

## Invited Article

# Neurology: The Scenario in India



SV Khadilkar

## Introduction

The last decade has seen remarkable advances in the diagnostic and therapeutic abilities of the neurologists. Key diagnostic tests like the scans and advanced blood based tests have become available throughout India. As a result, the diagnostic accuracy has increased. The therapeutic armamentarium of the neurologists has significantly widened over the years. More and more diseases are coming under the umbra of modification and cure. In particular, neuro-immunological disorders are being altered favourably. Neurogenetics has also begun to take roots in India and slowly, genetic disorders are being diagnosed locally. As the preventive aspects of the genetic diagnosis will be expedited in the near future, the full scope of genetic diagnosis will become apparent. While these developments are taking place, concerns about the limitations of the neurology workforce in India and its uneven distribution throughout the country remain unchanged and therefore it is important to nurture the physician and neurologist partnership in India to provide quality health care uniformly. This article will focus on the current situation of common neurological diseases and also touch upon some aspects of the neurology health care.

## Neurological Disorders

The spectrum of neurological disorders seen in India is similar to that of other parts of the world with some regional differences.

### Strokes

Stroke is a major health problem in India.<sup>1</sup> The average annual incidence rate of strokes in a recent study from Kolkata was 145 per 100,000 population<sup>2</sup> which compares well with the developed countries. Stroke burden has been rising in India as compared to the developed countries where it has reached plateau or decreased.<sup>3</sup> Overall, ischemic strokes account for about 80% of all strokes in India<sup>4</sup> and intracranial atherosclerosis tends to be commoner in Indian people.<sup>5</sup>

The therapy of ischemic strokes in the initial few hours has changed dramatically. The possibility of thrombolysis exists in every patient who reaches the medical setups within 4.5 hours of having had the event. Delivery of thrombolytic therapy requires a CT scan, and informed neurologist or a physician. The exclusion and inclusion criteria have now been well worked out and do not require further instrumentation. The window for intravenous thrombolysis has been recently widened to 4.5 hours. However, realistically, only a small proportion of stroke patients can avail of this therapy. The reasons are multiple. The awareness of the community about reaching the hospital early in case of a paralytic stroke is still wanting. The initial manifestations of a paralytic stroke are not well recognized by people at large. Transient ischemic attacks are often neglected because symptoms tend to improve. Further interaction of medical individuals with the public is very necessary to improve this awareness. The decision for thrombolysis has to be taken very quickly and hence the setups need to be geared for this therapy, which is currently possible only in a few centres. More advanced therapies like intra-arterial thrombolysis and mechanical ablation of the clot are available only in few

tertiary care centres. Carotid endarterectomy, aneurysm coiling and carotid stenting are getting established slowly in various tertiary centres in India. Different specialties like interventional neuroradiology, cardiology, neurology, neurosurgery and intensive care medicine participate in these interventional procedures. While the participation of multiple specialties is welcome to an extent, such turf battles hinder the development of excellence, as individuals take much longer time to get over their learning curves. Development of specialized stroke units will increase the yield.<sup>6</sup>

### Epilepsy

Recent community-based surveys have shown that epidemiological indices of epilepsy in India are comparable to those from developed countries, with a prevalence rate of ~5 per 1000 and incidence rate of ~50 per 100,000.<sup>7,8</sup> While the pattern of epilepsy seen in India is comparable to that in the other parts of the world, epilepsies related to neuroinfections, trauma and perinatal difficulties seem to be more prevalent in local situation. Due to the shortage of neurologists and physicians in rural India, large numbers of epilepsy patient either do not receive therapy at all or tend to receive polypharmacy in irrational formats.<sup>9</sup> In the context of the whole country, the treatment gap [percentage of individuals who are treated] is still very large being about 70%.<sup>10</sup> The discontinuation rate is also very high.<sup>11</sup>

On the other hand, there are encouraging aspects to the epilepsy care in India. The epilepsy Society of India, with its wide networking, has helped increasing the awareness of epilepsy in the society and thereby, to an extent, has reduced the stigma. A wide variety of antiepileptic drugs are available to us in India and hence the choices are comparable to those on the international scene. As many of these drugs are manufactured in our own country, the costs are favourable to the patients. With the frequent use of CT scan and MRI scan, Lesions are being diagnosed earlier and therefore the outcomes have improved. A number of centres have now developed epilepsy surgery programs and pre-and peri operative evaluation has improved. Lesional epilepsy surgeries are gaining more popularity and are being offered earlier, as the results keep improving.

### Dementias

Our large Indian population has undergone demographic transition. The crude birth rates have dropped as have our crude death rates. As a result, the living population is aging. Not surprisingly therefore, there is a steep rise in the numbers of patients with dementia. Presently, there is under recognition of dementias<sup>12</sup> but in the coming few years, dementias will probably assume larger public health importance. We shall have to prepare ourselves to tackle this issue not only at the medical level but also at the social level. At the present point in time, day care centres or centres where the demented individuals could be looked after are very few and this puts the whole burden of the care on relatives. With family structure getting to be nuclear, with both partners working, it is becoming increasingly difficult for a family unit to look after their demented relatives. Whereas Alzheimer's disease forms the bulk of dementias in the developed world, in India, vascular dementia is prevalent as well. Also, there is a growing feeling that other dementias like frontotemporal dementia in India are presently under recognized. Vitamin B12 deficiency, hypothyroidism and HIV infection of the CNS also account for

a proportion of dementias seen in India. Most of the medicines used in the treatment of dementia are available to us in India but their impact on the process is very limited, hence rehabilitative services need to be developed further.

#### **Parkinson's disease and other movement disorders**

The prevalence of Parkinson's disease in Indians is generally believed to be lower than people of European origin. A recent epidemiological study showed a low prevalence (Crude Prevalence: 45.8 and Age Adjusted Prevalence: 71.6 per 100,000) of Parkinsonism.<sup>13</sup> While idiopathic Parkinson's disease is the most common, a small proportion of genetic forms have been identified in hospital based studies in India.<sup>14-18</sup> Manganese related toxic parkinsonism is also reported from India.<sup>19</sup> With the aging of the Indian population, Parkinson's disease will probably be seen more frequently in neurological clinics in India. The movement disorder clinics have now become an integral part of large neurology centres, classifying and characterizing the Parkinsonian syndromes. Social organizations for Parkinson's disease and movement disorders are also active in helping the patient groups. In addition to a variety of dopaminergic medications, with conventional and novel delivery approaches, surgeries like deep brain stimulation, thalamotomy and pallidotomy are being performed in the specialty centres. Recently, yoga therapy has been studied in association with physical therapy. Other movement disorders like chorea, dystonia, tremor and myoclonus are seen regularly. Rheumatic chorea still remains the most common cause of chorea in India.

#### **Neuroimmunological disorders**

The spectrum of immunological disorders that affect the nervous system is widening. Immune mediated encephalitis, acute disseminated encephalomyelitis, myelopathies, and cranial neuropathies like optic neuritis are some of them. In India, where viral infections abound and vaccinations of various categories are freely used, such encephalopathies are seen again and again. Immune mediated encephalitis is being further characterized. Some of the well-recognized conditions in this category are limbic encephalitis and NMDA antibody encephalitis. These patients present with behavioural and memory changes, seizures and can deteriorate rapidly. As specialized antibody testing is necessary for diagnosis, not freely available in India, the cases tend to go unrecognized. In future, as the antibody tests become more available, these modifiable disorders could be diagnosed and treated early. Multiple sclerosis, a well-recognized neuroimmunological disorder, requires a special mention.

#### **Multiple sclerosis**

Once considered to be uncommon in Asia, multiple sclerosis is being recognized regularly in the last few years. It is difficult to know whether there is an actual increase in the incidence of multiple sclerosis, or with the wide availability of the MRI scans more and more patients are being recognized.<sup>20</sup> A large section of Indian population is known to be deficient in vitamin D3 due to multiple reasons. With the role of vitamin D3 increasing in the pathophysiology of immunological disorders, this aspect needs careful attention. The studies of phenotype of multiple sclerosis in MRI era in India have given the perception that multiple sclerosis in India is like anywhere else in the world. To an extent, optic nerve and spinal cord involvement seems to be more frequent in Indian patients. Neuromyelitis optica is also encountered in India.<sup>21</sup> The recent availability of advanced methodology to test NMO antibodies will certainly help characterize patients in coming years. It is important to recognise NMO separate from multiple sclerosis because the therapeutic options much differ. Disease modifying therapies for multiple sclerosis as well as neuromyelitis optica have become available in

India on regular basis but the costs are prohibitive. In future, as more people opt for the insurance policies, this gap may be filled.

#### **Infections of the CNS**

Regrettably, the incidence and prevalence of neurological infections has not reduced yet. Infections like tuberculosis, cysticercosis, HIV and related opportunistic infections are widely prevalent. Alarming, drug resistant strains of Mycobacterium tuberculosis are being seen more frequently. Since it is difficult to isolate the Mycobacteria from the nervous tissues, the sensitivity and specificity spectra cannot well worked out; an extrapolation from pulmonary tuberculosis is used for therapeutic paradigms. As the prevalence of cysticercosis links to social hygiene, it is not surprising that it has not reduced.<sup>22</sup> Overall the incidence of HIV infected individuals in India is steadily declining but their lifespan is increasing due to the wide use of antiretroviral therapies. As a result of the disease and the drugs, neuropathies, myelopathies, dementias and opportunistic infections pose long term management difficulties.

#### **CNS trauma**

Vehicular accidents account for a large number of casualties and disabilities in India. The increasing number of vehicles, the unsatisfactory conditions of the roads, reluctance of drivers to wear helmets and seat belts and drunken driving still leads to loss of young lives in India.

#### **Neuro rehabilitation**

Neuro rehabilitation has as yet remained in the background of acute care in India. Acute care physicians cannot devote much time to the disabled patients on long term. A large number of neurological diseases lead to severe lasting disabilities and hence it is very important that specialist rehabilitation centres are developed and nurtured. The scope of rehabilitative services has increased with therapies like Botulinum Toxin and will widen further with computer assisted and robotic devices.

## **Neurology Workforce**

At the present point in time, there are approximately 1100 qualified clinical neurologists working in India. Out of these, over 400 work in four large metros of India. Thus, many districts and rural parts of India have to be covered by single neurologists.<sup>23</sup> Nearly 80 students are registered for neurology courses every year throughout the country. A proportion of new graduates leave India for greener pastures and organised life. Thus, the neurology fraternity is growing very slowly and is grossly inadequate to cater to the large population of India. As a result of this disparity, only a small proportion of neurological cases can find their way to the neurologists and it is believed that over 90% of the neurology is handled by internal medicine specialists. Studying the figures mentioned above it is very clear that it is going to take many years before the neurology workforce in clinical sciences is adequate to deal with the health problems faced by the Indian population. Only when the clinical opportunities are saturated will students start venturing into the areas of research and development. Even though the population of India is very different genetically than the studied populations of the developed countries, it will be many decades before our own neuro scientists get down to study the intricacies of neurological disorders in India. The requirement of the present time, quite clearly, is for interaction between the physicians and the neurologists. Continuing medical education programs at regular intervals will prepare the physicians better to tackle neurological disorders. It may even be worthwhile considering development of short courses in neurology for six months to one year duration, which the physicians could undertake to arm themselves with the working knowledge of neurology.

Such combined clinical efforts and simultaneous development of local research institutes in India will go a long way in serving our huge population satisfactorily.

Comparative analyses of neurology in India vis-à-vis the world neurology reveals some interesting facts. The neurology scene in India is probably midway, better than many underdeveloped countries but far away from that of the developed world. To a large extent, neurology in the developing world is grappling with similar problems of lack of social awareness of neurological disorders, scant resources, limited access to investigations and severe restrictions of the workforce. In the developed world, the field of neurology has advanced much further. The research and development departments have been active for many decades and as a result a large body of research information is now available, relevant to these populations. In particular the advances in the field of genetics and immunology have been striking. The list of genes causing human neurologic diseases is ever going and has already become very exhaustive. This cumulative information has interestingly led to new problems. It is now well recognized that one genotype can lead to many phenotypes and vice versa. For example, abnormalities in the gene for spinocerebellar ataxia type 2, which commonly gives rise to an ataxic syndrome with slow eye movements, is also capable of resulting in a parkinsonian syndrome with good eye movements and minimal or no ataxia. This kind of information is resulting in disarray in systems of classification. At one end, the clinically-based classifications are very relevant to the bedside physicians; it is extremely difficult to predict the genotype based on clinical information. On the other hand, genetic classifications which are accurate and have the advantage of predictive and preventive abilities are often clumsy to use in the clinical context. Also, while the gene libraries are getting more exhaustive, the understanding of disease mechanisms has not kept pace. How genes translate into diseases remains unexplored in many cases. In some diseases, the scene is better. For example, in Duchenne muscular dystrophy, the human trials of exon skipping seem to be advancing gradually towards providing clinical improvements in children and in disorders like adrenoleukodystrophy, bone marrow transplantation has helped the sufferers. Similarly studies of the immunological system for human diseases has opened newer vistas of disease mechanisms but has also posed many unanswered questions. In the service sector, the developed world has much organized primary secondary and tertiary care facilities which are able to look after the clinical requirements of the populations. Thus, while India and the other parts of developing world have a long way to go in the research and service sector developments, the world neurology is still exploring new vistas of disease mechanisms and therapeutic options.

## Concluding Remarks

As can be surmised from the above mentioned discussion, the diagnostic and therapeutic abilities of neurological physicians have gradually widened in the present times. The potential therapies of neurological disorders are largely available to Indian physicians. The shortage of neurology workforce, it's uneven distribution, costs of neurology care are some of the hindrances in providing the available facilities to the common Indian patient. In time to come, fruitful interaction between physicians and neurologists is expected to go a long way in improvising the healthcare delivery in India.

## References

- Poungavarin N. Strokes in developing countries. *Lancet* 1998;352:(SIII)19-22.
- Das SK, Banerjee TK, Biswas A et al. A prospective community-based study of stroke in Kolkata, India. *Stroke* 2007;38:906-10.
- Garraway WM, Wishnant JP, Drury I. The continuing decline in the incidence of stroke. *Mayo Clin Proc* 1983;58:520-3.
- Nadamuni S: Researchers identify stroke subtypes in India. *Lancet* 2002;359:500.
- Kaul S, Sunitha P, Suvarna A et al. Subtypes of ischemic strokes in Hyderabad, South India. Data from Hospital based stroke registry. *Neurol India* 2002;50:s1-s14.
- Mishra NK, Khadilkar SV. Stroke Programme for India. *Ann Indian Acad Neurol* 2010; 13: 28-32.
- Sridharan R, Murthy BN. Prevalence and pattern of epilepsy in India. *Epilepsia* 1999;40:631-63.
- Radhakrishnan K, Pandian JD, Santoshkumar T, et al. Prevalence, knowledge, attitude, and practice of epilepsy in Kerala, South India. *Epilepsia* 2000;41:1027-35.
- Radhakrishnan K, Nayak SD, Kumar SP, et al. Profile of antiepileptic pharmacotherapy in a tertiary referral center in south India: a pharmacoepidemiologic and pharmaco-economic study. *Epilepsia* 1999;40:179-85.
- Mani KS, Rangan G, Srinivas HV, Kalyanasundaram S, Narendran S, Reddy AK. The Yelundur study: a community-based approach to epilepsy in rural South India-epidemiological aspects. *Seizure* 1998;7:281-8.
- Das K, Banerjee M, Mondal G, et al Evaluation of socio-economic factors causing discontinuation of epilepsy treatment resulting in seizure recurrence: a study in an urban epilepsy clinic in India. *Seizure* 2007;16:601-607.
- Chandra V, Pandav R, Laxminarayan R, et al Neurological disorders. In: Jamison DT, Breman JG, Measham AR, et al. (eds). Disease control priorities in developing countries, 2nd ed. Washington, DC, The World Bank and Oxford University Press, 2006;627-644.
- Das SK, Biswas A, Roy T, Banerjee TK, Mukherjee CS, Raut DK et al. A random sample survey for prevalence of major neurological disorders in Kolkata. *Indian J Med Res* 2006;124:163-72.
- Nagar S, Juyal RC, Chaudhary S, Behari M, Gupta M, Rao SN et al. Mutations in the alpha-synuclein gene in Parkinson's disease among Indians. *Acta Neurol Scand* 2001;103:120-28.
- Madegowda RH, Kishore A, Anand A. Mutational screening of the parkin gene among South Indians with early onset Parkinson's disease. *J Neurol Neurosurg Psychiatry* 2005;76:1588-90.
- Biswas A, Gupta A, Naiya T, Das G, Neogi R, Datta S et al. Molecular pathogenesis of Parkinson's disease: identification of mutations in the Parkin gene in Indian patients. *Parkinsonism Relat Disord* 2006;12:420-6.
- Punia S, Behari M, Govindappa ST, Swaminath PV, Jayaram S, Goyal V et al. Absence/rarity of commonly reported LRRK2 mutations in Indian Parkinson's disease patients. *Neurosci Lett* 2006;409:83-8.
- Biswas A, Maulik M, Das SK, Ray K, Ray J. Parkin polymorphisms: risk for Parkinson's disease in Indian population. *Clin Genet* 2007;72:484-6.
- Wadia NH. Manganese intoxication in Indian mines. In: Bogaert LV, Kafer JP, Poch G, Lopez L, editors. Tropical Neurology proceedings of the 1st International Symposium Buenos Aires. Buenos Aires, Argentina: 1962:272-7.
- Pandit L. "Insights into the Changing Perspectives of Multiple Sclerosis in India," *Autoimmune Diseases*, 2011, Article ID 937586, 5 pages, 2011. doi:10.4061/2011/937586
- Pandit L. Shetty R, Bhat IG, et al. Spectrum of multiple sclerosis and related demyelinating disorders in India in the background of revised diagnostic criteria. *Ann Ind Acad Neurol* 2007;10:(S2)44-5.
- Rajshekhhar V, Joshi DD, Doanh NQ, et al Taenia solium taeniasis/cysticercosis in Asia: epidemiology, impact and issues. *Acta Trop* 2003;87:53-60
- Khadilkar S V, Wagh S. Practice patterns of neurology in India: Fewer hands, more work. *Neurology India* 2007;55:27-30.