The Spectrum of Movement Disorders in Tertiary Care Centers in India: A Tale of Three Cities

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Abstract

Background: Movement disorders constitute a major burden among the neurological disorders. Overall prevalence and distribution of disorders requiring medical resources remain unknown. Objective: To understand the pattern of movement disorders burden in India. Materials and Methods: Retrospective electronic database review of new patients attending movement disorders clinics in three cities from 2012 to 2018 was done. Results: 14,561 patients (M:F-9,578:4,983) with mean age at assessment of 60.5 ± 14.9 years (Range: 1–98 years) were analyzed. The major broad syndromic diagnosis included: Parkinsonism (n = 9560, 64.9%), Dystonia (n = 2159, 14.8%), Tremors (n = 1129, 7.7%), Ataxia (n = 475, 3.3%), Chorea (n = 402, 2.7%), Peripheral induced movement disorders (n = 400, 2.7%), Gait Disorders (n = 156, 1.1%), Tics (n = 112, 0.8%), Restless Leg Syndrome (n = 89, 0.6%), and Myoclonus (n = 58, 0.4%). The syndromic diagnosis also included the functional disorders (0.6%). Conclusion: This large database from India show the burden of different movement disorders in tertiary clinics. In addition, it also gives insight into disorders requiring more resources for evaluation and management.

Keywords: Dystonia, epidemiology, India, Parkinson disease, spinocerebellar ataxias

INTRODUCTION

The global burden of diseases has been steadily increasing with neurological disorders being the leading cause of disability worldwide.[1-2] Proper epidemiological studies help to understand the prevalence of various disorders in a given geographical territory, thus helping to decide on national health care policies.[3-5] However, these studies are limited by resources and may not address all conditions in various medical subspecialties. These studies may also fail to indicate which subgroup of disorders end up consuming significant health care resources and caregiver burnout.[6] To address these deficiencies, analysis of pattern of patients attending tertiary subspeciality services may give insights to those deficiencies. Among various neurological disorders, the subspecialty of Movement Disorders has been rapidly growing over the years both in relation to understanding of various diseases and therapeutic advances. There have been very few epidemiological studies to understand the burden of Movement Disorders in the general population worldwide.[6,10-15] In this context we have tried to look into various Movement Disorders patients attending to a tertiary movement disorders clinic in three cities of India.

MATERIALS AND METHODS

The study was a retrospective review of database of patients attending Movement disorders clinics in three cities (Bangalore, Kolkata, Mumbai) in India. These clinics were part of private corporate hospitals and/or trust hospital. All patients at these clinics were evaluated and followed up by movement disorders specialists. The study included patients from January 2012 to December 2018. Details regarding their demographic pattern, predominant initial movement disorders symptoms (e.g., Parkinsonism, Dystonia, Ataxia, Tremors, etc.) and their initial clinical diagnosis considered by the movement disorders specialists were taken to aggregate the patients into various syndromic groups. The classifications and diagnosis may not represent the newer phenomenology classifications as these were based upon long-term data. Patients with mixed movement disorders were grouped into the primary/predominant movement disorders (e.g., Huntington’s disease into chorea or dystonia, Wilson’s disease into dystonia or tremors, and Iron accumulation disorders into dystonia, ataxia depending upon there predominant presenting phenomenology).

RESULTS

In study span of 7 years, 14,561 new patients (M:F-9,578:4,983) were seen at these Movement Disorders clinics with mean age...
of 60.5 ± 14.9 years (Range: 1–98 years). These patients were from across Indian subcontinent [Figure 1]. However, the bulk of the patients were from the geographical territory of the these clinics (Bangalore, Karnataka – 28.8%; Kolkata, West Bengal – 32.3% and Mumbai, Maharashtra – 22.4%). About 2% of the patients were international citizens, predominantly from south Asian and Middle East countries. There was a very small representation from African, European and North American continents. The burden of different movement disorder syndromes is given in Table 1, and prominently included Parkinsonism \( \left( n = 9460, 64.9\% \right) \), Dystonia \( \left( n = 2159, 14.8\% \right) \), Tremors \( \left( n = 1129, 7.7\% \right) \). Functional disorders were classified according their presentation and cumulatively constituted 0.6% of the whole cohort.

The Parkinsonian disorders were the largest subgroup \( \left( n = 9460 \right) \) seen at these subspecialty clinics. This group included: Parkinson’s disease \( \left( 65.8\% \right) \), Progressive supranuclear palsy \( \left( 10.2\% \right) \), Multiple system atrophy \( \left( 6.6\% \right) \), Corticobasal syndrome \( \left( 1.5\% \right) \), Dementia with Lewy bodies \( \left( 1.3\% \right) \) Secondary parkinsonism \( \left( 0.6\% \right) \), Drug-induced parkinsonism \( \left( 2.9\% \right) \), Vascular Parkinsonism \( \left( 3.3\% \right) \), Syndromic Parkinsonism \( \left( 0.1\% \right) \). Cumulative Atypical Parkinsonism patients constituted 3225 patients \( \left( 22.1\% \right) \) of all patients attending the movement disorder clinic. This indicates a huge burden of neurological disability requiring a majority of medical and rehabilitation resources.

The second major category was of dystonic disorders \( \left( n = 2159 \right) \) and included: Majority of the patients 1,677 \( \left( 77.6\% \right) \) had focal or segmental dystonia. [Table 1] Spasmodic dysphonia \( \left( 2.1\% \right) \), Multifocal dystonia \( \left( 0.5\% \right) \), Hemidystonia \( \left( 0.9\% \right) \), Generalized dystonia \( \left( 4.6\% \right) \), Paroxysmal dystonia \( \left( 0.6\% \right) \), dystonia with Syndromic diagnosis \( \left( 3.9\% \right) \), Drug-induced dystonia \( \left( 3.9\% \right) \), Secondary dystonia \( \left( 6.1\% \right) \), Pseudodystonia \( \left( 0.4\% \right) \), and Functional dystonia \( \left( 1.3\% \right) \) were the other dystonia patterns seen.

Tremor disorders were the third commonest group \( \left( n = 1129 \right) \) and included: Essential tremor/Essential tremor plus \( \left( 38.3\% \right) \), Dystonic tremors \( \left( 21.4\% \right) \), Primary writing tremors \( \left( 1.0\% \right) \), Secondary tremors \( \left( 3.5\% \right) \), Drug induced tremors \( \left( 5.1\% \right) \), Synergistic tremor disorders \( \left( 14.2\% \right) \), Voice tremors \( \left( 1.6\% \right) \), Orthostatic tremors \( \left( 1.0\% \right) \), Cerebellar outflow tremors \( \left( 2.4\% \right) \), Functional tremors \( \left( 3.9\% \right) \) and mixed/others \( \left( 7.5\% \right) \). Tremors was the predominant presenting features in 156, SCA-12 patients.

Ataxia was a prominent presenting symptoms in 475 Patients and were predominantly considered to have spino-cerebellar ataxias (SCA) \( \left( 49.4\% \right) \) followed by secondary ataxias \( \left( 18.7\% \right) \), early onset cerebellar ataxia \( \left( 11.8\% \right) \) and other mixed causes \( \left( 20.4\% \right) \). In total there were 180 SCA-12 patients and they were predominantly from Kolkata center \( \left( n = 145 \right) \). This skew was attributed to the active support group center at the clinic.

Predominant choreic symptoms were noted in 402 patients. This group consisted of predominant drug induced choreas \( \left( 19.65\% \right) \), Orobuccolingual dyskinesias \( \left( 18.17\% \right) \), secondary choreas \( \left( 16.67\% \right) \), Huntington’s disease \( \left( 16.4\% \right) \), Huntington phenotype \( \left( 12.69\% \right) \), Hemicoreia \( \left( 2.49\% \right) \), Choreoacatohytosis \( \left( 2.23\% \right) \), Rheumatic chorea \( \left( 2.74\% \right) \), Benign hereditary chorea \( \left( 0.25\% \right) \), Paroxymal dyskinesias \( \left( 1\% \right) \), Functional \( \left( 3.73\% \right) \), and other undiagnosed \( \left( 3.98\% \right) \). The interesting observation has been the very low burden of rheumatic choreas \( \left( n = 11 \right) \).

Peripheral movement disorders \( \left( n = 400 \right) \) was another major category. This predominantly consisted of Hemifacial spasms \( \left( n = 390 \right) \). Myoclonic disorders \( \left( n = 58 \right) \) included myoclonus dystonia, post hypoxic myoclonus (Lance Adam’s syndrome), and metabolic syndromes. Isolated/
Table 1: Demographic and syndromic spread of movement disorders subjects

| Center Location | Bangalore | Kolkata | Mumbai | Total |
|-----------------|-----------|---------|--------|-------|
| No. of Subjects | 5357      | 4811    | 4393   | 14561 |
| Male:Female     | 3568:1789 | 3210:1601 | 2804:1589 | 9578:4983 |
| Mean Age (yrs) (Range) | 58.2±16.7 (1-98) | 62.88±13.09 (04-95) | 60.5 | 60.5±14.9 (1-98) |
| Asymptomatic    | 3         | 0       | 0      | 3 (0.02%) |
| Akathisia       | 10        | 3       | 3      | 16 (0.1%) |
| Ataxia\(a\)    | 217       | 157     | 101    | 475 (3.3%) |
| Ballism         | 4         | 4       | 2      | 10 (0.07%) |
| Choreab\(b\)   | 155       | 144     | 103    | 402 (2.7%) |
| Dystonia        | 803       | 790     | 766    | 2159 (14.8%) |
| Blepharospasm   | 52        | 58      | 70     | 180 (8.3%) |
| OMD             | 46        | 45      | 91     | 182 (8.4%) |
| Meige’s syndrome| 52        | 42      | 25     | 115 (5.9%) |
| Cervical        | 162       | 133     | 121    | 416 (19.3%) |
| Focal Limb      | 60        | 26      | 33     | 119 (5.5%) |
| Task Specific   | 130       | 142     | 103    | 375 (17.4%) |
| Generalized     | 52        | 25      | 23     | 100 (4.6%) |
| Segmental       | 43        | 112     | 86     | 241 (11.2%) |
| Others\(c\)     | 206       | 07      | 214    | 427 (19.8%) |
| Gait disorders  | 13        | 78      | 65     | 156 (1.1%) |
| Myoclonus       | 19        | 11      | 28     | 58 (0.4%) |
| Parkinsonism    | 3504      | 3149    | 2807   | 9460 (64.9%) |
| PD              | 2090      | 2218    | 1921   | 6229  |
| MSA             | 355       | 141     | 131    | 627   |
| PSP/CBS         | 382       | 249     | 468    | 1099  |
| Atypical\(d\)   | 333       | 006     | 158    | 497   |
| Others\(e\)     | 344       | 555     | 129    | 1008  |
| RLS\(f\)        | 7         | 24      | 58     | 89 (0.6%) |
| Spasticity\(g\) | 19        | 4       | 21     | 44 (0.3%) |
| Stereotypy      | 2         | 2       | 4      | 8 (0.05%) |
| Tics            | 61        | 21      | 30     | 112 (0.8%) |
| Tremors         | 406       | 483     | 240    | 1129 (7.7%) |
| PIMD\(h\)       | 129       | 115     | 156    | 400 (2.7%) |
| Unclassified    | 5         | 26      | 9      | 40 (0.27%) |

\(a\)This group including Spinocerebellar ataxias, Friedreich’s ataxia, Cerebrotendinous xanthomatosi, drug induced ataxia, alcohol related ataxia, hereditary spastic ataxia, DRPLA, Multiple system atrophy, Ataxia Telseignecetasia, Ataxia with occlulomotor apraxia, episodic ataxia, paraneoplastic ataxia, post infectious ataxia, autoimmune ataxia, post traumatic ataxia, HIV associated ataxia, prion diseases, adrenonemloencephalopathy, early onset autosomal recessive ataxia, B12 deficiency ataxia. \(b\)The group included Post kernicterus chorea, post infectious chorea, Neuroacanthocytosis, Post hypoxic chorea, drug induced and tardive chorea, familial chorea, post intoxication chorea, metabolic choreas, chorea gravidum, NBI, vascular chorea, and psychogenic choreas, in addition to others described in the text. \(c\)This cumulative “others” included patients with Wilson’s Disease, Neurodegeneration with Brain Iron accumulation disorders, post encephalitic sequelae, Spinocerebellar ataxias, vascular etiologies, dystonia gravidum, metabolic causes, Post traumatic sequelae, autoimmune and post/parainfectious disorders. \(d\)Atypical Parkinsonism included parkinsonian syndromes, which did not fit into a proper clinical diagnosis (PD, MSA, PSP, CBS, DLB, FTDP) at evaluation after ruling out secondary causes. \(e\)Includes patients with DBL, FTDP. Drug induced parkinsonism, Lower body parkinsonism, autoimmune parkinsonism, post encephalitic sequelae’s and Functional. \(f\)RLS: Restless Leg Syndrome. \(g\)Includes stiff person syndrome, and other primary movement disorders with Spasticity. \(h\)PIMD: Peripheral Induced Movement Disorders. \(i\)Includes Hemifacial spasms, Painful leg and moving toes, Myokymia. PD: Parkinson’s Disease, MSA: Multiple System Atrophy, PSP: Progressive supranuclear palsy, CBS: Corticobasal syndrome

predominant Restless leg syndrome constituted about 0.6% of the whole cohort. Wilson’s Disease constituted 0.4% (n = 60) of the whole cohort and lesser number was attributed to exclusive Wilson’s disease clinic present in those cities. Asymptomatic cases primarily included Wilson’s disease patients.

**Discussion**

Movement Disorders is one of the rapidly growing subspecialities in neurology because of rapid changes in understanding of the disease and therapeutic scenarios. In general, there has been a lack of epidemiological studies on Movement disorders in the global literatures and more in specific to Indian subcontinent. The current study gives an insight into the pattern of Movement Disorders in Indian subcontinent and also provides a snapshot of the subtype of movement disorders which end up at specialty clinics. The critical highlights were that the study included movement disorder clinics catering to East, West and South of India. The pattern of movement disorders was almost similar across the regions and hence could be used as a pan-Indian representation. Restless Leg syndromes and Tremors are considered to be the most prevalent movement disorders in epidemiological studies, their representation in the..
specialty movement disorders clinics is minimal, which may be because of either minimal affection to person’s quality of life or lack of referral of these common pathologies. Parkinsonian disorders and dystonic syndromes requiring more care formed the bulk of the burden at specialized clinics. Alarming was the high prevalence of atypical Parkinsonism (22.1%) both associated with significant disability and poor quality of life. The commoner disorders may not be having significant quality of life burden or disability and hence more likely are managed at the physician level or Neurologists. It was also noted that the gender burden (M:F-1.9:1) is skewed more towards male (65.8%) with almost twice the number of male patients seen in comparison to female patients in these clinics. SCA-12, which is geographically common in Indian context had predominantly tremors (86%) as a clinical presentations. Another interesting observation was a very low number of rheumatic chorea patients \( (n = 11, 0.07\%) \) in the whole cohort and the trend was same across the clinics noted. This could be related to significant early treatment of respiratory tract infections with antibiotics at the family physician levels. Genetically confirmed Huntington’s disease accounted for about 0.4% of the whole cohort. There was almost equal number of Huntington phenotype disorders. The Functional movement disorders had a relatively low burden and constituted about 0.6% \( (n = 92) \). Among the dystonias, focal limb dystonia (22.9%, including task specific dystonias) was the commonest group, followed by cervical dystonia (19.3%).

There are a few studies looking at the spectrum of Movement Disorders in movement disorder clinics \[ \text{Table 2}. \] Fahn and Jankovic\[^{11}\] mention in their textbook, a similar data that looked into the spectrum of Movement Disorders attending two specialized movement disorders clinics since their inception till 2009 (Data collected from electronic databases of the clinics - personal communication with Prof. Fahn). Both the studies have been on almost similar methodology and address the pattern of patients attending the subspecialty clinics. Compared to the Fahn and Jankovic data, our study had higher relative case burden or Parkinsonism (64.9% vs. 35%), ataxia (3.3% vs. 1.9%) and Hemifacial spasms (2.7% vs. 1.6%) and a lower burden of Dystonia (14.8% vs. 24%), Tremors (7.7% vs. 15.8%), Myoclonus (0.4% vs. 5%), Tic disorders (0.8% vs. 6.4%), and RLS (0.6% vs. 1.9%). \[ \text{Table 2}. \] On the other hand, our data was comparable to that of Okubadejo from Nigeria where the case distribution seemed to be similar to that in India \[ \text{Table 2}. \] This could highlight differences in referral pattern and subsequent burden or patients in movement disorder clinics in different geographical areas.

The current study gives the spectrum of movement disorders seen at a tertiary movement disorders clinics in India. We do know that this is a tip of iceberg when compared to the burden of movement disorders in India. There could also be a skew in the pattern of the patients seen based upon the socio economic conditions, albeit the current study centers have been catering to all the socio economic strata of the society. The other limitation of the study was that the initial diagnosis of these patients was taken for analysis. In a broader perspective the diagnosis may have to be revised in a small subset of patients, these diagnosis could have revised during their subsequent follow-ups. Overall, this study gives an insight of pattern of Movement disorders patients seeking sub-specialists for care and hence being an indicator for the burden on health care and caregiver burnout.

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**Table 2: Comparisons of published publications on movement disorders frequencies in world literature**

| Author | Current study | Fahn and Jankovic\[^{11}\] | Okubadejo NU\[^{12}\] | Tse WI\[^{13}\] | Muthane UB\[^{14}\] | Wenning GK\[^{14}\] | Anand KS\[^{15}\] |
|--------|--------------|------------------------|-----------------|----------------|-----------------|-----------------|-----------------|
| Year   | 2019         | 2009                   | 2012            | 2008           | 2006            | 2005            | 1993            |
| Country| India        | USA                    | Nigeria         | USA            | India           | Italy           | India           |
| Duration| 7 years     | ??\[^{3}\]         | 1 yr             | 5 months       | 2005-06         | Cross section   | 1 yr            |
| Study Setting | MDC\[^{4}\] | MDC\[^{4}\]     | Elderly Home    | Elderly homes  | Population   | Hospital       |                 |
| Assessed by | MDS\[^{5}\] | MDS\[^{6}\]    | Neurologists    | MDS\[^{8}\]   | Neurologist    | Neurologist    |                 |
| No. of subjects | 14561      | 42826                  | 184             | 83/397        | 1/3\[^{4}\] of 493 | 214/706         | 225/234,021 |
| M:F    | 9578:4983   | -                      | -               | 81:316        | -               | -               | -               |
| Mean age (yrs) | 60.5±14.9   | (1-98)                | -               | 85.9+/−8.5    | -              | -               | -               |
| Parkinsonism | 9460 (64.9%) | 15,107 (35.3%)         | 101 (54.9%)     | 28            | ~24%           | 61*             | ~16.9% (~195) |
| Dystonia | 2159 (14.8%) | 10394 (24.3%)          | 27 (14.7%)      | 05            | -              | 16              |                 |
| Tremors | 1129 (7.7%)  | 6754 (15.8%)           | 44 (23.9%)      | 47            | ~4.5%          | 114*            |                 |
| Ataxia  | 475 (3.3%)   | 764 (1.9%)             | 2.7%            | -             | -              | -               | ~3.7% (~30)    |
| Chorea  | 402 (2.7%)   | 1225 (2.9%)            | 1.6%            | -             | -              | 1               |                 |
| Myoclonus | 58 (0.4%)   | 1713 (5%)              | 1.6%            | 02            | -              | -               |                 |
| HFS\[^{*}\] | 390 (2.7%)  | 693 (1.6%)             | -               | -             | -              | -               | -               |
| Tics    | 112 (0.7%)   | 2753 (6.4%)            | -               | -             | -              | -               | 3               |
| RLS\[^{*}\] | 89 (0.6%)    | 807 (1.9%)             | -               | -             | -              | -               | 74              |

\[^{1}\]Movement Disorders Clinic, \[^{2}\]MDS- Movement Disorders Specialist, \[^{3}\]Including peripheral myoclonus- Hemifacial spasms, \[^{4}\]RLS - Restless Leg Syndrome, \[^{5}\]The duration of study is not available, but has been told as since the electronic data entry was initiated up to April 2009 (725-30 yrs)
Conflicts of interest
There are no conflicts of interest.

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