

EPIDEMIOLOGY OF JAPANESE ENCEPHALITIS

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ABSTRACT

Seven hundred and sixty-two cases of Japanese Encephalitis (JE) were studied during the last 5 years (1985-1989) in relation to age, sex, religion, nutritional status, living habits, exposure to domestic animals and mosquitos, clinical profile, seasonal variation and mortality pattern. The maximum occurrence was in 1987-1988 and it showed a preponderance in males (51-82%). The disease is progressively decreasing in Muslims (3-7%) and gradually increasing in tribes (25-60%). Children in the age-group of 6-7 years (19-25%) were maximally affected and the disease was rare in infancy. The common features were coma, convulsions, neck rigidity and fever (88-97%). Gastrointestinal manifestations were rare (3.6%) but were associated with the highest mortality. About 80-95% had exposure to domestic animals directly or indirectly and 95% of the patients were not using mosquito nets. The CSF protein and sugar content were normal, with or without slight leucocytosis while the lymphocyte count was variable. The CSF and blood picture had no significant relation with clinical presentation and prognosis.

Key words: Japanese encephalitis, Viral encephalitis.

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Japanese-Encephalitis (JE) constitutes one of the major public health problems in many countries of south-east Asia and Western Pacific region. The disease has a significant mortality in children and old people. JE has been seen in epidemic form since the year 1973 in different areas of India, mainly involving West Bengal and the attack rate appears to be gradually increasing during these last two decades. The present prospective study was conducted during the last 5 years to evaluate the epidemiology and clinical profile of the disease, in Burdwan, West Bengal.

Material and Methods

This study was conducted at Burdwan Medical College and Hospital from 1985 to 1989. All the cases of clinically diagnosed JE admitted to the Department of Pediatrics, were included in the present study. Only half the cases were also confirmed serologically as the facilities for the remainder could not be extended so rapidly during the epidemic season. A detailed history and a thorough clinical examination were recorded in all the cases at the time of admission. Special emphasis was given to the socio-economic status, occupation, living conditions, relation with domestic animals and use of mosquito nets. The nutritional status was assessed according to recommendation of Nutrition Sub-committee of the Indian Academy of Pediatrics and socio-economic status was graded according Indian Council of Medical Research (ICMR) recommendations (1984). The cases were examined regularly in the ward and relevant investigations performed.

Convulsions were controlled with intravenous diazepam and intramuscular paraldehyde followed by oral administration of sodium valproate or phenobarbitone sodium. Children with intractable convulsions

were treated with dexamethasone along with mannitol combined with ancillary measures like correction of hypoglycemia, acidosis, oropharyngeal suction, control of temperature, *etc.* Nutrition was maintained either by intravenous fluids or intragastric feeding.

Results

A total of 762 cases were studied during the years 1985 to 1989. The distribution of cases in relation to sex is shown in *Table I*. The maximum number of cases were documented in 1989 and more boys were hospitalized.

Table II depicts that more Hindus were seen and there appears to be a fall in Muslim and a rise in tribal population hospitalization over time.

Table III shows that the maximum number of cases occurred in the age-group of 6-7 years (19.3-25%) and the minimum number was noted below 1 year. The next

vulnerable age-group was 3-4 years (17.7-20.5%)

The common features were convulsion, coma, neck-rigidity, positive Kerning's sign and pupillary changes. Gastrointestinal manifestations were rare and these children had higher mortality (*Table IV*).

Table V demonstrates that the disease was predominant in the Grades II and III malnutrition. Malnutrition was more profound in the age-group of 4-5 years.

It was noted that 80 to 95% of the parents were farmers, who worked in the field for cultivation and were living in Kutcha houses, had got direct or indirect contact with pigs, cattle and buffaloes. Only 8 to 15% cases had relation with ducks. A vast majority (90%) of them were sleeping without mosquito nets. It was found that 80% of cases occurred in the month of October-November, 10-12% between December to February and 8-10% between July to September. No significant attack rate was

TABLE I—Sex Distribution in Different Years

Year	1985		1986		1987		1988		1989	
	M	F	M	F	M	F	M	F	M	F
Number	42	37	88	85	106	74	115	85	80	50
%	53	47	51	49	59	41	58	42	62	38

M = Male; F = Female.

TABLE II—Racial Distribution

Year	1985		1986		1987		1988		1989	
	Hindu	Muslim	Hindu	Muslim	Hindu	Muslim	Hindu	Muslim	Hindu	Muslim
Number	62	17	151	22	167	13	187	13	120	10
%	78	22	87	13	83	7	94	6	93	7
Tribes number	20		58		68		75		78	
%	25		34		38		38		60	

TABLE III—Age Distribution

Age (yrs)	1985	1986	1987	1988	1989
0-1	7 (8.8)	4 (2.3)	5 (2.8)	3 (1.7)	8 (5.1)
1-2	12 (15)	13 (7.5)	14 (7.7)	12 (6.6)	5 (3.2)
2-3	13 (16.4)	26 (15.0)	21 (11.4)	23 (12.8)	21 (13.5)
3-4	10 (12.6)	31 (17.9)	32 (17.8)	25 (13.9)	28 (17.9)
4-5	14 (17.7)	31 (19.9)	40 (22.2)	35 (19.4)	32 (20.5)
5-6	5 (6.3)	27 (15.6)	24 (13.3)	36 (20.0)	28 (17.9)
6-7	18 (22.6)	41 (23.5)	44 (25.0)	45 (25.0)	30 (19.3)
Total	79	173	180	200	130

Figures in parentheses indicate percentages.

observed from the month of March to June.

The mortality pattern in relation to age is depicted in *Table VI*. The mortality ranged from 25 to 31.5% from 1985 to 1988, but there was a significant rise in mortality in 1989 (43%). The important causes of deaths were pulmonary edema (75-80%), aspiration pneumonitis and hypostatic pneumonitis (10-15%), secondary infection like urinary tract infection and sepsis (3-5%), intractable convulsions (3-5%) and gastrointestinal hemorrhage (3-5%).

An interesting observation was the increase in incidence in tribal groups. This could be partly explained by socio-economic factors, living habits and inter-relationship with domestic animals. The disease *per se* has no predilection for any religion; the higher incidence in Hindus is

probably a reflection of the proportion of tribals.

Discussion

The present prospective clinico-epidemiological investigation of Japanese Encephalitis in children was conducted in an area with limited medical facilities. Although the diagnosis was serologically established in only half the cases, the clinical and cerebrospinal fluid picture in the remainder was fairly characteristic. The mortality experience of this cohort is compared with other reports in *Table VII*. It is heartening to note that despite limited facilities, the mortality was comparable to other series(1-4).

In conformity with other reports(1-4), the peak incidence was documented between October to November. The disease has a direct relationship with monsoon as

TABLE IV—Summary of Clinical Presentation

Clinical features	Year				
	1985	1986	1987	1988	1989
Convulsions	76 (96)	170 (88)	175 (98)	193 (97)	125 (96)
Neck-rigidity	68 (86)	168 (97)	173 (96)	188 (94)	115 (88)
Kerning' sign	68 (86)	168 (97)	173 (96)	188 (94)	122 (94)
Temperature	76 (96)	165 (98)	178 (98)	193 (97)	125 (96)
Coma	76 (96)	170 (98)	175 (98)	193 (97)	125 (96)
Pupillary changes	50 (63)	150 (87)	155 (86)	175 (88)	80 (62)
Plaster	72 (91)	170 (98)	175 (98)	172 (86)	125 (96)
G.I. manifestation	3 (3)	6 (3)	11 (6)	7 (4)	5 (4)
Headache	68 (86)	168 (97)	173 (96)	188 (94)	155 (88)
Aphasia	3 (3)	6 (3)	11 (6)	7 (4)	5 (4)

Figures in parentheses indicate percentages.

TABLE V—Nutritional Status

Year	Nutritional status			
	Grade I	Grade II	Grade III	Grade IV
1985	4 (5)	20 (25)	52 (65)	4 (5)
1986	9 (5)	36 (20)	117 (65)	18 (10)
1987	9 (5)	36 (20)	116 (63)	21 (12)
1988	10 (5)	52 (26)	86 (43)	18 (14)
1989	9 (7)	36 (28)	63 (61)	18 (14)

Figures in parentheses indicate percentages.

breeding of mosquitos mainly occurs in the rainy season. In South India, the disease was reported to exclusively affect children below 15 years of age(4). In the present

series, the younger age group was less affected. In Burdwan District, the specific antibody to JE virus was detected in 30.8% of pigs and 37% of cattle. The close proxi-

TABLE VI—Mortality in Relation to Age and Period

Age (Yrs)	1985	1986	1987	1988	1989
<1	1 (1.2)	Nil	Nil	1 (0.5)	1 (0.76)
1-2	2 (2.4)	2 (1.2)	1 (0.6)	2 (1.0)	4 (3.0)
3-4	3 (3.6)	11 (6.4)	5 (5.0)	10 (5.0)	13 (9.9)
4-5	3 (3.6)	11 (6.4)	10 (5.6)	12 (6.0)	14 (10.6)
5-6	2 (2.4)	9 (4.2)	7 (3.9)	10 (5.0)	10 (7.7)
6-7	4 (4.8)	20 (1.6)	13 (7.3)	20 (10.0)	8 (6.1)

Figures in parentheses indicate percentages.

TABLE VII—Comparison of Mortality

Year	India		West Bengal		Burdwan		Present study	
	Attack	Death%	Attack	Death%	Attack	Death%	Attack	Death%
1985	2490	36.8	1869	32.2	171	39.2	79	25.0
1986	7500	35.0	983	32.0	801	27.7	173	35.8
1987	2877	40.7	1674	36.0	768	34.9	180	25.0
1988	5975	33.5	1531	43.4	536	33.2	200	31.8

mity of children in the age group of 4-7 years to domestic animals could be one of the factors responsible for the higher incidence in this age group.

The observed clinico-epidemiological features were in broad agreement with the earlier reports(1-4). An interesting observation was the increase in incidence in tribal groups. This could be partly explained by socio-economic factors, living habits and interrelationship with domestic animals. The disease *per se* has no predilection for any religion; the higher incidence in Hindus is probably a reflection of the proportion of tribals.

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