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Global Polio Eradication- Are we there???

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ABSTRACT

Since its launch at the World Health Assembly (WHA) in 1988, the Global Polio Eradication Initiative (GPEI) has reduced the global incidence of polio by more than 99% and the number of countries with endemic polio from 125 to 3. More than 10 million people are walking today who otherwise would have been paralysed. The year 2012 ended with the fewest polio cases in the fewest countries ever; now is the best opportunity to finally put an end to this terrible, yet preventable, disease.At the beginning of 2013, polio – a highly infectious viral disease that causes swift and irreversible paralysis – was a distant memory in most of the world. There were still a few hundred cases of WPV-related paralysis each year (416 cases in 2013 and 359 in 2014).The number of wild poliovirus type 1 cases reported in the last 6 months is 25 (Pakistan- 23, Afghanistan- 2).(2)

KEYWORDS

On 26 May 2012, the World Health Assembly declared ending polio a "programmatic emergency for global public health". Noting India's success using available tools and technology, the threat to the global community of ongoing poliovirus transmission in the last three endemic countries Afghanistan, Nigeria and Pakistan – and the growing knowledge about and risk of circulating vaccine-derived polioviruses (cVDPVs), which can cause outbreaks of paralytic disease, the WHA called on the World Health Organization Director-General to develop and finalize a comprehensive polio endgame strategy.(1)

The Polio Eradication and Endgame Strategic Plan 2013-2018 (the Plan) was developed to capitalize on this new opportunity to end all polio disease. It accounts for the parallel pursuit of wild poliovirus eradication and cVDPV elimination, while planning for the backbone of the polio effort to be used for delivering other health services to the world's most vulnerable children.(1) Live attenuated oral polio vaccine (OPV) and inactivated polio vaccine (IPV) are the tools being used to achieve eradication of wild polio virus. Because OPV can rarely cause paralysis and generate revertant polio strains, IPV will have to replace OPV after eradication of wild polio virus is certified to sustain eradication of all polioviruses.(3)

However, uncertainties remain related to IPV's ability to induce intestinal immunity in populations where fecal–oral transmission is predominant. Although substantial effectiveness and safety data exist on the use and delivery of OPV and IPV, several new research initiatives are currently underway to fill specific knowledge gaps to inform future vaccination policies that would assure polio is eradicated and eradication is maintained.(3)

Advances against Polio

Global eradication of polio is within grasp. Only Pakistan, Nigeria and Afghanistan are currently considered endemic for polio because they have never eliminated indigenous polio viruses. Although the overall reduction in global incidence of cases has been more than 99% since the eradication efforts begun in 1988 when an estimated 350,000 persons were paralyzed by wild polio viruses (WPVs), there are still a few hundred cases of WPV-related paralysis each year (416 cases in 2013 and 359 in 2014). These cases are occurring both in the endemic countries as well as in countries re-infected via importations.(3) The number of wild poliovirus type 1 cases reported in the last 6 months is 25 (Pakistan- 23, Afghanistan- 2)(Fig 1.)(2)

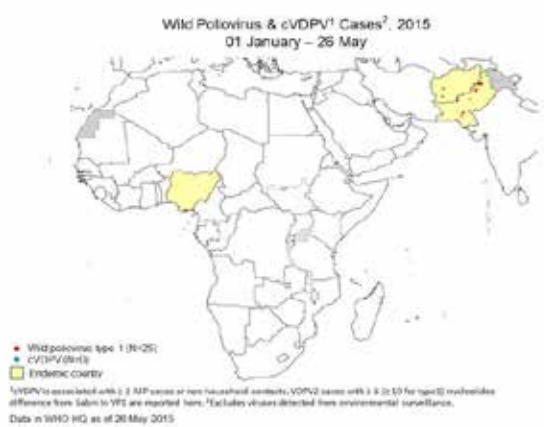

Figure1: World map of wild Poliovirus Circulation in the year 2015

Two vaccines, live attenuated oral poliovirus vaccine (OPV) and inactivated poliovirus vaccine (IPV) are used throughout the world to protect against polio.OPV is used instead of IPV for several reasons: OPV costs substantially less than IPV (15¢ vs US$1or more); primary immunization with OPV induces superior intestinal immunity compared with IPV and thus has the potential to better prevent transmission of wild viruses; OPV confers contact immunity through passive immunization of unvaccinated persons from viruses shed by vaccines; and OPV is administered in oral drops, which are easier to administer than IPV injections and easier to store and transport.Despite these advantages, most developed countries have transitioned to IPV, primarily because OPV has the major disadvantage of causing paralytic disease in rare cases.(3)

Even the Strategic Advisory group of Experts (SAGE), the world's chief immunization guidance body has recommended the withdrawal of type 2 component of vaccine and facilitated the introduction of at least one dose of IPV.(1)

Challenges in Global Polio Eradication Initiative

On 26 May 2012, the WHA declared ending polio a "programmatic emergency for global public health". But the threat to the global community of ongoing WPV transmission in the last three endemic countries- Afghanistan, Nigeria and Pakistan remains. Risk of imported WPV is significant for India as its neighbouring countries Pakistan accounts for 176/224

global cases of WPV reported in 2014 and Afghanistan account of 24/224 cases.

Apart from this, the risk of circulating vaccine derived polioviruses (cVDPVs), which can cause outbreaks of paralytic disease made Director General of WHO to develop and finalize a comprehensive polio endgame strategy.[1] VDPV2 causes more than 90% of the cVDPV outbreaks in the world including India and more than 40% of VAPPs.

Polio Eradication and End Game Strategic Plan 2013-2018
The plan was created by the GEPI in extensive consultation with national health authorities, global health initiatives, scientific experts, donors and other stakeholders. Its goal is the complete eradication and containment of all wild, vaccine related and Sabin Polioviruses, so no child ever again suffers paralytic poliomyelitis.[1]

Major elements that distinguish this plan from previous GPEI strategic plans include: 1) strategic approaches to end all polio disease (wild and vaccine related), 2) an urgent emphasis on improving immunization systems in key geographies 3) the introduction of new affordable IPV options for managing long term poliovirus risks and potentially accelerating wild poliovirus eradication 4) risk mitigation strategies to address new threats, particularly insecurity in some endemic areas and contingency plans should there be a delay in interrupting transmission in such reservoirs 5) a concrete timeline to complete the programme.[1]

Main Objectives of Plan
The four main objectives of the plan are: 1) Poliovirus detection and interruption: stop all WPV transmission by the end of 2014 and new cVDPV outbreaks within 120 days of confirmation of the first case; 2) Immunization systems strengthening and OPV withdrawal: hasten the interruption of all poliovirus transmission and help strengthen immunization systems; 3) Containment and certification: certify all regions of the world polio free and ensure that all poliovirus stocks are safely contained; 4) Legacy planning: ensure that a polio free world is permanent and that the investment in polio eradication provides public health dividends for years to come (Figure 2).[1]

Figure 2 Main objectives and time line of global end game strategic plan 2013-2018[article]

Implementing the Plan
A Monitoring Framework will be used to assess progress against the major milestones. Important aspects of the Plan's success

- Checks and balances to ensure the milestones are met and corrective actions are implemented as needed
- Maximum efficiency and effectiveness to administer the programme and achieve results.[1]

End Game Barriers
While it has been shown that IPV integrated into RI programs will indeed reduce the prevalence of paralytic polio within a population,uncertainties remain on IPV's role in impacting transmission as part of a global polio eradication strategy as evident with the situation in Israel in 2013–2014 with more than a year of WPV1 isolation in sewage samples as discussed before.[3]

On the other hand, Yogyakarta in Indonesia also switched to an all IPV schedule and has not detected any VDPVs since the change. Yogyakarta had very high coverage and improved economic and public health infrastructure which may limit generalizability of this case to the low-income settings.

Also, the force of infection of a vaccine virus may be different than that of a WPV, and IPV may be more effective against the former than the latter. It will be important to continue to monitor for circulation of type 2 viruses in particular as IPV becomes the only inducer of immunity to type 2 with the proposed switch of tOPV to bOPV.[3]

Tools of the Future
- Research is underway to assess the impact of the number and timing of full or fractional doses of IPV on priming and viral shedding.
- Several new vaccine technologies are currently being explored such as monovalent IPV-2, aluminum salt adjuvants, double-mutant heat-labile enterotoxin adjuvants, intradermal delivery of IPV with innovative tools, IPV manufactured from Sabin strains and more genetically stable OPV strains among other research initiatives. [3]

Future Perspective
- Significant effort is required to rid the world of the last reservoirs of poliovirus disease and secure eradication for generations to come. Although the currently available vaccines are effective, safe and have been proved to be adequate in eliminating the disease from most part of the world, improved tools and techniques can further accelerate the process of achieving and sustaining eradication in developing countries. [3]

Conclusion
Poliovirus transmission has been wiped out from more than 99% of the world with the successful use of OPV and IPV over the past several decades and effective programmatic use and delivery of these two vaccines in the current polio reservoirs should be adequate to enable global polio eradication in the near future. However, to maintain a world permanently free from the risk of all polioviruses, the eradication program will have to overcome challenges such as the rare occurrence of revertantneurovirulent and highly transmissible strains of polioviruses from OPV, and the relative lack of primary intestinal mucosal protection from IPV. Ongoing and future research initiatives focused on evaluating immunogenicity and safety of current and new vaccine choices in different schedules with careful consideration towards cost and programmatic feasibility have the potential to further accelerate the goal of achieving and sustaining eradication.[3]

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