

Editorial

The vicissitudes of global eradication of polio

The current context

Two recent developments demand our attention. In India a group of scientists have questioned the need and strategy of polio elimination in India¹ (Banerji D, *et al.* Memorandum on Polio Eradication Initiative in India, addressed to the World Health Organization, UNICEF and Government of India, World Health Day, 7 April 2004). In Nigeria, Muslim religious leaders have alleged that oral poliovirus vaccine (OPV) is unsafe for children². Consequently immunization coverage has dropped and there is currently an outbreak of polio in Nigeria, spilling over to neighbouring countries².

Time is running out fast from under the feet, and finances even faster, for reaching the finishing line, postponed perforce to 2005 from the original target date of 2000. Unless polio is eliminated in India and Nigeria, global eradication cannot be achieved. Unless achieved this year, or latest the next, the future of the programme itself may well be in jeopardy. Now is not the time for raising controversies, for which the polio eradication field is fertile. At the same time one cannot wish them away and it is imperative that the concerns raised are addressed in order to forge unity among all involved and interested groups and persons. First, wild poliovirus transmission must be stopped in India. Later, together with the global partners, India must plan to face the next phase, to conclude the task safely and economically.

The global scenario

By 22 June 2004, globally 333 children with wild-virus polio have been reported³. The six countries endemic for indigenous wild virus transmission in the previous year continued to be so in 2004 also, and accounted for 307 cases - Nigeria (257 cases), Niger (18), Pakistan (15), India (13), Afghanistan (3) and Egypt (1)³. The Sub-Saharan African nations that had imported virus from Nigeria and had polio in 2004 were Cote d'Ivoire (8 cases), Chad (7), Benin (4), Burkina Faso

(4), Botswana (1), Central African Republic (1) and Sudan (1)³.

The situation was alarming in India in 2002 with 1600 cases. It is alarming today in Nigeria. The listed African nations that had earlier eliminated polio are at risk of re-establishing transmission by virus seeded from Nigeria. The key to success is the elimination of wild virus transmission from the endemic sources. The common adverse factors in the polio endemic regions of India and Africa include unsatisfactorily low and slow coverage of regular childhood immunization, low efficacy and efficiency of OPV and in some places, extremely high 'force of transmission' (FoT) of wild polioviruses⁴.

Since 1988 the global polio eradication partnership has spent more than US \$ 3 billion², which is already far in excess of the original budget. An additional US \$ 100 million has been stated as the current shortfall².

The Nigerian scenario

Nigerian population is predominantly Muslim in the north with Christian minority concentrated in the south. Some Islamic religious leaders in the north alleged that OPV had been laced with anti-fertility hormone to render girls infertile³. The build-up of such objections had already resulted in poor acceptance of OPV for many months and also the suspension of OPV campaigns in 2003². Consequently in March 2004 the monthly incidence of polio in Nigeria was the highest ever recorded³. Kano state has the highest incidence in the current outbreak, yet the state government refused to participate in immunization campaign to contain virus transmission³. The Rotary International, a major non-United Nations partner in polio eradication, had Jonathan Majiyagbe of Nigeria as its president during 2003-2004; yet this crisis could not be averted². In 2004, so far 257 children are paralysed by wild-virus polio in the predominantly Muslim communities in Nigeria³. The polio high season is yet to come and experts fear a calamitous epidemic not only in Nigeria but in other African nations also². Poliovirus

has spread to ten neighbouring countries in recent months, including in seven in 2004. The latest signal of importation is a child paralyzed in Darfur in northern Sudan on May 20, 2004. Earlier for three years Sudan was free of poliovirus transmission. The people of Darfur, already devastated by civil strife, are facing famine conditions; if poliovirus establishes local transmission, they face another uphill task to interrupt it.

There is some comforting news in that the Nigerian religious leaders have apparently agreed to allow immunization with OPV made in Indonesia, another Muslim country^{2,3}. Immunization is needed now, for which negotiations are apparently under way. The current plan is to organize massive OPV pulse campaigns synchronized in 22 countries in Africa, covering 74 million children, during October and November this year². By then the virus would have spread widely.

The Indian scenario

As mentioned earlier, 13 wild virus isolations – 12 type 1 and one type 3 – from children with paralysis had been reported in India until mid-May 2004³. On 19 May one more child developed paralysis due to type 1 poliovirus, bringing the total to 14. Geographically there was a single case each in the states of Karnataka (date of onset 4 February), Tamil Nadu (18 February), Delhi (3 March), West Bengal (11 April) and Andhra Pradesh (1 May); and there were 5 cases in Uttar Pradesh and 4 in Bihar. The last type 3 virus isolation was from a child in Bihar with onset of paralysis on 28 January. So far this is the lowest number ever in a comparable time period, but then there were only 18 cases in 2001 January to May, the year preceding the outbreak in 2002. As of now we cannot be certain if any more wild virus would be found in the specimens collected in May and June, and there is no guarantee that the upswing of numbers seen in 2001-2002 will not recur in 2004. Yet, the facts that only one type 3 strain was detected in 5 months and that 5 cases were 'stray and single' in widely distant regions, without evidence of secondary cases, are signs of dwindling transmission chains.

In Mumbai city there is a project to search for wild polioviruses in sewage, conducted by the Enterovirus Research Centre of the Indian Council of Medical Research. On several occasions during 2004 wild viruses were detected, but there was no child with polio in the

city (JM Deshpande, personal communication, June 2004). Genotyping has shown these viruses to be of Uttar Pradesh lineages. This illustrates that virus does circulate for limited periods of time even in well-immunized communities in which most children are protected from disease.

The national plan of action for the remaining months of 2004 calls for immunization campaigns in the affected states in July and August this year, followed by nationwide pulse campaigns in October and November. With these efforts it is hoped that further transmission of wild viruses could be stopped.

Is poliomyelitis eradicable?

The Memorandum referred to earlier states that "an elimination strategy is passed off as an eradication strategy when it is clear that poliovirus cannot be eradicated in India relying on vaccination alone". The definition of elimination is zero incidence of disease or infection in a defined geographic territory⁵. In the case of polio, elimination of disease cannot be achieved without elimination of infection. Eradication is elimination at the global level, and elimination is eradication at country or regional level⁵. Thus, these are terms applied to the geographic extent of achieving zero incidence, not to the degree of our mastery over the pathogen.

In the absence of extra-human reservoir, polioviruses are theoretically eradicable, as we have adequate tools for intervention and diagnosis. This much everyone agrees, but questions do remain. Absolute proof of eradicability has to emerge *post facto*. Proof of principle is ample in rich and middle-income countries in which the FoT of wild polioviruses was relatively low or moderate. Wild viruses have been eliminated even in nearly all low-income countries with low or moderate FoT. The problem is in communities with very high FoT, such as in parts of Egypt, Nigeria and India. High density of population with high birth rate resulting in very high density of children, combined with poor sanitation and hygiene, form a milieu of formidable FoT, a barrier to breaking the chains of poliovirus transmission.

Historically, improvements in sanitation, hygiene and living standards in industrialized nations did not control polio, but simply shifted the epidemiology to periodic outbreaks affecting adolescents and adults. Thus polio

became even more dreaded than before, providing the urgency of impetus to develop preventive vaccines. The tactical application of immunization is the only way to eradicate polio.

In India, the median age of paralytic polio is 12-18 months, illustrating that the FoT is extremely high. It was more on faith than on evidence that termination of poliovirus transmission was targeted in India and other places with very high FoT. However, the tactics of vaccination applied in such places were the same as in places with easier epidemiology. Basically this was the reason why the world missed the target of 2000. Infants and young children are the most efficient amplifiers of wild viruses. Eradication requires higher 'force of immunization' than the FoT of natural infection, whereby infants are fully immunized more speedily than the speed of acquiring natural infection. Against wise counsel, India adopted the policy of exclusive use of OPV, in spite of its drawbacks of low efficacy and potential for vaccine-associated paralytic polio (VAPP)^{4,6,7}. Expert suggestion for a policy on polio was to use OPV only as an interim measure to rapidly control the disease, while getting prepared to introduce IPV⁸. The WHO had advised cautionary steps for countries using OPV, which were unfortunately ignored⁶. With OPV, infants should receive more than 7 doses to achieve the necessary force of immunization, which means at least five doses in the age-based immunization schedule and three doses by annual pulse campaigns. Instead, India scheduled only three regular doses, which was inadequate even to control the disease and went on to the eradication mode even before achieving control status. These issues can be debated at appropriate forums, but today our responsibility is to complete the task undertaken by our Government in 1988, to eradicate polio by 2000.

Indian delegation to the World Health Assembly of 1988 voted for global polio eradication by 2000, thus committing the Government of India to its elimination in the country by 1997, for obtaining certification in 2000. However, the Ministry of Health, Govt. of India did not take any initiative to achieve this during the ensuing several years. Irrespective of several debatable issues, it is the duty of every right-minded person to help fulfill the nation's promise to the world. Just as we have expressed our solidarity with the nation at times of war, the need of the hour is to ensure India wins this war against polioviruses. There is a time for

dissent and there is a time for duty. Now is the time for keeping our differences of opinion away from distracting us from our primary duty to eliminate polio. We should not become the rogue nation holding the rest of the world at ransom with the threat of exporting wild polioviruses.

India's immunization campaigns for eradication started in 1995-1996 and eight years of herculean efforts have progressively retarded wild virus transmission and it must now be brought to zero in 2004 as we have the best ever opportunity to achieve that goal. It will be good to have an internal Indian review of the polio eradication programme with two purposes. One is to design the tactics for the final phase, when we must eliminate infection by vaccine viruses. Second is to learn lessons of successes and failures so that India will be better prepared to face other challenging problems of communicable diseases. Dissent can and must wait, but now all of us should put our shoulders to the wheel.

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