

Polio Eradication in India: Myth or Reality

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Abstract

Background: Poliomyelitis has been eradicated from large parts of the world. In South East Asian Region, India and Pakistan remain the only countries where active transmission of the disease persists. A decade-long initiative to eradicate the disease is in progress in India. Initial results were encouraging, with the number of fresh polio decreasing till 2001. The year 2002, however, witnessed a setback, with significant rise in cases of poliomyelitis.

Methods and Results: The eradication measures have been reviewed. The corrective measures appear to be succeeding. Various facets of eradication and their impact are evaluated.

Conclusion: Poliomyelitis is controlled but the ultimate target of eradication may still be elusive, keeping in mind operational lacunae and vaccine virus characteristics.

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Key Words: Poliomyelitis; Eradication in India; Surveillance; Vaccine

Introduction

Poliomyelitis has been the focus for prevention and control right from the inception of the Expanded Programme for Immunisation (EPI), adopted by the World Health Assembly in 1974. The availability of both the live attenuated Oral Polio Vaccine (OPV) and injectable Inactivated Polio Vaccine (IPV) and their effective usage in various countries raised hopes of eradicating this scourge. OPV was incorporated by India into the Universal Immunisation Programme (UIP) for children in 1980.

Intensive Pulse Polio Immunisation (IPPI) was started in 1995, when all children under five years of age, irrespective of their immunisation status, were given additional doses of Oral Polio Vaccine (OPV) on National Immunisation Days (NIDs) and Sub National Immunisation Days (SNIDs). After a decade of intensive effort, are we any closer to eradication?

Since the World Health Assembly resolved in May 1988 to eradicate poliomyelitis, estimated global incidence of polio decreased by more than 99%, with three World Health Organization (WHO) regions (Americas, Western Pacific and Europe) being certified as polio-free. Since 1994, when the South-East Asia Region (SEAR) began accelerated polio-eradication activities, substantial progress has been made [1]. By 2001, poliovirus circulation in India had been limited primarily to two northern states of Uttar Pradesh and Bihar, with 268 cases reported nationwide. However, a

major resurgence occurred in 2002, with 1600 cases detected nationwide, of which 1363 (85%) were in Uttar Pradesh and Bihar [2].

Poliomyelitis Eradication - an Overview

Poliomyelitis is caused by wild poliovirus of 3 types - Type 1, 2 and 3. The virus spreads by the faeco-oral route. Almost 90% of those infected shed the virus in their faeces but are not ill. 5-10% suffer aseptic meningitis, mild fever, sore throat, abdominal pain and vomiting, while less than 1% develop paralysis.

WHO defines polio eradication as 'zero incidence of wild poliovirus (WPV) transmission anywhere in the world' [1]. However, this definition excludes a rare form of poliomyelitis caused by Vaccine derived poliovirus (VDPV) that can cause Vaccine associated paralytic polio (VAPP). Essentially, all live attenuated strains of OPV can mutate and revert to neurotropic form, causing VAPP. However, the incidence is very rare at 1 per 1.5-2.2 million doses administered [3,4]. A study in India found the risk of VAPP to be 1 per 4.1-4.6 million doses [5].

The National Polio Surveillance Project (NPSP), a partnership of the Govt of India and WHO is coordinating the eradication efforts in India. The strategy to eradicate wild poliovirus is two-fold-immunisation and surveillance.

Immunisation

For effective herd immunity, at least 80% of all eligible children must get routine doses of OPV. Non-registration

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of home deliveries, lack of education and non-availability and incorrect administration of potent vaccine interferes with effective immunisation. During 2002, approximately 68% infants received more than 3 doses of oral poliovirus vaccine (OPV3) in India. Substantial variation was found between states in routine coverage with OPV3, ranging from 21% in Bihar to 99% in Madhya Pradesh. OPV3 coverage in Uttar Pradesh was 41% [6]. Even those administered OPV were not protected and sero-conversion with 3 doses of OPV varied from 70-90%, which rose to 88-96% with 5 doses [4].

To overcome these problems, NIDs are held in many countries. The whole nation is mobilised to provide vaccine to every child aged less than 5 years. This is the basis of IPPI in India and since 1995 biannual NIDs using fixed-site OPV vaccination have been conducted to supplement routine OPV vaccination. During 1999, Supplementary Immunisation Activities (SIAs) were intensified, with the addition of house-to-house vaccination after an initial day of fixed-site activity [7].

During 1999-2002, the number of large-scale NIDs and SNIDs conducted in India decreased, from six during October 1999-March 2000 to four during 2000-2001 and three during 2001-2002. However, during 2002-2003, two NIDs and four large SNIDs (the latter targeting 60-70 million children during each round) were conducted [7]. Monitoring of SIA quality was enhanced by introduction of new vaccinator data-collection forms and standardized independent observer checklists. Specific districts and blocks were identified for focused attention, based on data analysis that revealed weaknesses in the programme.

In Uttar Pradesh and Bihar, routine OPV coverage improved substantially during 2002-2003. The proportion of children aged 6-59 months who had less than 3 OPV doses (routine or supplemental) decreased from 20% to 6% in western Uttar Pradesh and from 17% to 7% in Bihar. However, during the same period, the proportion of such children increased to more than 23% in eastern Karnataka and to 10% in Andhra Pradesh [7].

With VAPP being linked to OPV, possibility of replacement with Inactivated Polio vaccine (IPV) has been suggested [3,4,8,9]. The enhanced potency IPV (eIPV) trials in the western world have been encouraging but herd immunity, has only been studied in small samples. Proponents of IPV have even suggested a combined OPV-IPV schedule to replace OPV.

Surveillance

Finding children suffering from paralysis of sudden onset or Acute Flaccid Paralysis (AFP) is a sensitive indicator of wild poliovirus activity. An AFP case detected by health workers is reported to local health

authorities and to state and national bodies. Case investigators are sent to confirm the diagnosis and collect faecal samples that are transported to the nearest laboratory for virus culture. This is followed by Outbreak Response Immunisation (ORI), wherein all children less than 59 months in the area are given an additional dose of OPV. At least 500 children are vaccinated under ORI. Along with ORI, an intensive search is carried out for more cases of AFP. The case definition includes any child less than 15 years with history of flaccid/floppy paralysis. The AFP cases are revisited after 60 days of onset of paralysis to check for residual weakness/neurological deficit. The confirmation of paralytic polio is based on the review after 60 days and the laboratory report of the stool specimen.

The suspected stool samples are sent to WHO recognized National Laboratories where poliovirus culture and identification are carried out. If poliovirus is found, the samples are forwarded to one of the Regional Reference Laboratories where VDPV and wild poliovirus are differentiated.

During 2003, a total of 225 wild poliovirus (WPV) cases were reported from India, a substantial decrease from the 1600 cases reported in 2002. Of these, 203 (90%) were WPV type 1 (P1), and 22 (10%) were WPV type 3 (P3). During 2003, incidence decreased from 1242 to 88 in Uttar Pradesh, from 121 to 18 in Bihar and from 49 to 28 in West Bengal. 68% of the confirmed cases in Uttar Pradesh occurred in minority populations, which constitutes 17% of the state's total population [7].

The 225 cases reported in 2003 are the lowest number of polio cases in India's history with Uttar Pradesh and Bihar reporting the lowest number of cases ever. The increased frequency and quality of SIAs and expanded social mobilization had an impact. Outbreak of disease in southern states in 2003 was attributable to inadequate routine OPV3 coverage [7,8].

Reasons for resurgence

Resurgence of polio cases in 2002 can be explained by the decline in OPV3 coverage in critical areas. During 1999-2002, the number of NIDs / SNIDs decreased. Also, no NIDs or SNIDs were conducted during January-September 2002, allowing the accumulation of a large susceptible cohort of newborns. The geographic extent of SIA implementation had also decreased. Although some smaller-scale SIAs ("responsive mopping-up" activities) were conducted in selected districts while the majority of districts in eastern and central Uttar Pradesh were not targeted, leaving this area at high risk. SIA monitoring in western UP during June-August 2002 indicated that house-to-

house teams vaccinated children in <15% of houses in some districts. Thus, hundreds of thousands of children were missed in areas with high population density, a very large birth cohort and poor sanitation which favor poliovirus transmission. A major factor contributing to poor SIA quality in Uttar Pradesh was inadequate involvement of the community, particularly minority groups [9]. Other reasons for non-compliance have been a) apprehension of side effects b) unawareness of necessity for repeated doses c) social barriers like caste, gender, "purdah" system etc. d) lack of faith in 'government activity' e) lack of motivation among workers to carry out house-to-house mop-up rounds.

Corrective measures have been successful. During 2004, 130 confirmed cases of wild poliovirus have been reported from 26 districts in India [10], 78 from west Uttar Pradesh, 39 from Bihar, 3 from Maharashtra, 2 each from Delhi, Haryana and West Bengal and a single case from Andhra Pradesh, Tamil Nadu, Karnataka and Uttaranchal.

Sceptics feel there is an element of under-reporting in these statistics [11]. The definition of confirmed polio "residual weakness 60 days after onset of paralysis *and* isolation of poliovirus in stool sample", may not be adhered to in some places and independent validation needs to be reinforced.

Conclusion

A critical juncture has been reached in eradication of poliomyelitis in India. The tools are available which are proven to be effective across the world. The large disparity in routine vaccine coverage among various regions of the country is hampering the eradication efforts. Compounding the problem is the social mobility from migrant labour moving to urban conglomerates. Eradication efforts need to be focused on these high-risk groups, including mop-up activity for absentee and defaulter immunisation. Community participation remains the key to success and has to be ensured for better compliance.

The importance of ensuring cold chain has to be stressed to maintain vaccine potency. Potency checking of OPV is hardly done after the inception of the Vaccine Vial Monitor (VVM) into IPPI. A review of this may be necessary to ensure that a potent vaccine is used.

As we near the control of wild-virus transmission, VAPP is a real danger. The introduction of IPV may be an option, at least in the better performing areas like Kerala and the North East. Combination of DPT with IPV in the UIP has been suggested and may have to be done in the near future.

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