortality rate in India due stroke is 7.3/ 1,00,000. Thus, deaths due to stroke were 22 times higher than malaria, 1.4 times that due to tuberculosis, 4 times that due to rheumatic heart disease and almost equal to that of ischemic heart disease. In India, delayed hospital arrival is important factor[13] of all deaths 1-2 % is due to stroke[14]. These figures suggest that stroke mortality in India is 2-3 times higher compared to Caucasians lipoprotien ( ) in particularty important risk factor in young[15]. Indians have higher risk of dying from stroke than Caucasians. A study has shown that among Indian immigrants to UK and Wales men have 53% more and women have 25% higher risk of dying from stroke (Balgan, 1991). There is a need to initiate steps to collect data on stroke mortality and morbidity as a first step towards control measures.

LONG TERM OUTCOME

No major studies are available from India to address the issues like post stroke disability, stroke recurrence, functional outcome, due to lack of rehabilitation care facilities.

ROLE OF THROMBOLYTIC THERAPY IN ACUTE ISCHEMIC STROKE AND ITS FEASIBILITY IN INDIA

Not many trails have been reported from India about use of thrombolytic treatment in India. The reasons cited for the relatively minimal use of thrombolytic therapy in India are its unaffordability and late arrival of patients in hospital. Prasad et al studied factors delaying hospital arrival of stroke patients. The median time from symptom onset to reaching casualty was 7.66 hours, with 25 % cases arriving in 3hours and 49 % in 6 hours. Distance from the hospital, contact with local doctor and low threat perception of symptoms were independent factors associated with delay in arrival[10].

In a study by Nandigam et al[16], a significant number of patients' who reached casualty within the therapeutic window and who were eligible for thrombolytic treatment, did not receive thrombolytic therapy. Hence measures are also required to increase awareness of the extent of the therapeutic window of stroke and the efficacy of thrombolytic treatment in primary care doctors as well[8].

In a hospital based study by Pandian et al, relatives of patients with a history of stroke were interviewed to assess awareness of symptoms, risk factors and treatment of stroke. The knowledge regarding organ involved, etiology and treatment was lacking. Considerable education is needed to increase public awareness in modern concept of stroke treatment[16].

CONCLUSION

Stroke in India has certain specific problems. Stroke in young and venous infarct form an important subgroup. Apart from the usual risk factors, anaemia, rheumatic heart disease and habit of squatting are unique risk factors. As compared to western countries, outcome is poorer among Indian patients. More commonly intracranial block of the arteries and long segment involvement is unique to Indian patients.

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