

Original Article

Prevalence of common neurological disorders in Kashmir Valley of North-West India

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A population based epidemiological study to ascertain the prevalence of neurological disorders was conducted in Hazratbal block of Srinagar district (Kashmir valley) in north India. This population based survey provided basic information that is likely to be crucial for developing not only hospital but also community specific neurological services in the state. The study area is spread over 105 km² supporting a population of about 112389 and having peculiarity of inhabiting both rural as well as urban population with different socio-economic groups. During this two phase, house to house survey, a total of 7,648 population was screened. Children below seven years of age were excluded from the study leaving a net study population of 6960, which included 3602 (51.75%) males and 3358 (48.25%) females. In the first phase, sample of households was screened by a resident doctor to identify the persons who possibly had a disorder of interest using pretested questionnaire (sensitivity 98%, specificity 89%). Subsequently, individuals with one or more disorders of interest were examined by a qualified neurologist in the second phase. The crude prevalence rate of major neurological disorders was 5186.78 per 100,000 of population. Headache was found to be commonest disorder with a crude prevalence rate of 3433.91/100,000 followed by stroke and epilepsy which recorded a crude prevalence rate of 898.97/100,000 and 387.93/100,000 population respectively. Other neurological disorders observed in descending order of frequency in the study population included peripheral nerve disorders (172.41/100,000), dementia (100.57/100,000), cerebral palsy (71.84/100,000), spinal cord disorders (57.47/100,000), Parkinson's disease (57.47/100,000), tremors (28.74/100,000), mental retardation (28.74/100,000) and motor neuron disease (28.74/100,000). Apart from headache, all neurological disorders were comparatively more common in males. Stroke was significantly higher in males. Population in the age group of 30-39 was found to have as high as 1293.90 prevalence rate per 100,000 population followed by age groups of 50-59 and 20-29 years in descending order. Children below 9 years and elderly (≥ 70 years) constituted 3% and 5.5% of total positive cases respectively. The prevalence rate in unskilled work force was 3362.05 per 100,000 population compared to 143/100,000 for professionals implying that the neurological disorders were significantly higher in illiterate section of the population.

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Key words : Neurological disorders, headache, stroke, epilepsy.

Neurological disorders such as headache, stroke, epilepsy and neuropathies constitute major health hazards in developing as well as developed countries. It is estimated that 6% of the population at some time in life had a neurological disorder causing a substantial social and financial loss to the society¹.

The socio-demographic and epidemiological transition in developing countries has changed the morbidity and mortality pattern among communities. This has brought non-communicable diseases to the forefront of the health care delivery system. Within this group neurological disorders constitute a significant proportion affecting morbidity, mortality, disability and quality of life². In India recently a change is observed in demographic profile to-

wards a growing aging population³. The community based prevalence studies from India have documented crude prevalence rates of epilepsy varying from 247 to 883; stroke 55 to 150; parkinsonism from 7 to 328 per 1,00,000 in over all population and dementia from 8.4 to 35 per 1000 among population above 55 of years. Age specific prevalence of stroke, dementia and parkinsonism also revealed higher rate with advanced age⁴.

Reliable data on prevalence and pattern of neurological disorders is scanty. Most of the information available is limited to hospital based studies which may not reflect the true dimensions of the disorders prevalent in a community. Further most of the data on epidemiological aspect of neurological disorders is limited to some developed countries.

While some elementary demographic data of 2001 census of Jammu and Kashmir state (India) is available, there is no systematic record of health hazards in different popu-

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lations of the state. In Kashmir for an estimated population of more than 5.67 million the number of neurologists and neurosurgeons is <10 and to add to that, there is no trained neuropathologist or neuroradiologist. Furthermore 100% of these trained personnel are concentrated in the two medical teaching hospitals of the valley. This is in contrast to United States where there is one neurologist for every 29,100 population⁴.

There is paucity of neuroepidemiological studies from Kashmir valley due to nonavailability of adequate infrastructure and economic constraints. Razdan *et al* (1994) have reported prevalence rates of various common neurological disorders as 9.67 per 1000 population in South Kashmir. The prevalence rates of various common neurological disorders in their study were: epilepsy 2.47/1000; stroke 1.43/1000; poliomyelitis 2.18/1000 and mental retardation 2.09/1000⁵. Similarly primary headache disorders have been reported to be more common than other cranial neuralgias in our valley⁶.

MATERIALS AND METHODS

Survey Area :

The study was conducted in the Hazratbal block of Srinagar district of the state of Jammu and Kashmir (North India). It is located between 34.09°N latitude and 74.79°E longitude. The total area of the block is 105 square kilometers⁷. The area has four well defined seasons. The total population of the area according to the recent census of 2001 is 1,12,389 and is distributed in 9 zones.

The study area has a peculiarity of having both rural as well as urban population with different socio-economic groups. Majority of the population is Muslim. The main source of income of people in rural zones is farming and agriculture while majority of those inhabiting urban areas are artisans and traders^{7,8}.

All the inhabitants of the block have a ready access to health care services. The block has 1 primary health centre, 1 new type primary health centre (NTPHC), 13 sub-centres and 22 allopathic dispensaries (AD's).

The total study population of 7,648 was selected by simple random sampling. A complete list of villages and mohallas was framed and randomization was done to select the study population. As the study was conducted on a population more than 7 years of age, the net screened population came to be 6,960.

Eligibility :

Persons were eligible for enrolment in this study if on 1st September 2008 their residence was in the survey area and were household members. A household was defined as a group of persons generally relatives by blood, marriage and adoption who live in the same dwelling (housing unit) and share their incomes.

College students, tourists and security forces personnel who lived temporarily within the survey area were considered ineligible for the study.

Screening Instrument :

The screening instrument used was a questionnaire designed according to the WHO protocol. It has been designed to elicit medical and demographic information⁹.

It has three main sections.

- The first section pertained to the demographic profile of the respondent.
- The second section was the core of the screening instrument. It contained questions pertaining to commonly recognized symptoms of disorders of interest. Such medical information was used to identify people who required a neurological examination because of their likelihood of having one or more disorders of interest.
- The third section contained information regarding some basic tests done to give a basic idea of the disorder the respondent is suffering from.

The proforma was translated into local vernacular and then administered to the respondents.

Pretesting of the Screening Instrument :

The screening questionnaire was pretested before the actual data collection began on 1208 subjects over a period of four months. The sensitivity and specificity of the questionnaire was found to be 98% and 89% respectively.

General Study Design :

The study was conducted in two phases.

Phase – I

A sample of households was screened to identify persons who possibly had a disorder of interest. Before the study was undertaken confidence of people was gained by taking the local elders and health workers into confidence. The objective and possible benefits of the study were explained to them.

The study design required that each eligible individual living in a house-hold should be screened and that each individual with suspected neurological disorder be subjected to clinical examination should they cooperate for the same.

At each inhabited dwelling, the screening questionnaire was administered to a responsible adult, who could provide appropriate answers to the questions. The questionnaire was administered in the local vernacular.

Phase – II

All the respondents suspected of having one or more disorders of interest were invited to have a clinical examination at the local public health centre. The examination was conducted by a senior neurologist. To encourage people to participate fully in the study an effort was made to avoid long lapses of time between screening interview and the clinical examination.

The data collected was statistically analyzed using rel-

evant software to work out Odd's ratio, Chi-square to ascertain prevalence rate and p values.

OBSERVATIONS

Population Characteristics :

Out of the total population of 7648 sampled, net population of 6960 was studied. Six hundred and eighty eight children below 7 years of age which comprised about 9% of the population were excluded from the study in accordance with the WHO protocol (Table 1).

The study sample of 6960 comprised of 3602 (51.75%) males and 3358 (48.25%) females. Maximum number of subjects 1806 (25.95%) belonged to 10-19 years age group followed by 20-29 years age group which included 1498 (21.52%) subjects. The next major age group was 20-29 years. However gender distribution in all the age groups was almost same, bearing no statistically significant difference ($p > 0.05$). This connotes that the cohort was age and sex matched (Table 2).

Age and sex distribution : The age and sex distribution of screened positive cases is shown in Table 3. The observations show 361 positive cases of neurological disorders among the cohort wherein 169 (46.8%) were males and 192 (53.2%) females. This gave a prevalence of 5186.78 per 1,00,000 for neurological disorders. It has been observed that children (< 9 years) constituted 3% and elderly adults (≥ 70 years) 5.5% of the total positive cases. Population in the age group of 30-39 years was found to have the highest prevalence of 24.9% which constituted 1293.10 per 100,000 of the population followed by the age groups of 50-59 and 20-29 years comprising 16.6% and 15.8% of the population respectively.

Study population	Total number	Percentage
Sample taken	7,648	6.80
Excluded (children < 7 years of age)	688	9.0
Net study population	6,960	91
Screened population :		
Phase - 1	381	5.47
Phase - 2		
Non responders	15	3.94
Negative response	5	1.31
Net positive	361	94.75

Age (Years)	Male (%)	Female (%)	Total (%)
< 9	190 (5.27)	162 (4.83)	352 (5.06)
10 - 19	953 (26.46)	853 (25.45)	1806 (25.95)
20 - 29	791 (21.96)	707 (21.09)	1498 (21.52)
30 - 39	582 (16.16)	635 (18.94)	1217 (17.49)
40 - 49	460 (12.77)	425 (12.68)	885 (12.72)
50 - 59	292 (8.11)	269 (8.03)	561 (8.06)
60 - 69	198 (5.50)	182 (5.43)	380 (5.46)
> 70	136 (3.78)	125 (3.73)	261 (3.75)
Total	3602 (51.75)	3358 (48.25)	6960 (100)

$\chi^2 = 9.705$, $p = 0.206$ (Non-Significant)

Age (years)	Male (%)	Female (%)	Total (%)	Prevalence rate per lac
≤ 9	8 (4.7)	3 (1.6)	11 (3.0)	158.05
10 - 19	10 (5.9)	30 (15.6)	40 (11.1)	574.71
20 - 29	21 (12.4)	36 (18.8)	57 (15.8)	818.97
30 - 39	41 (24.3)	49 (25.5)	90 (24.9)	1293.10
40 - 49	25 (14.8)	21 (10.9)	46 (12.7)	660.92
50 - 59	28 (16.6)	32 (16.7)	60 (16.6)	862.07
60 - 69	24 (14.2)	13 (6.8)	37 (10.2)	531.61
≥ 70	12 (7.1)	8 (4.2)	20 (5.5)	287.36
Total	169 (46.8)	192 (53.2)	361 (100)	5187.78

$\chi^2 = 20.233$; $p = 0.005$ (Significant)

Demographic Profile of Positive Subjects :

The minimum and maximum age in males was 7 and 88 years respectively with an average age of 41.95 ± 17.95 . Similarly the minimum and maximum age of female subjects was 7 and 80 years respectively with an average age of 36.70 ± 17.03 . The difference in age as per gender did not show any significant difference ($p > 0.05$). Hence it is concluded that the cases with neurological disorders in the study were age and sex matched (Table 4).

Occupation and Gender Distribution :

Among the positive cases studied, prevalence rate of neurological disorders was significantly high in unskilled population. The majority of the cases ie, 64.8% or 234 subjects were un-skilled workers which included students and unemployed people. The prevalence rate of neurological disorders was 3362.07 per 1,00,000 population. The difference in prevalence rate as per occupation showed a significant difference ($p < 0.05$).

Prevalence of Neurological Disorders :

Among various neurological disorders headache, cerebrovascular disorders followed by seizures were three most frequent disorders with an overall prevalence rate of 3433.91, 818.97 and 387.93 per 100,000 respectively. Other disorders recorded in the subjects found affected by the neurological disorders included peripheral nerve disorders (172.41), dementia (100.57), cerebral palsy (71.84), spinal cord disorders (57.47), Parkinson's disease (57.47), tremors (28.74), mental retardation (28.74) and motor neuron disease (28.74). While a significant high prevalence rate of headache was observed in females, other diseases

	Male	Female	Total
Frequency	169	192	361
Prevalence Rate/Lac	2428.16	2758.62	5186.78
Mean \pm SD	41.95 ± 17.95	36.70 ± 17.03	39.16 ± 17.64
(Range)	(7 - 88)	(7 - 80)	(7 - 88)
Median	40.00	35.00	37.00

$p = 0.005$ (Significant)

were comparatively high in males. Stroke was significantly higher in males. Overall gender difference in neurological disorders was statistically significant ($p < 0.05$) with male preponderance (Table 5).

Discussion

The successful completion of the main study in Hazratbal block of Kashmir valley suggests that a community survey for neurological disorders is feasible in Kashmir valley even in situations of scarce resources.

The sensitivity and specificity achieved by the study questionnaire are comparable to those from other studies that have used a similar protocol. This further confirms the perception that the questionnaire is a useful instrument for epidemiological study of major neurological diseases for which it was designed¹⁰⁻¹⁴. It demonstrated that the strategy of evaluating subjects with abnormal responses usually in their homes improved community compliance and minimized loss of work days for follow-up.

The sex distribution of the subjects screened is similar to the general pattern observed in Kashmir. The population census from this study showed that the community is predominantly young with only 9% of population over the age of 60 years. The relatively young population in this community as in other parts of Kashmir is similar to the general pattern in developing countries but contrasts with the population structure in industrialized countries where about 15% of population is above 60 years^{3,4,11}.

The sociodemographic characteristics have revealed that people are predominantly involved with unskilled occupation (65.6%). The low literacy rate and high levels of unemployment may be responsible for this disparity.

The overall prevalence rate of neurological disorders in the community in earlier studies has varied from 984 to 4070 per 100,000 population in India (Gaurie Devi *et al*, 1995). Similar observations have been made by other researchers (Gauri Devi *et al*, 2004, Osuntokun and Adenge 1987)^{2,4}.

In our study 361 out of 6960 screened subjects were positive for various neurological disorders with overall crude prevalence rate of 5186.78 per 1,00,000. This figure is less as compared to other studies^{2,8,11,12,15,16}. This may be because of the large sample size taken in these studies. In our study among the positive cases, females (54.4%) outnumbered males (45.6%) which is consistent with the study conducted at Thugbah¹¹. Other study conducted at Ethiopia had more males than females positive for various neurological disorders¹⁷.

Our observations also indicate that the prevalence rate of neurological disorders was highest (3362.07 per 100,000 of population) in unskilled workers. This may be attributed to low literacy rate, unemployment and less health care awareness. Another important observations

Table 5 — Prevalence of common neurological disorders as per gender

Neurological disorder	Male (%)	Female (%)	Total (%)	OR*	Rate/Lac	Result
Headache	92 (54.4)	147* (76.6)	239 (66.2)	2.73	3433.91	$p < 0.05$ (Sig.)
Seizure	15* (8.9)	12 (6.3)	27 (7.5)	1.46	387.93	$p > 0.05$ (NS)
Cerebrovascular disorders	37* (21.9)	20 (10.4)	57 (15.8)	2.41	818.97	$p < 0.05$ (Sig.)
Peripheral nerve disorders	7* (4.1)	5 (2.6)	12 (3.3)	1.62	172.41	$p > 0.05$ (NS)
Dementia	5* (3.0)	2 (1.0)	7 (1.9)	2.90	100.57	$p > 0.05$ (NS)
Spinal Cord disorder	3* (1.8)	1 (0.5)	4 (1.1)	3.45	57.47	$p > 0.05$ (NS)
Parkinson's disease	3* (1.8)	1 (0.5)	4 (1.1)	3.45	57.47	$p > 0.05$ (NS)
Tremor	1* (0.6)	1 (0.5)	2 (0.6)	1.14	28.74	$p > 0.05$ (NS)
Mental retardation	1* (0.6)	1 (0.5)	2 (0.6)	1.14	28.74	$p > 0.05$ (NS)
Cerebral Palsy	3* (1.8)	2 (1.0)	5 (1.4)	1.72	71.84	$p > 0.05$ (NS)
Motor Neuron disease	2* (1.2)	0 (0.0)	2 (0.6)	4.60	28.74	$p > 0.05$ (NS)
Total	169 (100)	192 (100)	361 (100)			

$\chi^2 = 22.505$; $p = 0.013$ (Significant)
 NS = Non-significant; Sig. = Significant; OR = Odd's ratio
 * = Odd's ratio calculated on that value

made was high rate of prevalence of neurological disorders among age group of 30-39 years. Conversely low prevalence rate among children below 9 years and elderly population above 70 years has been observed. High prevalence rate of neurological disorders like headache among young adults may be attributed to the militancy related stress in the community since 1990. Gaurie Devi *et al* have however, observed high rate of neurological disorders among children and elderly people above 60 years of age².

To conclude, the results of our study are comparable in general with those of other researchers from India. However, marginal discrepancies in prevalence of some neurological disorders may be attributed to socio demographic factors.

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