Japanese Encephalitis (JE); The Fatal Public Health Issue In Uttar Pradesh, India : A Review

Purnima Srivastava*[1] and Manindra Kumar Srivastava[2]

ABSTRACT

Japanese Encephalitis (JE) an important disease of viral origin has attracted the attention of public health specialists in South East Asian Regions especially in the BBIN (Bangladesh, Bhutan, India & Nepal) countries due to its endemicity, high CFR and residual problems among survivors. JE has been occurring in the endemic form since long back particularly in northern states of India. Eastern parts of U.P. particularly Gorakhpur division is the worst hit division of Uttar Pradesh (UP) in India. U.P. alone is reporting nearly half of the cases found in whole India. Innocent children are the most common victims. This paper attempts to review the problem & emphasizes the need of identifying auxiliary feasible factors rather than concentrating on unfeasible, as despite of best efforts of state the disease is still a major public health problem.

Key Words: *JE, Epidemic, Endemic, Case Fatality Rate (CFR), Cerebro Spinal Fluid (CSF)*

1. INTRODUCTION

The term Encephalitis literally means inflammation of the brain parenchyma-part or all of the "encephalon" and is an important cause of death and permanent neurological disability among most of the survivals. Japanese Encephalitis (JE), a particular form of Encephalitis is a zoonotic disease caused by an arbovirus of the type B (Flavivirus) subgroup of Togaviridae known as Japanese Encephalitis Virus (JEV). 'Clinical features of JE have been divided in three stages- a prodormal stage with fever, headache and malaise, an encephalitic stage characterized by coma, convulsions and neurological deficit with continuing fever and a convalescent stage marked by gradual recovery with or without sequelae.

A uniform case definition was proposed for adaptation in BBIN countries for syndromic surveillance and case confirmation of JE.

Suspected case for referral to hospital: fever and altered sensorium.

Viral Encephalitis Syndromic Surveillance:

1.1 Primary Criteria

Fever >7 days, altered sensorium (decreased mental status& abnormal behavior) lasting 24 hrs or greater, without recent rash & negative malaria smear.

1.2 Supportive Criteria

focal neurological signs & symptoms, endemic areas, JE season, CSF consistent with viral Encephalitis & normal metabolic profile.

1.3 Confirmed Case

Encephalitis syndrome & positive IgM ELISA in serum or CSF at least 7 days after onset of symptoms.

Considering both hindering & supporting elements of various diagnostic tests available IgM Capture ELISA (MAC-ELISA) would be the ideal laboratory test for use in JE surveillance until simpler diagnostic

1*. Purnima Srivastava, Department of Statistical Research, State Institute of Health & Family Welfare, Lucknow, India. e-mail: purnima_srivastava2000@yahoo.co.in

2. Manindra Kumar Srivastava, Assistant Professor-I, Department of Humanities & Applied Sciences, School of Management Sciences, Techanical Campus, Lucknow, India. e-mail : mohitmanindra83@yahoo.co.in

tests are available. The JE virus is transmitted to human beings by mosquitoes feeding on viremic animals, mostly domestic pigs. It is perhaps the single agent causing the largest number of encephalitis cases worldwide. The virus is active over a vast geographic area covering India, China and virtually all of the South East Asian Regions especially the BBIN countries. Approximately 3 billion people live in the JEV endemic areas where at least 50,000 cases of JE are reported every year. Of these, about 10,000 cases result in deaths and a high proportion of survivors develop serious neurological and psychiatric sequel. In recent years, outbreaks of JE have occurred in several previously non-endemic areas and virus has been isolated from newer geographical locations such as Pakistan and Australia. It has become a major public health problem due to its endemic potential, high Case Fatality Rate (CFR) and the frequent residual neuropsychiatry complications among survivors.

In India JE has been occurring in the endemic form particularly in northern states and it is a major public health problem in Uttar Pradesh (UP) apart from Measles and Acute Diarrheal diseases. Eastern districts Mahrajganj, Kushinagar, Deoria, and Gorakhpur are the worst hit districts identified as hyper endemic; Basti, Siddharth Nagar, Sant Kabir Nagar, Baharaich, Kheeri, Gonda, Azamgarh, Ballia & Mau are endemic whereas Sultanpur Raebareli, Balrampur, Pratapgarh, Lucknow, Faizabad, Ambedkar Nagar Pilibheet & Shahjahanpur are low endemic districts indicated in figure 1. (Refer Figure1)

2. STATUS OF JE IN INDIA AND UTTAR PRADESH

Outbreak of encephalitis like a disease in young children was recorded in 1950 where as encephalitis caused by JE virus was first recorded in Pondichery and Vellore. There was a small outbreak in Madurai district of Tamilnadu in 1964. In 1973 a major out break (July-Oct) was reported in Burdwan with 340 cases and 190 deaths (CFR 56%) and in Bankura with 329 cases and 168 deaths (CFR 58%). In 1978 major outbreak were noticed from many states like Karnataka, Bihar, Assam, West Bengal and some districts of UP including Gorakhpur and Deoria. U.P. alone is reporting nearly 50% of the cases found in whole India, CFR varying from 20% to 40%. Sequelae rate is as high as 42%. JE noticed in epidemic form in 1978 in Gorakhpur division and other districts of UP. Total 3448 cases and 1106 deaths were reported from 39 districts with CFR 32%. Prior to 1982 the disease trend was epidemic on every alternate year but after 1982 every consecutive year is an epidemic year. In 1990 cases were reduced significantly due to vaccination programme launched by government of India. But again in the absence of vaccination cases and deaths were increased in 1998 & 1999 but with minimum CFR (18.5%), which has risen to 23.0% in 2000 & came down to 19.8% in 2001 but again rose up to 22.0% in 2002 again in 2003 and 2004 CFR is 21.09% and 22.06% and maximum CFR is 24.85% in 2005 after that again CFR is 22.94% in 2006. The number of cases & deaths in Gorakhpur Medical College was 787 & 169 respectively in year 2003 till November 11. CFR was 21.5%. Out of total number of districts 70 in UP 52(74.3%) districts have reported JE cases from 1978 to 2002 whereas 23 (32.9%) districts have reported JE cases from 1998 to 2002. Number of districts reporting JE cases regularly from 1978 to 2002 is 9(12.9%). (Refer Table 1).

It has also been observed that number of cases is higher in males than in females and the difference between them reduces with increase in age. Japanese encephalitis is an outbreak prone disease and has a cyclic trend with seasonal phenomenon. In recent years, a declining trend of the disease has been observed as stated below (Refer Figure 2)

S-JPSET : ISSN : 2229-7111, Vol. 7, Issue 1

In this diagramme, we see that maximum JE cases in year 2005 i.e. 5581 cases and 1387 deaths. In year 2006, again it was down i.e. 2075 and deaths were 476. From the year 1998, in year 2002 JE cases were very less i.e. 604 and 133 deaths. The reason behind this was the rainy water, which stayed in different places, giving rise to higher mosquito density, which is a main factor in spreading JE. (Refer Figure 3)

In this diagramme, Case fatality rate in U.P. increased in year 2006 in compare of year 1998. Although C.F.R. (24.75%) was maximum in year 2005 but in every year 1998, C.F.R increased from 1% to 2%. Due to all programmes by Government C.F.R reduced in year 2006 in comparison of year 2005 but still C.F.R is not showing much difference despite of all efforts by Government. (Refer Table 2)

From Table 2, we see that maximum JE Cases in the 5-9 age-group i.e. 820 and after that maximum cases in the 10-14 age-group . 150 persons are died and 670 persons are srvived.(Refer Table 3 and Figure 4)

From diagram 4, we see that in month August and in month September have most of the JE cases are seen and as we know that both are months of the rainy season impling that JE cases are seen maximum during monsoon season. (Refer Table 4)

From the Table 4 , it is clear that males (62%) are more affected than females(38%) .

2.1 JE Treatment Centers in U.P.

The facilities of oxygen cylinder, suction machine, medicines, catherization, transportation and nursing are available at JE treatment centers. There are 4 centers at Gorakhpur, 2 at Kushinagar, 8 at Deoria, 3 at Mahrajganj, 3 at Basti and 1 at Siddharthnagar.

2.2 Vaccination Aspects of JE in Lac

Mouse brain dried vaccine, which is manufactured in CRI Kasauli, is being used in U.P. This is given in three doses. Children below three years of age require half dose.

It costs Rs 50.42/dose and is being used since 1993.Not being manufactured by private sector, its production is neither sufficient nor in time.

Calculation of Total Requirement of vaccines (Approximately) for 1-3, 3-5and 5-15 years population in Endemic Districts of Mahrajganj, Kushinagar, Deoria and Gorakhpur, Khiri and Bahraich is as follows:

For 3-5 years (8.98 Lac) = 8.98*1.0*3=26.94 Lac doses
For 5-15 Years (31.41 Lac) = 31.41*1.0*3=93.42 Lac Doses
Total Cost @ Rs.50.42/Dose = Rs.67, 47, 70,886/=

Vaccine manufactured in China is required only in single dose and costs only Rs.8.06 /Dose, which is quite cheap. It has been successfully used in three districts of Nepal with high efficacy rate of 99.3%. It has still not been tried in India.

2.3 JE Preparedness and Vaccination Programme in U.P.

From 1993-1995 14,19,254 children between the age group 5-10 years were vaccinated .In 1996 only 1000 doses to UP were given due to non-working of freezed drying machine. In 1997 efforts were made to obtain 5 lac doses from WHO, Geneva but no supplies were made. 40,0000 does were given which were used in a pilot project at Chargava PHC in Gorakhpur district in 2002 .In year 2003 vaccinations could not be done due to non-availability of vaccine. Action plan is implemented every year. Two rounds of insecticide spray and weekly anti larval operations, three rounds of Fogging at two weeks interval and vector assessment with segregation of amplifying host are done. Focal spray is also being done in 50 houses around patients house. Priorities are to provide Health Education and to train Medical personals and professionals for early diagnosis and proper management at CHC, block and district level.

Vaccination and close monitoring through daily reports is being done. Inadequate budget is major problem. There is a lack of awareness campaigns at various levels. Diagnostic facilities are also not up to the mark. Production of Vaccines is neither sufficient nor in time. Method applied by entomologists to identify vector density is very crude.

3. CONCLUSION AND SUGGESTIONS

- Table 1 show that CFR has risen from 18.5% (in1998) to 23.0 %(in 2000). It came down to 19.8% (in 2001) but again rose up to 22.0% (in 2002) despite of all efforts made by state.
- It is clear from Table 2 that children between age group of 5 to 15 years are at the maximum risk. The data also shows that the rate of increase in numbers of cases in children (0-4yrs) has risen to an alarming level. Serious effort should be made to identify the factors responsible for this rate of increase. There is a slow rate of increase in the high- risk group (5-15 years) whereas the no. of cases have come down to a considerable level in more than 15 years group.
- It is clear from Table 3 and figure 4 that July to November son is the peak time for JE therefore appropriate preventive measures must be insured before the monsoon and accurate mosquito density assessment along with special awareness campaigns during monsoon will also be helpful.
- Political and Administrative commitment is a must to make the existing system effective to fight the disease by development of inter-state and inter-country networking with standardized case definition, diagnostic technique, treatment protocol and surveillance system for JE.
- Diagnostic & treatment facilities should be decentralized in the endemic areas so that diagnosis & treatment can be provided at the earliest & nearest.
- Support of Multi-Media, NGO's and key community representatives may be taken to enhance information, education and communication (IEC) activities. Awareness programmes at grass root levels e.g. individual, village, block, schools etc will ensure that exposed population will be in a better position to combat JE.
- All aspects of vaccination may be reviewed & feasible long term planning should be prepared.
- Control on population of pigs in endemic areas may be considered at administrative & political levels.
- Private institutions should also be involved in reporting and epidemiological data must be scrutinized carefully preferably with the help of a trained statistician.
- Shifting attention from Uncontrollable factors:

  We see that there are many unfeasible factors playing vital role in spreading JE for e. g. Geographical location like tarai belt or flood prone areas, area under paddy crop etc, so it is very important that we must identify the auxiliary variables which are highly correlated with these factors and are feasible.
- Specific statistical models and techniques should also be developed and used to analyze JE data in a better way and to understand how various factors are contributing in spread of JE so that more appropriate, cost effective & feasible policies and action plans can be formulated to control JE.

ACKNOWLEDGEMENT

Authors are thankful to E-Branch, DGMHS, and U.P. for providing information and data.

Table - 1: Year Wise Distribution JE of Numbers of Districts Cases/ Deaths in U.P.

Year	No. of Districts Reported	% of Districts Reported	Cases	Deaths	C.F.R.
1998	20	28.6	1052	195	18.5
1999	22	31.4	1370	275	20.1
2000	18	25.7	1126	259	23.0
2001	23	32.6	1005	199	19.8
2002	10	14.3	604	133	22.0
2003	16	22.9	1124	237	21.09
2004	17	24.3	1030	228	22.06
2005	34	48.6	5581	1387	24.85
2006	22	31.4	2075	476	22.94

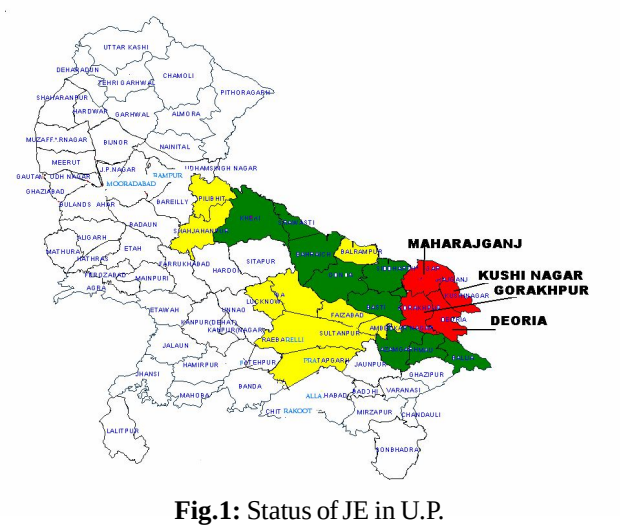

Fig.1: Status of JE in U.P.

Table - 2: Age-Group Wise Distribution of JE of Number of Survives/Deaths in U.P.

Age-group	Deaths	Survives	Total
0-4	81	375	456
5-9	150	670	820
10-14	92	395	487
15 & A	70	342	412
Total	393	1782	2175

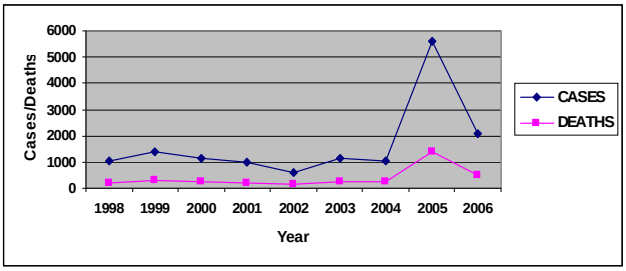

Fig.2: JE Cases in U.P.(1998-2006)

Table - 3: Season Wise Distribution of JE Cases in U.P.

Year	July	August	September	October	November	December
1999	6	396	553	353	62	0
2000	0	237	449	338	102	0
2001	57	341	322	214	67	4
2002	56	137	202	138	69	2
2003	0	249	500	242	121	12
2004	44	350	320	247	67	2
2005	556	693	1551	1128	929	331

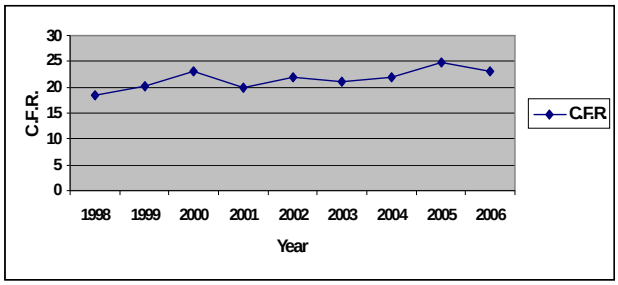

Fig.3: C.F.R. of JE Cases IN U.P.

Table - 4 : Sex-Wise JE Cases(2002)

Male		Female	
Case	**Death**	**Case**	**Death**
181	48	110	16

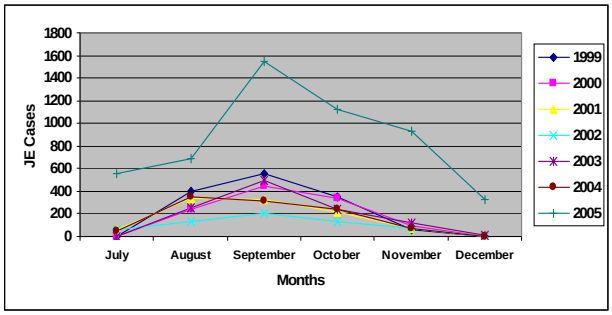

Fig.4: Year Wise Seasonal Variation of JE Cases

REFERENCE

1. Misra S. & Mishra A. K., Statistical Aspects of Scenario of JE in UP, IBS Conference (Nov 25-27'2003), B.H.U. Varanasi, India.

2. Report of an Inter-country workshop on Standardization of JE Surveillance, March 10-13' 2003, NIV, Pune, India.

3. Encephalitis, Current Trends & Challenges; Proceedings of Intramural CME (26-27th Sep 2003) SGPGI, Lucknow, India.

4. Misra S. & Mishra A.K. (Nov 25-27'2003), Statistical Aspects of Scenario of JE in U.P.,IBS Conference, B.H.U.,Varansi, India.

5. March 10-13'2003, Report of an Inter-Country Workshop on Standarazed of JE Surveillance, NIV, Pune, India.

6. Kumar, R, Senthilselven A (1994), Mature A et al. Clinical Predictors of Japanese Encephalitis, Neuroeepideniology, 13, 97-102.

7. Directorate General of Health & Family Welfare (2004), Prevention and Control of Japanese *Encephalitis Guidelines, Government of India, Directorate of National Vector Borne Diseases* Control Programme, 1-10.

8. National Institute of Communicable Diseases (19980, Investigation and Control of Outbreaks Japanese Encephalitis, Directorate General of Health Services, 1-10.

9. Mathure A., Chaturvedi U.C., Tandon H.O., Agarwal A.K., Mathur G.P., NAG D,et al. (1982),Japanese Encephalitis Epidemiology in Uttar Pradesh, India during 1978, Indian J Med Res, 75, 161-9.

