Original Article

Neurological Disorders in Children and Adolescents

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ABSTRACT

Objective. To ascertain the prevalence of active epilepsy, febrile seizures (FS), cerebral palsy (CP) and tic disorders (TD) in aged 19 years or less.

Methods. This was a cross-sectional observational study conducted as a two-stage door-to-door survey of a stratified randomly selected population in 2003-04. Trained field workers screened the population followed by case examination by the field neurologist.

Results. A total of 16979 (male 8898, female 8081) subjects aged ≤ 19 years were surveyed. The prevalence rates per 100,000 population of active epilepsy, FS, CP and TD with 95% confidence intervals are 700.87 (580.60 – 838.68), 1113.14 (960.07 – 1283.59), 282.70 (CI 208.43 – 374.82) and 35.34 (12.96 – 76.92) respectively. Active epilepsy prevalence shows a rising trend and that of other disorders a declining trend with age. Of the epileptics who had brain CT scans, 23.4% showed single or multiple lesions suggestive of neurocysticercosis. Regarding treatment, 23.5% of the epileptics never received any antiepileptic drugs. Among those with history of FS, 9.5% developed epilepsy later on. The prevalence of FS among slum dwellers is lower than in the non-slum population. Among CP cases, 39.6% gave history of birth anoxia, 16.7% kernicterus and 31.3% epilepsy. Prevalence of CP is significantly associated with lower education status.

Conclusion. The prevalence of CP and TD is lower than reported from western countries. CP prevalence is also comparatively lower than in many community studies from India. Compared to western nations, higher proportion of FS cases develops epilepsy. A third of the CP cases have seizures which is higher than in many Indian studies. Birth anoxia is a common cause of CP and educational underachievement is frequent. **[Indian J Pediatr 2009; 76(2) : 139-146]** *E-mail: das_sk70@hotmail. com*

Key words : *Active epilepsy; Febrile seizure; Cerebral palsy; Tic disorder; Prevalence*

With a population of over 1 billion, India is the second most populous country in the world. According to the 2001 census report, 45% of the Indian population is of age below 20 years. This figure is higher than that of the world standard population where 34.62% are below 20 years of age.[1] Unfortunately, despite this fact, there is a dearth of epidemiological data on neurological illnesses among children and adolescents in this country.

Various community-based studies from India have documented an overall prevalence of major neurological disorders in the recent past. The average crude prevalence for active epilepsy has been estimated to be 533 per 100,000 and that of febrile seizures between 328 and 571 per 100,000.[2,3] Community studies from eastern, northern and southern parts of India have documented overall crude prevalence of cerebral palsy to range between 21 to 173 per 100,000 and that of tics disorders to be around 2 per 100,000.[4-6] However, no comprehensive analysis of neurological disorders commonly prevalent among children and adolescents has been carried out in India, although some of these disorders may produce significant morbidity and mortality and require rehabilitation. Some of these disorders, such as epilepsy, may impose a huge economic burden. The annual economic burden of antiepileptic drug treatments as monotherapy is estimated to be 4-30% of GNP per capita whereas corresponding figure from a western country is 0.2-1.5%.[7,8] On a global perspective, neurological and psychiatric disorders combined account for a remarkable 28% of all years of life lived with a disability.

In the city of Kolkata, the eastern metropolis of India,

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we had conducted a population-based random sample survey on major neurological disorders among 52377 persons of all age groups, the results of which have been published.[9] As a part of this larger survey, we surveyed the major neurological problems prevalent among children and adolescents and planned to determine the prevalence rates of active epilepsy, febrile seizure (FS), cerebral palsy (CP) and tic disorders (TD).

MATERIALS AND METHODS

This was a population-based, cross-sectional, observational study. Our survey area was the part of the metropolis that falls under the jurisdiction of Kolkata Municipal Corporation (henceforth to be called 'the city') with a population of 4.58 million. The National Sample Survey Organization (NSSO) of the Government of India divides the city into 5200 blocks. Complete data for each block as regards its geographical location, types of housing and boundaries are available from the NSSO office. For the purpose of the present study, the city was divided into six strata based on geographical location and type of dwellings. Fig. 1 provides a summary of the stratum planning. Stratum I consisted of predominantly slum areas. The non-slum areas were divided into south, north and central according to geographical location. The southern and northern parts of the city were further subdivided into those with or without consolidated housing complex and for the central part, only area with consolidated housing complex was considered. Thus strata II to VI covered non-slum areas. From each stratum, proportionate number of blocks were selected using random number lists. From each block, 50% of the households were surveyed by visiting alternate houses. Thus a total of 166 blocks comprising 52377 inhabitants were surveyed.

The survey team comprised of four field workers headed by a neurologist. The study was conducted during the one-year period from March 1, 2003 through February 28, 2004. In the first stage, field workers performed door-to-door survey using a 'General Screening Questionnaire' divided into two parts – Part I, socio-demographic details and Part II, the screening questionnaire. The screening questionnaire (Part-II) also consisted of two portions – **Proforma- A** for all subjects above 7 years and Proforma- B for children aged 7 years or below. The above questionnaires are modifications of WHO questionnaires and have been followed at the National Institute of Mental Health and Neurosciences, Bangalore for epidemiological surveys of epilepsy, stroke, movement disorders, neuromuscular disorders, gait disorders and cognitive dysfunction. The B portion of the screening questionnaire, intended for children below 7 years, was tailored for detecting cases of epilepsy, febrile seizures, cerebral palsy, neuromuscular disorders, speech disorders and abnormal intelligence. We incorporated an additional disease-specific **Part III** that comprised a semi-structured questionnaire for recording details of the detected cases. The questionnaires were translated into Bengali and test-retest was done to check validity of translation.

Subjects below the age of 20 years who were screened positive for active epilepsy, FS (or with past history of FS), CP and TD were selected for the present study. In the second stage, the screening information was verified by the neurologist; the cases were confirmed and categorized

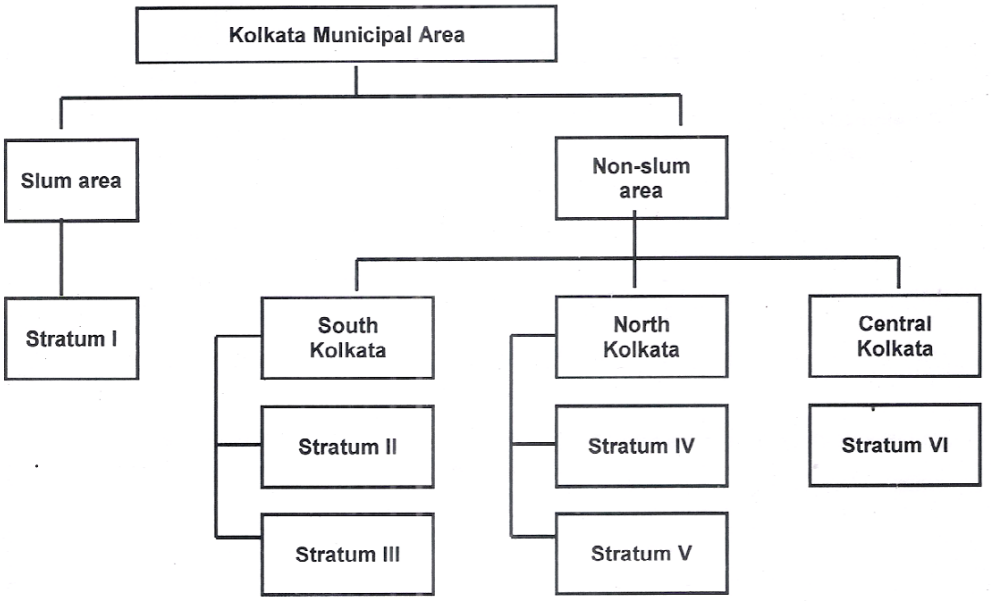

Fig. 1. Stratum planning for the survey.
It may be noted that the southern and northern parts of the city were further subdivided into those with or without consolidated housing complex and for the central part, only area with consolidated housing complex was considered.

as per the operational definitions given below. The neurologist further clinically examined the cases at their homes and recorded the disease-specific details. The clinical history was obtained from the immediate guardian or head of the family, or, if not available, from the next most informative adult person. Investigational reports available with the cases were reviewed. The cases with diagnostic dilemma (< 1% of total) were further examined by the senior neurologists (SKD, TKB) in the field. Few were even brought to the institute for a detailed examination.

Operational definitions

Active Epilepsy was defined as at least one seizure episode in the previous 5 years, regardless of antiepileptic drug treatment.[10] **Febrile Seizure** was defined as seizure in children between the age of 6 months and 5 years, accompanied by fever, but without evidence of underlying central nervous system infection.[11] It was classified into (a) simple, and (b) complex. **Simple FS** is generalized convulsive seizure without focal features, lasting < 15 minutes and not recurring within 24 hours. **Complex FS** has at least one of the following features: prolonged duration (≥ 15 minutes), focal features or seizure recurrence within 24-hour period or within the same febrile illness.[12] Cerebral palsy (CP) was defined as non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of development.[13] Tic disorder (TD) was defined as abrupt, transient, stereotypical coordinated movement of a body part or parts or vocalization that is voluntarily suppressible for a short duration.[14]

Quality Control: The field workers were non-medical personnel intensively trained at Bangur Institute of Neuroscience and Psychiatry, in the general neurology out-patient department as well as the various specialty clinics, before commencing survey work. A pilot survey was carried out at the outset. It screened 3041 subjects (of all ages) for neurological illness to determine the sensitivity and specificity of the screening questionnaire. These subjects were evaluated by both, the field workers and the study neurologist. Overall, the screening instrument was found to have 84% sensitivity and 99.5% specificity. The corresponding sensitivity and specificity figures for epilepsy was 90.9% and 100%, for CP 83.3% and 100% and for tic disorder 73.9% and 100%. During the regular survey, the neurologist randomly reviewed 10% of screened negative subjects, to detect false negative cases.

Statistical analysis: Results have been summarized by simple descriptive statistics. Proportions have been depicted with their 95% confidence intervals (CI) where deemed relevant. The 95% CI for the prevalence rates have been calculated assuming a Poisson distribution for the events. Odds ratios have also been expressed with their 95% CI. Categorical data have been compared between groups by chi-square test with Yates' continuity correction as appropriate. Where categories are in a logical hierarchy (e.g. age groups) the Chi-square for trend analysis has been used. A two-sided p value < 0.05 has been considered statistically significant.

RESULTS

A total of 16979 (male 8898, female 8081) subjects aged ≤ 19 years were studied. They constituted 32.4% of the total (of all age groups) surveyed population. The overall and age-specific prevalence of the various neurological disorders of interest have been presented in Table 1. Statistical analysis of the prevalence rates in relation to gender, slum versus non-slum residence, income and education status have been summarized in Tables 2 to 5 respectively.

Active epilepsy: One hundred and nineteen (male 72, female 47) cases of active epilepsy were found among children and adolescents giving a prevalence rate of 700.87 (95%CI 580.60 – 838.68) per 100,000. The sex-specific prevalence was 809.17 (633.18 – 1018.99) per 100,000 among males and 581.61 (427.30 – 773.42) per 100,000 among females. The overall prevalence of active epilepsy shows a significant rising trend with increase of age (Table 2) and a similar trend is maintained among both genders (data not shown). Thus age specific prevalence does not show any gender bias. The prevalence rates of active epilepsy do not show any significant difference between male and female, slum and non-slum population, and also with respect to education status. However, a significant difference has been noted among income groups, with higher prevalence in the middle income range (Table 5).

There were 89 (74.8%) cases of pure generalized tonic-clonic convulsions, of which 7 had both febrile and afebrile convulsions. Simple partial seizure with secondary generalization was present in 11 (9.2%), complex partial in 3 (2.5%), absence in 3 (2.5%) and myoclonic in 8 (6.7%) cases. Twenty-one (17.6%) had family history of epilepsy. Fifteen (12.6%) had past history of FS. Fifteen (12.6%) also had history of birth anoxia. Fifty two (43.7%) had EEG and 64 (53.8%) had cerebral CT scan done and the records were available for perusal. Out of 52 cases with EEG available, 11 (21.2%) had typical epileptiform (spike and wave) discharges, 25 (48.1%) normal tracing and the rest non-specific abnormalities. Of the 64 subjects who had cerebral CT available, 33 (51.6%) had normal scan and 15 (23.4%) had single or multiple lesions suggestive of neurocysticercosis. Twenty eight (23.5%) of the total 119 cases of active epilepsy never received any antiepileptic drug (AED), although three mentioned that they were under homeopathic treatment.

Table 1. Prevalence of Various Neurological Disorders in the Study Population

Age group	N	Active epilepsy			Febrile seizures			Cerebral palsy			Tics	
		Cases	PR	OR (95% CI)	Cases	PR	OR (95% CI)	Cases	PR	OR (95% CI)	Cases	PR
0 – 4 y	3157	10	316.76	–	47	1488.76	–	14	443.46	–	0	0.00
				2.23			0.80			0.76		
5 – 9 y	3844	27	702.39	(1.08 – 4.61)	46	1196.67	(0.53 – 1.21)	13	338.19	(0.36 – 1.62)	0	0.00
				2.48			0.66			0.56		
10 – 14 y	4855	38	782.70	(1.24 – 4.99)	48	988.67	(0.44 – 0.99)	12	247.17	(0.26 – 1.20)	5	102.99
				2.73			0.63			0.40		
15 – 19 y	5123	44	858.87	(1.37 – 5.43)	48	936.95	(0.42 – 0.94)	9	175.68	(0.17 – 0.92)	1	19.52
Total	**16979**	**119**	**700.87**	**–**	**189**	**1113.14**	**–**	**48**	**282.70**	**–**	**6**	**35.34**
95% CI for PR			**580.60 – 838.68**			**960.07 – 1283.59**			**208.43 – 374.82**		**12.96 – 76.92**	

- PR = Prevalence rate per 100,000 population; OR = Odds ratio; CI = Confidence Interval; y = years
- The Odds ratio (95% Confidence Interval) is with respect to the 0-4 year age band
- Chi-square for trend analysis: Active epilepsy p = 0.006 [χ^2 = 7.452, d.f. = 1]; Febrile seizures p = 0.016 [χ^2 = 5.842, d.f. = 1], Cerebral palsy p = 0.018 [χ^2 = 5.634, d.f. = 1]

Table 2. Prevalence Rate of Various Neurological Disorders in Male Versus Female Population

Gender	N	Active epilepsy		Febrile seizures		Cerebral palsy		Tics	
		Cases	PR	Cases	PR	Cases	PR	Cases	PR
Male	8898	72	809.17	123	1382.33	26	292.20	5	56.19
Female	8081	47	581.61	66	816.73	22	272.24	1	12.37
Chi-square p value		NS		< 0.001		NS		NS	
Male *vs.* female OR (95% CI)		1.39 (0.96 – 2.02)		1.70 (1.26 – 2.30)		1.07 (0.61 – 1.90)		4.54 (0.53 – 38.19)	

• PR = Prevalence rate per 100,000 population; OR = Odds ratio; CI = Confidence Interval

Table 3. Prevalence of Various Neurological Disorders in Slum Versus non-slum Population

Residence	N	Active epilepsy		Febrile seizures		Cerebral palsy		Tics	
		Cases	PR	Cases	PR	Cases	PR	Cases	PR
Slum	4020	24	597.01	13	323.38	10	248.76	0	0.00
Non-slum	12959	95	733.08	176	1358.13	38	293.23	6	46.30
Chi-square p value		NS		< 0.001		NS		NS	
Slum *vs.* non-slum OR (95% CI)		0.81 (0.52 – 1.27)		0.24 (0.13 – 0.41)		0.85 (0.42 – 1.70)		0.25 (0.01 – 4.40)	

•PR = Prevalence rate per 100,000 population; OR = Odds ratio; CI = Confidence Interval

Table 4. Prevalence of Various Neurological Disorders in the Study Population Categorized by Monthly Family Income Groups

Average monthly family income	n	Active epilepsy			Febrile seizures			Cerebral palsy			Tics		
		Cases	PR	OR (95% CI)	Cases	PR	OR (95% CI)	Cases	PR	OR (95% CI)	Cases	PR	OR (95% CI)
Up to Rs. 2999	7673	15	195.49	–	71	925.32	–	23	299.75	–	3	39.10	–
				7.26			1.43			0.89			0.85
Rs. 3000 – 4999	5987	84	1403.04	(4.19 – 12.60)	79	1319.53	(1.04 – 1.98)	16	267.25	(0.47 – 1.69)	2	33.41	(0.14 – 5.12)
				3.10			1.27			0.90			0.77
Rs. 5000 or above	3319	20	602.59	(1.58 – 6.05)	39	1175.05	(0.86 – 1.89)	9	271.17	(0.42 – 1.96)	1	30.13	(0.08 – 7.41)
Chi-square for trend			18.352			2.494				0.103		0.061	
Chi-square for trend p value			< 0.001			0.114				0.749		0.805	

•PR = Prevalence rate per 100,000 population; OR = Odds ratio; CI = Confidence Interval; Rs. = Indian rupees
•The Odds ratio (95% Confidence Interval) is with respect to the lowest income group

Table 5. Prevalence of Various Neurological Disorders in the Study Population Categorized by Educational Status

Average monthly family income	n	Active epilepsy			Febrile seizures			Cerebral palsy			Tics		
		Cases	PR	OR (95% CI)	Cases	PR	OR (95% CI)	Cases	PR	OR (95% CI)	Cases	PR	OR (95% CI)
Illiterate or no formal education	4445	36	809.90	– 0.65	63	1417.32	– 0.79	42	944.88	– 0.06	1	22.50	– 1.69
Primary school	5253	28	533.03	(0.40– 1.08) 0.96	59	1132.17	(0.55 – 1.13) 0.58	3	57.11	(0.02 – 0.19) 0.03	2	38.07	(0.15 – 18.7) 2.08
Secondary school	6408	50	780.27	(0.63 – 1.48) 0.71	53	827.09	(0.40 – 0.84) 1.13	2	31.21	(0.01 – 0.14) 0.12	3	46.82	(0.22 – 20.0) 1.70
Higher than above	873	5	572.74	(0.28 – 1.80)	14	1603.67	(0.63 – 2.03)	1	114.55	(0.02 – 0.88)	0	0	(0.07 – 41.7)
Chi-square for trend			0.042			3.639			61.609			0.099	
Chi-square for trend p value			0.837			0.056			< 0.001			0.753	

•PR = Prevalence rate per 100,000 population; OR = Odds ratio; CI = Confidence Interval
•The Odds ratio (95% Confidence Interval) is with respect to the lowest education level

Of the rest 91 patients who received AED, 74 were on monotherapy, 1 patient could not recall the medicine he had and the rest had more than one AED. Thirty two epileptic patients received sodium valproate, 18 phenobarbital, 18 phenytoin, 18 carbamazepine and 8 clobazam, either as monotherapy or in combination. Sixty three cases (52.9%) had their seizures well controlled with AED.

Febrile seizure: There were 189 (male 123, female 66) cases with history of FS, yielding a crude prevalence rate of 1113.14 per 100,000 (95% CI 960.07 – 1283.59) study population [male 1382.33, 95% CI 1148.80 – 1649.36; female 816.73, 95% CI 631.60 – 1039.10]. An overall prevalence shows a significant declining trend (Table 1), the pattern being seen separately in males but not in females (sex-specific data not shown). Febrile seizure is common among males than among females (Odds ratio 1.70; 95% CI 1.26 – 2.30) (Table 2). The prevalence is significantly higher in the non-slum population (Table 3) but shows no relation with income (Table 4) and education status (Table 5). Among those with history of FS, 11 (8.9%) of 123 males and 7 (10.6%) of 66 females developed epilepsy later. Complex FS was present in 29 (15.3%) cases of which twenty were males and nine female. Twenty six (13.8%) cases received treatment with AED – 10 sodium valproate, 8 phenobarbital, 5 carbamazepine and 3 phenytoin. The rest did not have AED.

Among those children who were aged 5 years or less, 53 had FS, of whom 36 (67.9%) were males. Six (3 male) were cases of complex FS and the rest 47 (33 male) had simple FS. Fifteen had single attack of simple FS. Family history of FS was available in 13 (24.5%) cases. None had any definite history of trauma, sepsis or anoxia at or soon after birth, but history of premature birth was available in 4 subjects. Only 3 children received treatment with sodium valproate; the rest did not take any AED.

Cerebral palsy: There were 48 cases (male 26, female 22) giving a crude prevalence rate of 282.70 per 100,000 (95% CI 208.43 – 374.82) study population [male 292.20, 95% CI 190.83 – 428.19; female 272.24, 95% CI 170.65 – 412.20]. The prevalence shows a significant declining trend with age (Table 1) and similar trend is observed in both genders when analyzed independently (data not shown). The prevalence has no difference with respect to gender (Table 2), slum *versus* non-slum residence (Table 3) and income status (Table 4) but shows a declining trend with increasing educational attainment (Table 5). The distribution of the CP subtypes is as follows – 35 (72.9%) (male 21) had spastic diplegia, 2 (4.2%; male 2) spastic quadriplegia, 6 (12.5%; male 3) hemiplegia, 3 (6.3%; male 1) dystonic and 2 hypotonic (4.2%; male 2) cerebral palsy. Fifteen (31.3%) had associated seizure disorder, of whom 10 were male and 5 female. In 9 cases (18.8%) the mother had delivery at home; the remaining mothers' confinements were in hospital. In 19 (39.6%) cases there was a definite history of birth anoxia and in 8 (16.7%) history of profound neonatal jaundice was present.

Tic disorders: Very few cases were encountered. The prevalence rate (Table 1) is estimated at 35.34 (95% CI 12.96 – 76.92) per 100,000 study population [male 56.19, 95% CI 18.21 – 131.15; female 12.37, 95% CI 0.37 – 68.93]. The prevalence does not have any significant relationship with age, gender, slum *versus* non-slum residence, income and education status (Tables 2 to 5). Tics were most prevalent in the 10-14 year age band where 0.1% of the population was affected. All 6 cases encountered (males 5) were motor tics and no subject in the sample had vocal tics. Only 1 case gave a family history of TD.

DISCUSSION

Since children and adolescents represent the future productive population of a country, we intended that this

comprehensive survey would generate prevalence and allied data that might help health planners to allocate resources suitably. Two important features of the present study, we feel, are the stratified random sampling design which is an ideal method for sampling in such a situation and the house-to-house survey recognized as the gold standard for case ascertainment. Fig. 2. shows, the age distribution of our sample almost perfectly matched that of the entire city, making it quite representative of the heterogeneous city population. The data thus generated is truly representative of neurological disorders in the entire city population.

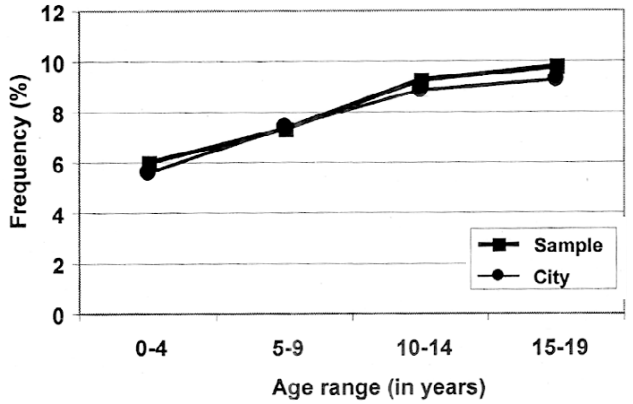

Fig. 2. Showing comparison of age-distribution of sample and entire city population.

Active epilepsy

According to an Indian meta-analysis, the prevalence rate of epilepsy is 533 (urban 511; rural 547) per 100,000 population[2] in India. In the present study, because we concentrated on the young population where epilepsy is generally common, the prevalence rate was higher. In the rural population survey conducted by Radhakrishnan *et al*[15] among over 200,000 people, an overall prevalence rate of 490 per 100,000 was obtained, but the age-specific prevalence of epilepsy was the highest in the 10-19 age group at 650 per 100,000 which is lower than the present study (821/100,000 between 10-19 year's age band). In our observation male epileptics outnumbered females. Similar finding has been noted earlier.[13] One reason for the apparent lower prevalence among females could be the tendency to conceal epilepsy among women of premarital age.[16] In the present study, nearly one-quarter of the epileptics had imaging which suggested neurocysticercosis. This concurs with a previous Indian study that showed that nearly one-third of active epilepsy was due to neurocysticercosis.[17] Treatment gap in epilepsy indicates the proportion of epileptics who never received any anticonvulsant medication. It is a genuine problem in countries like India and the extent varies from 38% in well-developed states like Kerala to 75% in rural Kashmir.[2] Ignorance, prejudice and misconceptions driven by illiteracy are the root causes for treatment gap in epilepsy. In the present study, the treatment gap was 23.5%. This comparatively lower figure is probably explained by the overall literacy rate of 81% in the urban population and by the fact that the present study subjects were young and therefore likely to receive more attention with respect to health. Generalized convulsion was found to be overwhelmingly more common than partial seizure in the present survey. Earlier community-based study also noted similar high prevalence of generalized seizures.[15] However, this could be an overestimation since generalized tonic-clonic seizures are more dramatic and therefore more likely to be noticed.[18] EEG and cerebral CT scans were available in only about half the cases, because many could not afford the tests due to financial constraints.

Febrile seizures

The prevalence of FS in those aged 5 years or less was 1.36% while 1.11% of those aged 19 years or less gave history of FS. This discrepancy could be partly due to recall bias for older age group subjects since their guardians may not recall properly whether FS did occur during their childhood. The higher male dominance is a universal phenomenon and has been reported earlier irrespective of race.[19] From retrospective analysis, it was noted that 9.5% of cases with FS developed epilepsy later. In a UK study, the prevalence rate of FS in the community was 2.4% and of the FS cases, 5.5% later developed epilepsy.[20] A consensus report has mentioned that patients with simple FS should not be prescribed a prophylactic anticonvulsant for an extended period.[21] This guideline seems to be followed among the present studied population under investigation, since 86.2% of the children and adolescents did not receive treatment with AED. However, a few of the FS cases in the community were treated with carbamazepine or with phenytoin, the anticonvulsants known to worsen FS frequently. The reason behind higher prevalence of FS among non-slum-dwellers is not known, since it is expected that slum-dwelling children are predisposed to intercurrent infections more frequently and should have higher prevalence. Perhaps parental oversight or recall problem among socioeconomically disadvantaged people living in slums led to some under-reporting of FS from these localities. In the literature too, there is no reference of social class or status influencing the prevalence of febrile seizures.[22]

Cerebral palsy

CP was found to be slightly more prevalent among males than females, although the difference was not statistically significant. The prevalence of CP in the present study is much lower than that of other community studies from India[4-6] and the global figure of 1.2 to 2.5 per 1000 children of early school age that has been described in the standard literature. Significant declining trend of CP prevalence with increasing age may reflect the higher mortality with

age in this disorder. It is documented that CP children have higher mortality, due to infections and status epilepticus, by about 12 times compared to children of comparable age group in the general population. This rate may escalate to 70 times if the affected children have severe disability with comorbid disorders such as mental subnormality.[23]

Hospital-based data from India documents spastic type of CP in more than 90% of cases.[24,25] The commonest variety in these studies is quadriplegic in 34.9 – 61% of cases. In the present study, proportion of spasticity is almost the same, but the commonest type encountered is spastic diplegia. This might indicate prematurity as an important factor for CP in the present study. Thirty one percent of the CP cases had associated seizure disorder. This figure is four-fold higher than a hospital-based report where 8.8% had seizures, but similar to a western report where seizures have been reported among 23 – 52% cases depending on the severity.[24,26] In western industrialized nations, prenatal risk factors are most important, and birth asphyxia is the cause for CP in less than 10% of cases. In India, the cause of CP is not easy to establish since birth and antenatal records are often unavailable and one has to depend upon the history given by the parents.[24,25] It appears from the present study that preventable factors like birth anoxia and kernicterus are still important causes of CP in India and this correlates well with data from previous case-control and cohort studies.[24,26] Significant association of CP with illiteracy and lack of formal education may indicate educational under-achievement due to physical disability or co-morbid conditions such as seizures and mental subnormality, which are important components in majority of cases.[25] It may also reflect social factors – lack of schools that cater to children with special needs and reluctance of parents to send their wards to regular schools that usually discourage admission of CP cases. These aspects need to be probed in future studies.

Tic disorders

In TD, no relation of prevalence rate with age, gender, income level, educational level and social status was noted, which can possibly be attributed to the very low prevalence detected. Although tics have an overall low prevalence, it has been reported earlier that boys outnumber girls substantially in tic disorders and that 5-20% of schoolchildren suffer from motor or vocal tics during their lifetime.[14] The present study shows that TD is mostly in the 10-14 year age group and the prevalence (0.1%) even in this group is far fewer than in previous reports. No vocal tics were documented. We depended upon parental reporting and it is quite possible that many of the mild to moderate cases of TD are overlooked by family members due to lack of awareness and only those cases where the disorder affected normal activities were captured in the present study.

This study has some limitations. On most occasions, we have interviewed the head of the family or the mother/grandmother. It is possible that if we could examine all the children and adolescents individually, we could have detected more cases, particularly of early CP and TD, which escaped the attention of family members due to mild nature of the problem or lack of complaints by the sufferer. Because of resource constraint, we could not include other major neurological problems of childhood and adolescence such as mental retardation and behavior disorders. Undertaking investigations was not part of the protocol, and therefore the evaluation of the etiology of the cases was seriously hampered by lack of investigation reports such as neuroimaging and EEG in about 70% of cases.

CONCLUSION

Notwithstanding the limitations, the present study provides valuable data on common neurological diseases among children and adolescents in the city of Kolkata. This study has shown slightly higher prevalence of active epilepsy, but lower prevalence of febrile seizures and cerebral palsy as compared to other Indian studies. The prevalence of active epilepsy shows rising trend and that of febrile seizures and cerebral palsy show declining trend with age. Significant higher prevalence of febrile seizures among non-slum dwellers could not be explained. Significant association of lower educational status among cerebral palsy cases indicates hindrance to academic achievement either due to primary or co-morbid illness or due to social factors like parental reluctance and availability of social support. This community-based study has documented higher frequency of seizures in comparison to hospital-based studies. Compared to western nations, a higher proportion of cases with febrile seizures later develop epilepsy. Further, birth anoxia and kernicterus are the common causes of cerebral palsy. The low prevalence of tic disorders documented is possibly an underestimation.

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