

SERO-EPIDEMIOLOGICAL STUDY OF SEVERE FORMS OF PARALYTIC POLIOMYELITIS

S. Khare
P. Mullick
D. Sharma
S. Kumari

ABSTRACT

Poliomyelitis has assumed immense public health importance owing to the magnitude of problem. The present study describes clinical, epidemiological and virological profile of seventy four cases of severe forms of acute paralytic poliomyelitis admitted to Kalawati Saran Children Hospital, New Delhi, during the period from August, 1986 to May, 1987. Thirty two per cent of total paralytic poliomyelitis cases were diagnosed as severe cases. Highest incidence (45.95%) of the cases were in the age group of 6-12 months and male to female ratio was 2.08:1. There was preponderance of cases from urban area. Among all the cases, 12.2% had received three or more doses of oral poliovaccine. Fever and respiratory involvement were the commonest symptoms.

Sixty seven patients (90.5%) were virologically or serologically confirmed as an acute poliomyelitis due to any of the three poliovirus type. On follow up of the cases, complete recovery could be seen only in 4.2% of cases with varying degree of residual paralysis in 95.8% cases.

Key words: *Poliomyelitis, Oral polio vaccine.*

Poliomyelitis is an acute communicable disease caused by any of the three viruses of the same name and still remains the most common cause of childhood invalidism. Poliomyelitis is thriving in India and continues to affect the infant and toddler group(1,2). The incidence of acute paralytic poliomyelitis in India has been calculated to be 20-40 per 100,000 population per year(3,4). Thus 700 cases of paralytic polio occurs every day(5). This disease affects mostly the underprivileged and over worked class.

In Kalawati Saran Children Hospital, New Delhi alone 6.6-7.0% of children attending Out Patients Department suffer from poliomyelitis and account for 1500-2000 cases per year. Amongst severe paralytic poliomyelitis, the most feared is spinal respiratory type of poliomyelitis—an imminent danger to life(6). It continues to affect small children in the developing countries. No study on respiratory paralysis in poliomyelitis has been done in India where we continue to face such a high load of respiratory cripples.

It was with these above facts in mind that we decided to undertake a seroepidemiological study in children suffering from a severe form of paralytic poliomyelitis especially of the respiratory type.

From the National Institute of Communicable Diseases, Delhi 110 054, and Department of Pediatrics, Kalawati Saran Children Hospital, New Delhi 110 001.

Reprint requests: Dr. (Mrs.) S. Khare, Assistant Director (Microbiology), N.I.C.D., 22, Sham Nath Marg, Delhi 110 054.

*Received for publication August 3, 1990;
Accepted February 4, 1991*

Material and Methods

Subjects

Seventy four children clinically diagnosed as severe acute paralytic poliomyelitis treated in Kalawati Saran Children's Hospital, New Delhi during a period of ten months from August, 1986 to May, 1987, formed the subject matter of the study. Cases were chosen out of 1615 cases of acute poliomyelitis who attended Kalawati Saran Children's Hospital, New Delhi during the period of study. A detailed history of immunization status, history of intramuscular injection, feeding habits, socio-economic status and clinical findings were recorded in each case. The severe cases of acute paralytic poliomyelitis were diagnosed on the basis of generalized paralysis of all four limbs, neck and trunk or paralysis of muscles of respiration or bulbar paralysis or polio-encephalitis either as alone or in combination.

Specimens

Virological and serological investigations were carried out on the cases which were hospitalized. Paired serum samples at an interval of fifteen days were collected from all the cases. However, stool samples for virus isolation could only be collected in twenty five cases.

Virology

Stool samples were subjected to virus isolation in Vero and HEP2 cell lines and cytopathogenic agents isolated were serotyped and confirmed as polio virus by standard procedure(7).

Serology

All the serum samples were tested for

presence of Poliovirus neutralizing antibody by standard Micro-neutralization test(7). Any patient showing four-fold or more rise in antibody titre between two paired samples collected fifteen days apart was considered as positive.

Results

A total of 1615 cases attended the Kalawati Saran Children's Hospital, New Delhi during the period of ten months from August, 1986 to May, 1987. Two peaks of incidence of the disease were observed, one in August-September, 1986 and another surprise peak from March to May, 1987. Thirty two per cent of these had severe paralytic diseases. The overall mortality was 103/1615 (6.4%) and mortality among severely paralyzed cases was 19.9% in the mentioned hospital. The maximum number of cases were seen from March to May, 1987. A sample study of virus isolation from only twenty five cases and for antibody titres in paired sera in 74 cases were undertaken.

The youngest child was 6 weeks old and the oldest was five and a half years. The peak incidence of disease was seen in the age group of 6-12 months, *i.e.*, 46.0%. However, children below one year constituted 62.2% of all severe cases and 95.3% cases were in less than 2 years age group. The cases were two times more in males than in females. Preponderance of cases belonging to urban areas (63.5%) were seen mainly from Delhi and neighboring areas. The comparative analysis for residential status showed that more cases were accounted for from outside Delhi. A total of 97.3% of cases were seen in children from lower socio-economic group and 71.5% of the parents of these cases were illiterate. Only 62.2% of children suffering

from polio had no access to safe water supply and excreta disposal. Nutritional status was found to be normal or mild PEM Grades I and II in 81.0% of the cases while severely malnourished constituted only 19.0% cases.

Vaccination Status

A total of 62.2% of the cases were seen in unvaccinated children. However, 21.7% cases were seen in partially vaccinated (those who had received either one or two doses of OPV) and only 10.8% had received 3 doses of OPV. Only one child had received three doses and one booster before getting paralysis. Five cases have been seen who had received OPV 7-30 days prior to their illness accounting for disease directly associated with vaccine or children in incubation period of disease had

received vaccination. History of intramuscular injections was there in 69.0% of the cases in preparalytic stage. Clinically it was seen that 98.7% cases presented with fever, respiratory muscle paralysis and all had paralysis of all the four limbs.

Laboratory Studies

In 67 cases (85.1%), a four-fold rise in the neutralizing antibody titre to the homologous polio virus was demonstrated between acute and convalescent sera. Detailed results are shown in *Table I*.

Only in 25 cases, rectal swabs could be collected and processed for virus isolation. Virus was isolated in only seven cases which was confirmed to be polio virus. Cases where virus was isolated confirms the diagnosis made by serology.

TABLE I—Severe Polio Cases According to Type of Disease and Type of Poliovirus Infection

Type of virus	Presenting illness			Total
	Polio encephalitis	Spinal respiratory	Bulbospinal	
<i>Polio</i>				
Type I	2 (22.2)	15 (51.7)	15 (41.7)	32 (43.2)
Type II	6 (66.7)	9 (31.1)	8 (22.2)	23 (31.1)
Type III	1 (11.1)	2 (6.9)	5 (13.9)	8 (10.8)
Non-Polio	0 (0.0)	3 (10.3)	8 (22.2)	11 (14.9)
Total	9.0 (100.0)	29.0 (100.0)	36.0 (100.0)	74.0 (100.0)

Figures in parentheses show percentages.

No statistically significant difference in the incidence of polio virus type was observed in the vaccinated and unvaccinated cases except polio virus type III was more common among vaccinated (16.7%) than among unvaccinated group (8%).

It was observed that the vaccinated children had significantly higher protective antibodies to the non-infecting viruses and in the unvaccinated group, a large number of cases had no protective antibody titres to any of the non-infecting viruses. The difference was statistically significant ($p < 0.05$). The overall mortality among severely paralyzed cases in the hospital was 19.9% but in the study groups of seventy four cases, mortality was found in 10, *i.e.*, 13.5% cases. Of these 3 cases died of polio encephalitis, 7 of bulbo-spinal polio and none due to spinal type. It is important to note that 6 bulbo-spinal cases had non-polio virus infection and only one was due to polio-virus type II. The type of non polio virus infection in these cases were not further studied.

On follow up, only 45 cases returned. It was observed that 26.8% of the cases had minor paralysis. Only 44.4% had significant paralysis while 24.4% were severely crippled at 60 days follow up and only 4.2% cases fully recovered.

Discussion

Poliomyelitis has assumed immense public health importance owing to the magnitude of problem and devastating morbidity it leaves behind. The present study describes the severe paralytic poliomyelitis incidence, the types of virus causing such extensive disease and the recovery in these cases.

A total of 1615 cases attended Kalawati Saran Children's Hospital, over 0-10

month period of which 32.0% had severe paralytic polio. Similar incidence varying from 27.0 to 35.7% has been reported by previous workers(8,9). Respiratory involvement was seen in 97.0% cases which is slightly higher than reported earlier(9,10). Higher incidence of cases in August-September is similar to previous studies(11-13). However, surprisingly another peak incidence of disease is seen in March to May, 1987 which is unusual as compared to incidence in similar months in previous 3 years. This kind of spurt in March to May has been reported earlier from Kalawati Saran Children's Hospital(13).

Poliomyelitis continues to remain as infantile paralysis in our country. The present study shows incidence to be 95.3% below two years and 98.7% below three years. Various workers have reported 70-90% cases below three years of age (12, 14). Nearly 46% of the cases were in age group 6-12 months as has been seen earlier(14), 8.2% cases of all acute paralytic cases were seen in children less than 6 months. Male to female ratio was 2.08 : 1 similar to what has been found previously(2,12,14).

In the present series, 63.5% cases were from urban area. Only 44.6% of total cases were seen from Delhi and rest from outside Delhi. a similar incidence has been seen from previous studies(13,14). The cases from Delhi were mostly from the crowded areas. A total 97.3% of the cases belong to middle and lower middle classes which confirms the observation made earlier(11,14). However, in 1962(15) a higher incidence of poliomyelitis was observed in better socio-economic status due to lower naturally acquired immunity. Eighty one per cent of the polio cases were seen in children with normal nutrition or mild PEM (Grades I and II) and only 19.0% of

the cases were among severely malnourished. It has been mentioned that paralytic polio attacks the active robust child rather than sickly marasmic child(16). Nearly 62% of the cases were from areas of poor environmental sanitation.

Among the unvaccinated children, one third of the parents did not get their children vaccinated due to laziness, postponement or religious and cultural beliefs, 30% of parents were not aware of polio vaccination. Only 12.2% of cases were seen among those who had received 3 or more doses of OPV. However, others have reported this to be 14.6% and 10.0%, respectively(17,18). Nearly 69% of children gave history of intramuscular injection in the preparalytic stage. A similar incidence has been reported by other workers(11,19). Polio virus type one infection was the commonest, seen in 43.2% cases, followed by poliovirus type two in 31.1%. Earlier studies(7,9) have reported type I as the commonest agent in severe cases of poliomyelitis. Only 14.9% of the cases showed no rise in neutralizing antibody titre to any of the three virus types. These cases probably were due to non-polio viruses. This high incidence of non-polio viruses was also observed by previous workers(14). In our study, non-polio virus could not be further classified. Among the fully vaccinated group type 1 and type 2 virus infection was seen with equal frequency. However, type 2 and 3 injections in all the vaccinated children were found by others(14).

Forty five children could only be followed up to 60 days. Among these, 4.2% cases fully recovered and 95.8% cases were left with varying degree of paralysis. This was similar to what was observed earlier(14). However, a previous study(14) has shown better recovery in vaccinated children which was not seen in the present

case. No correlation was found between recovery and type of poliovirus causing infections.

Thus, it was observed that in India still we have a high incidence of poliomyelitis of severe type involving respiratory system. The poliovirus type 1 causes the commonest infection and recovery after 60 days is poor. There is need for strengthening of immunization against poliomyelitis and administration of safe, potent and full doses of oral poliovaccine.

REFERENCES

1. John TJ. Towards a National Policy on Poliomyelitis. *Indian Pediatr* 1981, 18: 503-506.
2. Park JE, Park K. Poliomyelitis. *In: Text Book of Preventive and Social Medicine*, 11th edn. Jabalpur, M/s Banarsidas Bhanot, 1986, pp 178-183.
3. John TJ. Poliomyelitis in India: Prospects and problems of control. *Rev Infect Dis* 1984, 6: 438-441.
4. Basu RN. Magnitude of problems of poliomyelitis in India. *Indian Pediatr* 1981, 18: 507-511.
5. John TJ. Immunization against poliomyelitis. Present concepts and practice. *Indian J Pub Health* 1985, 29: 157-162.
6. Sehgal H, Oberoi M. A clinical study of severe forms of acute poliomyelitis in children. *Indian Pediatr* 1977, 14: 47-53.
7. Melnick JL, Herbert A, Wenner, Allan Phillips C. Enteroviruses. *In: Diagnostic procedures for Viral, Rickettsial and Chlamydial Infections*. Eds Lennette EH, Schmidt NS. American Public Health Association Inc, 1979, 471.
8. Ratnaswamy L, John TJ, Jadhav M. Paralytic poliomyelitis in South Indian children: Clinical and virological

- observations. *Indian Pediatr* 1973, 10: 443-447.
9. Mana PP, Jadhav M, Mukundan F, John TJ. Paralytic poliomyelitis: Clinical and virological observations. *Indian Pediatr* 1981, 18: 533-538.
 10. Spencer WA. Circulatory Disturbances in Life Threatening Poliomyelitis. *In: Papers presented at IVth International Poliomyelitis Conference. Philadelphia, JB Lippincott, 1958, pp 520-529.*
 11. Srivastava AK, Kumar R, Rahman H, Sharan R, Agarwal VK. A clinical profile of paralytic poliomyelitis with special emphasis on physical therapy and rehabilitation. *Indian Pediatr* 1983, 20: 415-419.
 12. Basu SN. Paralytic poliomyelitis in Children—Part II. Age, sex and seasonal distribution. *Indian J Pub Health* 1985, 29: 183-187.
 13. Gujral VV, Sharma D, Gandrade S, Gupta SP, Dhamija K, Chowdhury DS. Paralytic poliomyelitis in children. *Indian Pediatr* 1977, 14: 379-385.
 14. Sen S, Sharma D, Santhanam S. A clinical and serological study of acute paralytic poliomyelitis in immunized and non-immunized children. *Indian Pediatr* 1985, 22: 891-898.
 15. Gharpure PV. Poliomyelitis—A problem in India. Dr RG Dayagude Memorial Lecture. *J Postgrad Med* 1963, 9: 158.
 16. Cherry JD. Enteroviruses. *In: Nelson's Text Book of Pediatrics. Eds Nelson WE, Behrman RE, Vaughan VC. Philadelphia, WB Saunders Co, 1983, pp 791-804.*
 17. Dave BKH. Study of poliomyelitis in Bombay. *In: Extract from Sentinel Surveillance, NICD, 1985, May.*
 18. Sundervalli N, Narmada R, Chezian SN, Mukunden P. Spurt in poliomyelitis on Madras. *Indian Pediatr* 1981, 18: 539-544.
 19. Saeed A, Kumar R, Srivastava AK, Rahman H, Agarwal VK. An outbreak of poliomyelitis in Allahabad. *Indian Pediatr* 1980, 17: 757-761.

NOTES AND NEWS

SPEAKING OF CHILD CARE EVERYTHING YOU WANTED TO KNOW

The second edition of this book by Dr. Suraj Gupte, M.D. is published by Sterling Publishers, New Delhi. It is meant to be a supportive prescription from a practising pediatrician for the educated young parents. The volume includes chapters on "Infant Parent Love Bonding", "Vaccination", "Working Mother's Problems", "Fathering", "Schooling and its Problems", "Difficult Child", "Gifted Child", "Sex Education", "Discipline", "Behavioral Problems", "Examination Fever", "Adoption" and many more. The style and format are just tailor-made for the target audience. Also available, besides the publishers and dealers, through the author, Dr. Suraj Gupte, M.D., "Gupte House", 60 Lower Gumat, Jammu 180001, J & K State. It is modestly priced at Rs. 150/-. Add Rs. 15/- for handling and postal charges.