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# PARALYTIC POLIOMYELITIS (1989-1994): REPORT FROM A SENTINEL CENTER

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***Objective:*** *To study the trends of paralytic poliomyelitis in pre Pulse Polio Immunization period.* ***Setting:*** *Hospital based sentinel surveillance.* ***Methods:*** *Analysis of 6704 line-listed poliomyelitis cases from January 1989 to December 1994 attending the Department of Physical Medicine and Rehabilitation.* ***Results:*** *85% of all cases reported in Delhi were from this center. A decline in alternate year peaks was observed from 1621 cases in 1990 to 1062 cases in 1994. There was an increase in proportion of cases with poliomyelitis in fully vaccinated children from 14% to 22.9%. Polio type I virus was the commonest isolated virus in all the years except 1993, when type II was isolated in 38.7% of cases.* ***Conclusion:*** *Despite improvement in immunization coverage, the study reveals that a large number of children (67.2%) who suffer from poliomyelitis are unvaccinated. This stresses need to intensify and sustain high level of immunization coverage with effective vaccine.*

***Key words:*** *Poliomyelitis, Epidemiology.*

SERIOUS attempts are being made to eradicate poliomyelitis by 2000 A.D. The criterion for eradication as described by the World Health Organization (WHO) calls for a situation where there will be no new case of clinical poliomyelitis by wild virus and no wild poliovirus shall be identified world wide through sampling of communities and the environment(l). To achieve this aim, immunization against poliomyelitis, started under the Expanded Programme on Immunization (EPI), which has been boosted by launching of Universal Immunization Programme (UIP) in 1985 and the National Child Survival and Safe Motherhood Programme (CSSM) in 1992. Three dose OPV coverage in children below 12 months of age has improved from less than 50% before 1986 to 93.2% in 1994-95 in different parts of India(2). A study from this center from 1976 to 1988 had indicated that even after improved vaccination coverage, there was no significant decline in the incidence of poliomyelitis; instead there was an increase in the proportion of vaccinated children among cases with poliomyelitis(3). This study presents further analysis of data of line listed paralytic poliomyelitis cases attending Kalawati Saran Children's Hospital (KSCH) from January 1989 to December 1994 to evaluate the status of poliomyelitis in Delhi in the pre Pulse Polio Immunization program period.

## Subjects and Methods

This study was carried out in the Department of Physical Medicine and Rehabilitation (PMR) at KSCH from January 1989 till December 1994. KSCH serves as a sentinel center for surveillance of poliomyelitis for northern India. The catchment areas include Delhi,

neighbouring districts of Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh and Bihar. It has a well-developed Department of PMR for management and rehabilitation of cases of poliomyelitis. Between 70% - 93% of all poliomyelitis cases reported in Delhi were seen at KSCH *(Table I).*

The following clinical criteria were utilized for the diagnosis of poliomyelitis: (i) history of abrupt onset of flaccid paralysis following a brief febrile illness; (ii) asymmetric paralysis and absent deep tendon reflexes without sensory loss; and (iii) paralysis with wasting of affected muscles after 60 days of onset.

Cases of poliomyelitis are treated mostly as out patients in the Department of PMR and severe cases are admitted according to standard guidelines. All out patients and hospitalized cases are referred to the Department of PMR where information regarding age, gender, residence, immunization status, clinical presentation and follow up is recorded. Stool samples for virus isolation were taken by anal tube technique from children presenting within four weeks of onset and sent to the Virology. Section, National Institute of Communicable Disease, Delhi. For this study, a fully vaccinated child was defined as one who had received three properly spaced doses of OPV, the last dose having been given at least one month prior to the onset of poliomyelitis. A resident case of Delhi was defined as a child who was residing in Delhi at the onset of illness. The total number of resident cases of Delhi was computed by compiling data from all major hospitals of Delhi, including KSCH(5).

## Results

A total of 6704 cases of poliomyelitis attended the KSCH from January 1989 till December 1994 comprising 85% of all the

**TABLE I**- *Poliomyelitis Cases Seen in Delhi and at KSCH*

| Year | Cases reported in Delhi(4) | Cases seen at KSCH | Delhi resident cases | Delhi resident cases seen at KSCH |
|---|---|---|---|---|
| 1989 | 1158 | 819 (70.7) | 283 (24.2) | 242 (85.5) |
| 1990 | 1749 | 1621 (92.7) | 616 (35.2) | 464 (75.3) |
| 1991 | 959 | 848 (88.4) | 406 (42.3) | 311 (76.1) |
| 1992 | 1818 | 1390 (76.5) | 576 (31.7) | 460 (79.8) |
| 1993 | 1052 | 964 (91.6) | 427 (40.6) | 369 (86.4) |
| 1994 | 1141 | 1062 (93.0) | 463 (40.6) | 435 (93.9) |
| Total | 7877 | 6704 (85.1) | 2771 (35.2) | 2281 (82.3) |

Figures in parentheses are percentages from total cases reported in Delhi.
* Percentage of Delhi residents seen at KSCH is from total resident cases.

cases reported in Delhi during this period. Peaks are evident in alternate years (1990, 1992,1994) *(Table I).*

*Age and Sex Distribution:* Out of the total 6704 cases, 4332 (64.6%) were male. The maximum number of cases were seen between the ages of 6 months to 2 years (73.8%) *(Table II)* and the median age of presentation ranged from 10-12 months during different years.

*Seasonal Variation:* Cases were reported throughout the year but a sharp increase was seen every year during the months of June to October with the peak invariably in the month of August *(Table III).* An early increase from March onwards in 1990 was

**TABLE II**–*Age Distribution of Cases.*

| Year | 0-3 mo | 3-6 mo | 6 mo-1 yr | 1-2 yr | 2-3 yr | >3 yr | Total |
|---|---|---|---|---|---|---|---|
| 1989 | 4 | 58 | 330 | 275 | 110 | 42 | 819 |
| 1990 | 17 | 121 | 569 | 618 | 193 | 103 | 1621 |
| 1991 | 2 | 54 | 318 | 335 | 94 | 45 | 848 |
| 1992 | 17 | 73 | 465 | 565 | 183 | 87 | 1390 |
| 1993 | 4 | 40 | 355 | 380 | 129 | 56 | 964 |
| 1994 | 10 | 45 | 302 | 433 | 163 | 109 | 1062 |
| Total | 54 (0.8) | 391 (5.8) | 2339 (34.9) | 2606 (38.9) | 872 (13.0) | 442 (6.6) | 6704 (100) |

Figures in parentheses indicate percentages of total.

**TABLE III** *Distribution of Poliomyelitis Cases by Month of Reporting.*

| Month | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
|---|---|---|---|---|---|---|
| January | 34 | 77 | 46 | 89 | 43 | 49 |
| February | 21 | 68 | 48 | 56 | 52 | 57 |
| March | 16 | 109 | 24 | 43 | 44 | 43 |
| April | 21 | 106 | 31 | 62 | 52 | 39 |
| May | 22 | 196 | 41 | 110 | 68 | 88 |
| June | 26 | 200 | 66 | 152 | 76 | 93 |
| July | 124 | 229 | 75 | 206 | 127 | 145 |
| August | 154 | 263 | 114 | 201 | 132 | 202 |
| September | 99 | 148 | 117 | 199 | 110 | 161 |
| October | 95 | 76 | 128 | 106 | 112 | 90 |
| November | 110 | 87 | 72 | 84 | 78 | 42 |
| December | 97 | 62 | 85 | 82 | 70 | 53 |
| Total | 819 | 1621 | 848 | 1390 | 964 | 1062 |

related to the early onset of rains that year.

*Geographical Distribution:* Delhi residents accounted for 34% of all the reported cases. In Delhi, more than 50% cases were reported from three zones, namely East Delhi (trans yamuna), Najafgarh and Civil Line zones. The cases mostly belonged to the low socio-economic groups, from the slums of Delhi, *i.e.,* Jhuggi Jhopri and resettlement colonies. The New Delhi Municipal Corporation (NDMC) zone and Cantonment zone reported the least number of cases (5%). Residents of Uttar Pradesh (UP) formed the major proportion of cases from outside Delhi (46.1%) *(Table IV).* The neighbouring districts of Ghaziabad (36%), Bullandsher (17%), Meerut (16.2%), Aligarh (8.5%), Muzaffarnagar (8%) and Moradabad (7.4%) mainly contributed to cases from UP. Only 12% cases belonged to Haryana, 2.3% to Rajasthan and 4.8% to Bihar.

*Immunization Status:* Fully vaccinated children constituted 19.2%, increasing from 14% in 1989 to 22.9% in 1994. Two-thirds (67.2%) children did not receive even a single dose of polio vaccine *(Table V).*

*Virus Isolation:* Of the total 769 samples sent for viral studies, 273 (35.5%) were positive for Polio virus type I which was the commonest virus seen, except in the year 1993 when type II was isolated in 38.7% cases. Non polio virus was isolated in 79 (11.3%) cases *(Table VI).*

*Clinical Pattern:* Of 6704 cases, 1714 (25.5%) required admission with an overall mortality of (4.5%) *(Table VII).* Symptomatology remained the same over the years with fever being the commonest symptom (95%). History of intramuscular gluteal injection

**TABLE IV**–*Geographical Distribution of Poliomyelitis Cases Seen at KSCH (1989-1994).*

| State | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | Total |
|---|---|---|---|---|---|---|---|
| Delhi | 242 | 464 | 311 | 460 | 369 | 435 | 2281 (34.0) |
| UP | 409 | 801 | 386 | 613 | 463 | 424 | 3096 (46.2) |
| Haryana | 124 | 237 | 81 | 169 | 69 | 135 | 815 (12.1) |
| Bihar | 15 | 55 | 47 | 85 | 38 | 42 | 285 (4.2) |
| Rajasthan | 18 | 38 | 15 | 43 | 21 | 16 | 151 (2.3) |
| MP | 5 | 18 | 5 | 12 | 1 | 7 | 48 (0.7) |
| Punjab | 3 | 5 | 2 | 2 | 1 | – | 13 (0.2) |
| Others | 3 | 3 | 1 | 6 | 2 | 3 | 18 (0.3) |
| Total | 819 | 1621 | 848 | 1390 | 964 | 1062 | 6704 |

Figures in parentheses are percentages from total cases at KSCH.

**TABLE V**–*Vaccination Status of Poliomyelitis Cases Seen at KSCH (1989-1994).*

| Year | Total Cases | Vaccinated Cases | | Total Vaccinated | Unvaccinated |
|---|---|---|---|---|---|
| | | Fully | Partially | | |
| 1989 | 819 | 115 (14.0) | 77 (9.4) | 192 (23.4) | 627 (76.6) |
| 1990 | 1621 | 287 (17.7) | 248 (15.3) | 535 (33.0) | 1086 (67.0) |
| 1991 | 848 | 146 (17.2) | 127 (15.0) | 273 (32.2) | 575 (67.8) |
| 1992 | 1390 | 306 (22.0) | 195 (14.0) | 501 (36.0) | 889 (64.0) |
| 1993 | 964 | 189 (19.6) | 89 (9.2) | 278 (28.8) | 686 (71.2) |
| 1994 | 1062 | 244 (22.9) | 177 (16.7) | 421 (39.6) | 641 (60.4) |
| Total | 6704 | 1287 (19.2) | 913 (13.6) | 2200 (32.8) | 4504 (67.2) |

Figures in parentheses indicate percentages of total cases.

(administered for fever by general practitioners) was obtained in 43.09% of cases and paralysis usually occurred first in the injected limb.

Spinal type of poliomyelitis was the commonest clinical presentation (in 90.5% of cases), followed by bulbospinal (8.3%), encephalitic (1%) and bulbar (0.2%; presenting as isolated facial palsy). Unilateral lower limb involvement was seen in 52.3%, bilateral lower limb paralysis in 39% while more than two limb involvement was documented in 2%. Generalized involvement with trunk, respiratory and neck muscle paralysis was seen in 4.7% of cases.

## Discussion

Baseline sample lameness surveys done in 1981 and 1982> which covered a period when there were no OPV immunization services in the country showed that on an average 20 to 25 cases of paralytic poliomyelitis per 100,000 population could be expected annually in the absence of an immunization programme(b). With improvement in vaccination coverage, the number of reported cases of poliomyelitis had declined from 28,264 in 1987 to 4,055 in 1993(2). The reported rate per 100,000 population in Goa, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, Chandigarh and Pondicherry had fallen from 5.7 in 1986 to 1.1 in 1990 and 0.6 in 1991. In Bombay, a significant decline first observed in 1988 has been sustained (7,8). In comparison, in Delhi there was a decline in the reported cases of poliomyelitis after 1981 but this was not sustained and a rising trend had been observed in 1987 and 1988(3). The present study indicates that poliomyelitis still persists in significant numbers in this area, with an increase in the observed cases in alternate years (1990,1992,1994). Similar peaks in alternate years had been observed

TABLE VI–*Type of Poliovirus Causing Disease.*

| Type | 1991 | 1992 | 1993 | 1994 | Total |
|---|---|---|---|---|---|
| Polio virus type I | 35 (40.7) | 92 (83.6) | 16 (32.6) | 16 (57.1) | 159 (58.4) |
| Polio virus type II | 35 (40.7) | 5 (4.5) | 18 (36.7) | 5 (17.9) | 63 (12.3) |
| Polio virus type III | 5 (5.8) | 9 (8.2) | 3 (6.1) | 6 (21.4) | 23 (8.4) |
| Multiple viruses > one type | 7 (8.1) | 4 (3.6) | 10 (20.4) | 1 (3.6) | 22 (8.5) |
| Not typed | 4 (4.7) | – | 2 (4.1) | – | 6 (2.1) |
| Total polio | 86 [32.6] | 110 [40.6] | 49 [40.2] | 28 [25.0] | 273 |
| Non polio virus | 14 [5.3] | 28 [10.6] | 5 [4.1] | 32 [28.6] | 79 |
| No virus | 164 [62.1] | 133 [48.8] | 68 [55.7] | 52 [46.4] | 417 |
| Total | 264 | 271 | 122 | 112 | 769 |

Figures in parenthesis indicate percentage of total cases

earlier(9,10). Fully vaccinated children constituted a significant proportion of children with paralytic poliomyelitis (22.9% in 1994). Higher (41%) and lower (5%) proportion of fully vaccinated children with acute poliomyelitis have been reported earlier (11,12). In a surveillance of acute flaccid paralysis (AFP) in two Districts of Haryana, 20% of reported AFP cases occurred in fully vaccinated children(7). With improvement in vaccination coverage, the proportion of polio cases occurring in fully vaccinated children can be logically expected to rise.

It is clinically difficult to distinguish cases of poliomyelitis from other non polio enterovirus infections resulting in AFP. Over a period of four years (1991-1994), out of 769 stool samples analyzed, non-polio viruses were isolated from 79 (10.2%) samples with an increase in their isolation in 1994 (28.6%). With improvement in vaccination coverage, non polio enteroviruses can be expected to contribute to a proportionately larger number of AFP cases. A recent study from Madras reported non-polio virus isolation in 20.2% cases clinically indistinguishable from poliomyelitis. These facts indicate that for surveillance and control of poliomyelitis, more facilities for laboratory confirmation are essential(13). In conclusion, data from our center shows that poliomyelitis persists in significant numbers and the alternate year 'peak-trough' pattern continues to occur. There is no change in the epidemiology and clinical pattern of the disease over the last 25 years (3,9) except that vaccinated children now constitute a larger proportion of cases. A

**TABLE VII**– *Mortality in Poliomyelitis Cases Seen at KSCH*

| Year | Total cases | Admissions | Deaths |
|---|---|---|---|
| 1989 | 819 | 241 (29.4) | 52 (6.3) |
| 1990 | 1621 | 423 (26.1) | 74 (4.5) |
| 1991 | 848 | 203 (23.9) | 43 (5.16) |
| 1992 | 1390 | 297 (20.9) | 53 (3.76) |
| 1993 | 964 | 265 (27.5) | 39 (4.0) |
| 1994 | 1062 | 285 (26.5) | 42 (3.9) |
| Total | 6704 | 1714 (25.5) | 303 (4.56) |

Figures in parenthesis indicate percentage of total cases seen at KSCH

large number of cases come from rural areas and urban slums and are unvaccinated. Awareness among the people for vaccination is imperative for the eradication of this disease.

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