

Epidemiology of Stroke in India

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Abstract

Strokes are a leading cause of morbidity and mortality world wide affecting millions of people every year. We present a review of the epidemiology of stroke in India using data available from major Indian studies and compare them with those from other countries. The prevalence of strokes is apparently less in India but this may be due to a lower life expectancy and a younger population as compared to those in developed countries. There is no evidence of a decline in incidence as seen in many other countries. The proportion of 'young strokes' is significantly higher, underlying heart disease, especially rheumatic and post partum venous sinus thrombosis being important causes. Preventable risk factors, especially hypertension, need to be effectively managed to lower the incidence of this devastating illness.

Key words: Epidemiology, stroke, India

INTRODUCTION

Strokes are a leading cause of death and disability worldwide, being the third most common cause of mortality in the USA after heart attacks and cancer. Epidemiological studies help determine the prevalence, distribution and risk factors and are necessary to streamline health services for prevention and treatment of the disease.¹ Many such studies have been carried out in India, most using the two stage method recommended for developing countries. This involves a preliminary screening for neurological disorders by trained non-professionals and subsequent examination and diagnosis by a neurologist.² Many of these studies have certain inherent deficiencies and these have to be appreciated while interpreting the results. For example, most of the studies have been carried out in large urban hospitals while at least 70% of the population resides in the rural areas. Deficiencies may occur due to non-uniform screening questionnaire and lack of standardized definitions for disease diagnosis and classification. Most of the studies focused on prevalence rates and there is little information on incidence. Moreover, many studies are retrospective analysis of data and this depends to a large extent on proper maintenance of patient records.^{1,2} But there are several noteworthy studies and a brief description of the salient findings are presented below.

ADMISSION TO HOSPITALS

It has been found that strokes account for 0.9 to

4.5% of total medical admission and 9.2 to 30% of admissions to neurological wards.^{2,3} While the former is comparable to data from other countries, the latter (admission to neurological wards) is significantly less than that seen in many industrialized countries. In the USA, strokes constitute about 50% of all adult neurological admissions.⁴

STROKE SUBTYPES

Most studies have recorded a larger number of ischaemic (embolic/thrombotic) to hemorrhagic strokes (57.3% to 89.7% and 13.6 to 37.9% respectively) as seen in Western countries.³ The Parsi study which was restricted to the Parsi community living in Bombay had an even higher proportion of ischaemic strokes (96.6%). In this study, hemorrhagic strokes accounted for 2.5% and subarachnoid hemorrhagic strokes for 0.8% of all strokes.⁵ But, as clinical criteria were given weightage, small intracerebral hemorrhages may have been misdiagnosed as ischaemic strokes.⁵

MORTALITY

The mortality rate varies with stroke subtypes and also with the incidence of the disease in a population. Gourie-Devi et al found a proportional mortality rate of 17.2%.² Dalal et al in their study of cerebrovascular disease in the young found a significant drop in case fatality rate during two study periods (1963-1968 and 1978-1982) from 32 to 12%.⁶ Dalal has noted

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that even though the relative distribution of cerebrovascular lesions have not changed, there has been a steady decline in stroke mortality.^{6,7} Mortality rates in other countries have ranged from 35.8 per 100,000 per year to 196.7 per 100,000 per year but with a similar declining trend as seen in India.⁸ Mortality in post partum venous sinus thrombosis is high in India ranging from 20-33%.³

INCIDENCE AND PREVALENCE

India has a large population of more than 900 million people with a relatively low life expectancy of about 61 years and a young population: 33.8% are less than 15 years, 59.1% between 15 and 59 years and only 7.1% are 60 years and above (1997 projection). Both the lower life expectancy and the younger population will naturally influence the incidence and prevalence rates of stroke.

The number of well defined population-based studies on incidence of stroke in India are limited. One study conducted at Vellore, South India, showed an annual incidence rate of 13/100,000 population (15.2/100,000 in males and 10.8/100,000 in females).^{9,10,11} This is considerably less than the annual incidence rate of 111 to 180/100,000 population found in many community-based studies from the U.S., Europe and Japan.⁷ This difference is likely to be due to the inclusion of only major strokes like hemiplegia in the Vellore study but may also be due to the younger

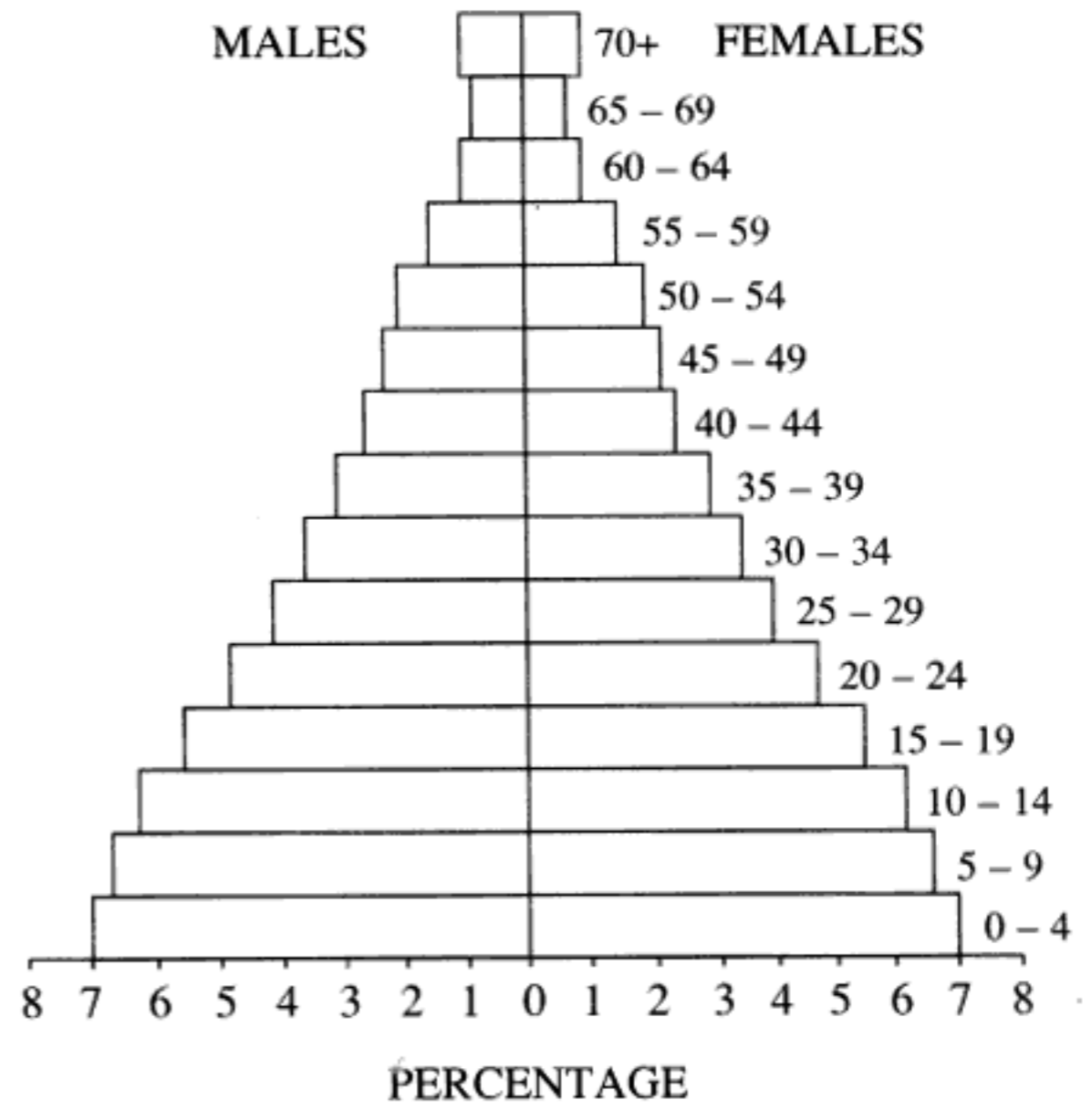


FIG. 2: Percentage distribution by age and sex of the population of India.

population in India. In developed countries a steady decline in the incidence of stroke has been observed, but such data are unavailable in India.⁷

Crude prevalence rates ranged from 44 to 842/100,000 population in the different studies.² In the Vellore study the prevalence rate was 56.9/100,000 population (68.5 in males and 44.8 in females). As mentioned previously, this low prevalence may be due to the fact that emphasis was given to major strokes with residual disability. In a large study in rural Kashmir, the crude prevalence rate was 143/100,000 (69.23% men and 30.77% women) and the age-adjusted rate was 274/100,000 (334/100,000 in men and 175/100,000 in women).¹² In the Parsi study, the point prevalence rate for completed stroke was 842/100,000 and the age-adjusted rate was 424/100,000. This figure is closer to the worldwide prevalence rates for cerebrovascular accidents (CVAs) of 500 to 700/100,000 population. As shown in figure 1, the age and sex distribution of the Parsi community is quite unlike that of the general Indian population (figure 2). Forty-four percent were over the age of 50 compared with 12% of the general Indian population. In this respect, the Parsi community resembles populations in developed countries with a greater proportion of elderly people who would be more prone to develop CVAs.

As observed in other countries, most studies show an increase in prevalence of stroke with advancing age and a male preponderance.^{3,5,11} In

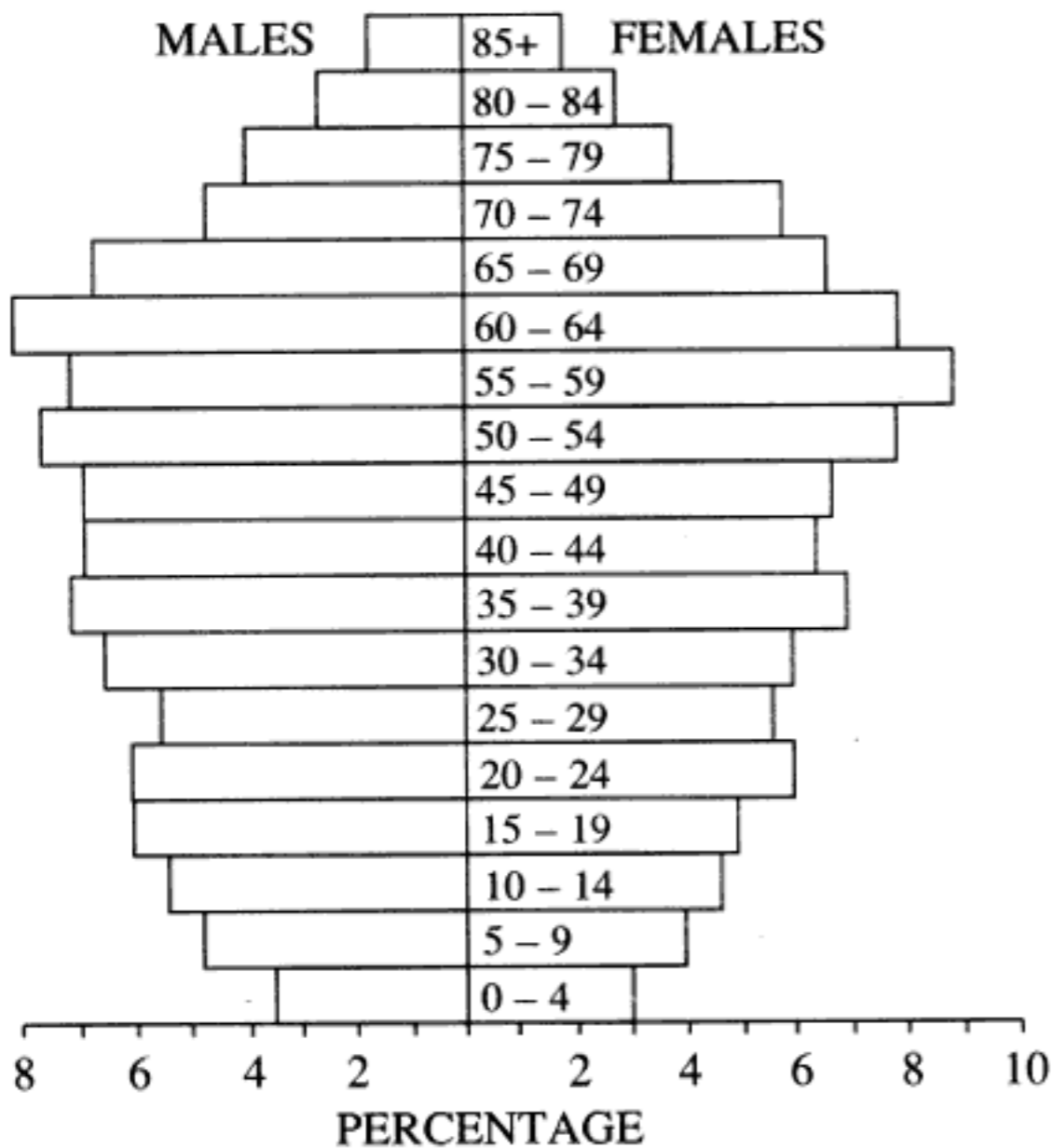


FIG. 1: Age and sex distribution of Parsis surveyed, March 1, 1985, in Bombay, India.

the Parsi study⁵, the prevalence ratio for those 75 years and older was 182 times higher than for those under 35 years of age. On the other hand, one study conducted at Pondicherry, South India, did not show any age specific differences in proportion of CVAs above 40 years of age.¹³ This was attributed to the higher incidence of stroke cases in the young in India.

STROKE IN THE YOUNG

Many studies have shown an increased prevalence of stroke in the young (those less than 40 years) in India^{3,6,11}, ranging from 18.8 to 32.0% of all stroke cases with a male:female ratio of 1.1:1.^{2,3} Corresponding figures in the U.S. (persons less than 30 years) and Japan are 2.8% and 7.6% respectively. This increased incidence has been attributed to: (a) cerebral emboli from cardiac lesions especially rheumatic heart disease; (b) ischaemic strokes related to pregnancy and puerperium; (c) thrombosis of the internal carotid artery; (d) lipid abnormalities; (e) hematological conditions like sickle cell disease, low and high hemoglobin concentration, increased platelet adhesiveness and aggregation and coagulation abnormalities; (f) arteropathies such as sequelae to CNS infections like intracranial tuberculous infection and meningovascular syphilis, Takayasu's disease and Moya Moya disease.^{2,3,7,14,15,16}

RISK FACTORS

Uncontrolled hypertension is the most common etiological factor for both ischaemic and hemorrhagic strokes.^{3,5,7} In the Parsi study¹⁷ it was found that 27.6% (794/2879) of the people were hypertensive (BP more than 140/90 mmHg or isolated systolic hypertension). This finding is similar to the 25.7% frequency for whites in the US NHANES II Study. Of the 794 hypertensives, 39.2% were aware that they had hypertension but only 16.6% (132 of 794) were currently on antihypertensive medication. The study also showed that the odds ratio of prior history of hypertension for stroke was 10.8. The attributable risk of hypertension for stroke could therefore be as high as 70%.

Diabetes mellitus, tobacco consumption (especially smoking), previous history of transient ischaemic attacks, cardiac disease (especially rheumatic heart disease, ischaemic heart disease and mitral valve prolapse), hyperlipidemia and excessive alcohol intake have been considered to be significant risk factors for stroke in different studies.^{3,5,7,17,18} The other

factors mentioned previously in connection with strokes in the young have naturally to be taken into consideration when determining the overall etiopathogenesis of strokes.

CONCLUSION

It can be noted that:

(a) Strokes are a very important cause of morbidity and mortality in India, and, unlike in developed countries, there is no evidence of any recent decline in their incidence.

(b) The prevalence of stroke in India appears to be less than in many other countries but this may be due to the lower life expectancy in India together with a younger general population than in developed countries.

(c) The proportion of young strokes in India is significantly higher than in developed countries. Chronic CNS infections like tuberculosis and meningovascular syphilis, together with a high prevalence of rheumatic heart disease and postpartum cortical venous sinus thrombosis are important contributing factors.

(d) Hypertension is clearly the most important modifiable risk factor for primary and secondary prevention and also the risk factor whose management remains much to be desired. Education of the general population and health providers in this regard is urgently required. Decreasing the incidence of rheumatic heart disease by early treatment of streptococcal pharyngitis and other preventive measures, better control of diabetes, avoidance of smoking and adequate peripartum care are also modifiable risk factors which should help in dramatically decreasing the incidence of this highly disabling and often fatal disease.

REFERENCES

1. Bharucha NE, Raven RH, Bharucha PE, Bharucha E.P. Application of neuroepidemiological research in the organization of neurological services. In: Chopra JS, Sawhney IMS, eds: Progress in neurology. BI Churchill Livingstone, 1995: 167-71.
2. Gourie-Devi M, Gururaj G, Satishchandra P. Neuroepidemiology in developing Countries. A manual for descriptive studies. 2nd edition. Prismic Books Pvt. Ltd. 1997.
3. Jain S., Maheshwari MC. Cerebrovascular diseases: a review of the Indian experience in the last 35 years. Neuroepidemiology 1986; 5:1-16.
4. Fisher CM, Mohr JP, Adams RD: Cerebrovascular diseases. In: Wintrobe, Thorn et al eds: Harrison's principles of internal medicine. McGraw Hill, 1974: 1743-80.
5. Bharucha NE, Bharucha EP, Bharucha AE, Bhise

- AV, Schoenberg BS. Prevalence of stroke in the Parsi community of Bombay. *Stroke* 1988; 19:60-2.
6. Dalal PM, Dalal KP, Vyas AC. Strokes in the young population in West-Central India - Some observations on changing trends in morbidity and mortality. *Neuroepidemiology* 1989; 8:160-4.
 7. Dalal PM. Strokes in young and elderly: risk factors and strategies for stroke prevention. *J Assoc Physicians India* 1997; 45:125-31.
 8. Fratiglioni L, Massey EW, Schoenberg DG, Schoenberg BS. Mortality from cerebrovascular disease. International comparisons and temporal trends. *Neuroepidemiology* 1983; 2:101-16.
 9. Abraham J, Daniel MV: General characteristics of the stroke population. In: *Aspects of cerebrovascular diseases in India*. Diocesan Press, 1972: 4-10.
 10. Sunder Rao PSS. Some aspects of epidemiology of stroke in South India. *Proceedings of the First All-India Workshop Conference on Stroke, Vellore, 1971: 25-31.*
 11. Abraham J, Rao PSS, Inbaraj SG, Shetty G, Jose CJ. An epidemiological study of hemiplegia due to stroke in South India. *Stroke* 1970; 1:477-81.
 12. Razdan S, Kaul RL, Motta A, Kaul S, Bhatt RK. Prevalence and pattern of major neurological disorders in rural Kashmir (India) in 1986. *Neuroepidemiology* 1994; 13:113-9.
 13. Anand KS, Chandra Singh MM. Pattern of neurological disorders above the middle aged population in JIPMER, Pondicherry. *Neurology India* 1993; 41:157-64.
 14. Khadilkar SV: Strokes in adolescents and young adults. *J Assoc Physicians India* 1997; 45:261-2.
 15. Dalal PM, Dalal KP. Cerebrovascular manifestations of infectious disease. In: Toole JF ed: *Handbook of clinical neurology*. Elsevier Science Publishers B.V. 1989, vol 11(55):411-41.
 16. Mukherjee A: Moya-Moya Disease and B-Thalassemia. *J Assoc Physicians India* 1995; 45:710-1.
 17. Bharucha NE, Bharucha AE, Anderson DW, Fernandes A, Muttagi VP, Bharucha EP. Hypertension in the Parsis of Bombay, India. (Unpublished).
 18. Dalal PM, Dalal KP, Rao SV, Parikh BR. Strokes in West-Central India: a prospective case-control study of risk- factors (a problem of developing countries). In: Bartko D, Gerstenbrand F, Turcani P. eds: *Neurology in Europe I*. John Libbey and Co. Ltd. 1989: 16-20.