

Polio Eradication: Pakistan and 2015. New Strategies and an Update

Ali Faisal Saleem

The Polio eradication requires the removal of all polioviruses from human populations, whether wild poliovirus (WPV) or those emanating from the oral poliovirus vaccine (OPV). So, even if global use of OPV could completely eradicate wild poliovirus, there would still be the issue of how to eradicate the vaccine-derived strains. The aim of this short commentary is to provide a brief summary of current poliomyelitis situation in Pakistan, along with important new innovative strategies essential for the eradication of this disease from Pakistan.

Pakistan is currently leading in Polio cases worldwide; contribute to almost 85% of 2014 cases globally¹⁻². The trends of reported Polio cases over the period of time in Pakistan is shown in Fig.1. Pakistan is also leading polio-exporting country directly or indirectly across from porous borders. World Health Organization took measures to ensure that all people traveling should have polio vaccination at least a month prior to their travel from Pakistan abroad. There were high-level meetings and new strategies and measures were also discussed in and across Pakistan. Hence 2014 was found to be the one of the worst Polio eradication year for Pakistan. However, there is certain good news too; There is no poliovirus 2 or 3 in Pakistan. Last case of wild poliovirus 2 was in 1999 and poliovirus³ was in 2012. All the reported cases since 2013 are of wild poliovirus1. Environmental samples were also negative for both these polioviruses. So, the last and only threat is poliovirus 1^{3,4}.

Department of Paediatrics Infectious Diseases,
Aga Khan University, Karachi, Pakistan.

Correspondence: Dr. Ali Faisal Saleem,
Assistant Professor, Paediatrics Infectious Diseases,
Aga Khan University, Karachi, Pakistan.
Phone: 021-34864718
Email: ali.saleem@aku.edu

One of the important strategy for the Polio endgame is "Polio Eradication & Endgame Strategic Plan 2013-2018", this provides a framework for interruption of WPV transmission in remaining endemic foci and lays out plan for the new Polio endgame, which includes the withdrawal of Sabin strains, starting with type 2, and the introduction of inactivated poliovirus vaccine (IPV), for risk mitigation purposes^{5,6}. Introduction of one dose of IPV into routine immunization schedules in OPV-only using countries is starting in 2014 and is planned to be completed in the second half of 2015. This introduction requires adequate funding, especially in low-resource countries as well as sufficient supply of IPV.

The current strategy for Pakistan is use of OPV in poliovirus eradication, this is either trivalent (tOPV) providing protection against all three poliovirus serotypes; bivalent OPV (bOPV) providing protection against serotypes 1 and 3; or monovalent OPV (mOPV1) providing protection against poliovirus type 1. The selection of OPV type for SIAs is driven by epidemiology and vaccine availability. All of these vaccines have been used in SIAs conducted in Pakistan⁷.

There are certain new strategies for Pakistan. Short Interval Additional Doses (SIAD) of Polio vaccine is an important strategy where giving 5-6 oral Polio vaccine dosages in a short interval mount/boost the Polio vaccine immunity. A recently concluded trial from The Aga Khan University evaluates the strategy for Pakistan where they assess the non-inferiority of shorter intervals (7 and 14 days) non-inferiority of shorter intervals (7 and 14 days) between doses of mOPV1 vaccine compared to the customary interval (30 days). A 4th arm will receive bivalent (bOPV) vaccine at standard intervals begin-

ning at 6 weeks of age. They found an increase Polio vaccine immunity among children received SIAD strategy. This study has been accepted for publication in Lancet Global Health, courtesy, Mir F et al.

In Pakistan, the rates of chronic malnutrition (stunting) are high and are documented to be about 43.7% among children below 5 years of age in a nationwide survey conducted in 2011, and 34.4% in 9-11 months old children⁸. In Pakistan, among 2011-2013 the majority of cases of paralytic poliomyelitis were observed in vaccinated children coming from areas with elevated levels of chronic malnutrition. Another recently concluded trial from Aga Khan University assessed the vaccine-induced serological and mucosal protection against poliovirus in malnourished and normal infants; and compared the immune responses between IPV+bOPV versus bOPV alone in malnourished and normal infants. The trail found that chronically malnourished infants were more likely to be unprotected against polioviruses than normal infants. IPV helped close the immunity gap better than bOPV alone⁹.

Both these new strategies are innovative and important and will fill the gap in polio eradication and Polio free Pakistan particularly in hard to reach areas and malnourished communities. This is the time to push hard to finish line because if we fail to eradicate, a resurgence of Polio could paralyze more children worldwide every year within a decade and expensive control measures will be needed.

There are many important updates available for Polio eradication globally and for Pakistan¹⁰⁻¹³. Solution of the current problem is that it is essential to introduce at least one dose of IPV as routine immunization¹⁴. This will not only enhance the poliovirus immunity among those who doesn't respond to many OPV doses but also the IPV will work better in communities who have already received OPV as their routine immunization. It seems that only possibility is to add one dose at 14 weeks of routine EPI immunization.

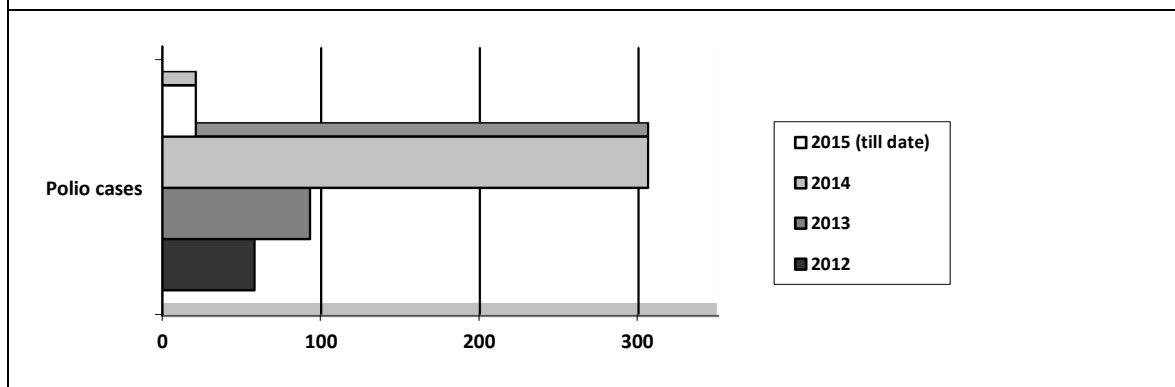
Secondly tOPV should be replaced with bOPV in routine immunization. The scientific rationale of adopting this strategy is to i), there will be minimal to no risk of vaccine drive poliovirus2 (VDPV-2) as tOPV is associated with increased risk of VDPV-2 as we witnessed in Baluchistan and Waziristan, and ii), bOPV is more immunogenic compared to tOPV in routine immunization.

In summary, strengthening routine immunization is the key. Inclusion of at least one dose of IPV is essential in routine immunization. There is a need of SIAD and IPV campaigns in hard to reach areas and areas with high malnutrition rates.

Conflict of interest

The author has no conflict of interest. Author has WHO funding on Global Polio Eradication Initiative and involve in WHO funded polio vaccine projects.

Fig. 1. Trend of reported polio cases from Pakistan during 2012- till date.



References

1. Poliomyelitis (polio) [Internet]. World Health Organization; 2015. Available from: <http://www.who.int/topics/poliomyelitis/en/>. Accessed on April, 2015.
2. Polio eradication this week [Internet]. Global Polio Eradication Initiative; 2015. Available from: <http://www.polioeradication.org/>. Accessed on April, 2015.
3. Ahmad SO, Bux AS, Yousuf F. Polio in Pakistan's North Waziristan. *Lancet Glob Health* 2015;3
4. Hadi YB, Sohail AM. Pakistan: the nidus for global polio re-emergence? *J Infect Public Health* 2015;8:214-5.
5. Global Polio Eradication. Polio Eradication and Endgame Strategic Plan 2013-2018 [Internet]; 2013. Available from: <http://www.polioeradication.org/ResourceLibrary/Strategyandwork.aspx>. Accessed on April, 2015.
6. World Health Assembly. Global eradication of poliomyelitis by the year 2000 [Internet]. Geneva: World Health Organization; 1988. Available from: <http://www.who.int/ihr/polioresolution4128en.pdf>. Accessed on April, 2015.
7. Hird TR, Grassly NC. Systematic review of mucosal immunity induced by oral and inactivated poliovirus vaccines against virus shedding following oral poliovirus challenge [Internet]. *PLoS Pathog* 2012;8:e1002599. Available from: <http://journals.plos.org/plospathogens/article?id=10.1371/journal.ppat.1002599>. Accessed on April, 2015.
8. <http://www.childinfo.org/files/nutrition/DI%20Profile%20-%20Pakistan.pdf>
9. Saleem AF, Mach O, Quadri F, Khan A, Bhatti Z, Rehman NU, et al. Immunogenicity of poliovirus vaccines in chronically malnourished infants: A randomized controlled trial in Pakistan. *Vaccine*. 4;33:2757-63.
10. Available from: <http://www.endpolio.com.pk/>. Accessed on April, 2015.
11. Available from: <http://www.polioinfo.org/>. Accessed on April, 2015.
12. <http://www.polioeradication.org/>. Accessed on April, 2015.
13. <http://www.endpolio.org/>. Accessed on April, 2015.
14. Patel M, Zipursky S, Orenstein W, Garon J, Zaffran M. Polio endgame: the global introduction of inactivated polio vaccine. *Expert Rev Vaccines* 2015;14:749-62.