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IPV OFFERS BETTER PROTECTION FROM POLIO VIRUS

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Intestinal immunity induced by oral polio vaccine is imperfect and wanes with time. Photo: Ch. Vijaya Bhaskar

Within days of the government announcing inclusion of injectable inactivated poliovirus vaccine (IPV) in the immunisation programme, a study done in India has shown that a dose of injectable inactivated poliovirus vaccine (IPV) given to children aged between 1-4 years who had been vaccinated with oral poliovirus vaccine (OPV) boosts intestinal immunity to poliovrius offering substantially greater benefit compared to an additional dose of OPV.

This conclusion was drawn by researchers on 450 children of two groups with 225 children receiving IPV and 225 no vaccine.

Both the groups had stool samples available for primary analysis seven days after bivalent OPV challenge. In the IPV group, 27 (12 per cent) children shed serotype 1 poliovirus and 17 (eight per cent) shed serotype three poliovirus compared with 43 (19 per cent) and 57 (26 per cent) in the no vaccine group, suggesting those given IPV did not allow poliovirus to multiply in the gut, hence was better immunised as compared to those who did not receive this.

The finding backs the use of IPV vaccine — included in the national immunisation programme on July 3 — to accelerate polio eradication by boosting herd immunity in endemic regions, prevent international spread by travellers, and minimise the risk of poliomyelitis outbreaks due to imported wildtype or vaccine-derived polioviruses.

In a paper published in *The Lancet* , the team of authors — led by Jacob John and Sidhartha Giri and others — conclude that intestinal immunity induced by OPV is imperfect and wanes with time, permitting transmission of infection by immunised children.

Inactivated poliovirus vaccine (IPV) does not induce an intestinal mucosal immune response, but could boost protection in children who are mucosally (oral or gut) primed through previous exposure to OPV.

The authors did a randomised controlled trial that was not blinded in 450 children between August and September last year in Chinnallapuram, Vellore.

These children were healthy, had not received IPV before, and had had their last dose of OPV at least six months before enrolment.

The substantial boost in intestinal immunity conferred by a supplementary dose of IPV given to children younger than five years who had previously received OPV shows a potential role for this vaccine in immunisation activities to accelerate eradication and prevent outbreaks of poliomyelitis, the authors point out.

OPV has been the vaccine of choice for the Global Polio Eradication Initiative (GPEI) because of its ease of administration in mass campaigns, low cost, and ability to induce strong intestinal mucosal immunity against poliovirus shedding and transmission.

Although children and adults vaccinated with oral polio vaccine are protected against poliomyelitis if they mount a neutralising antibody response to all three serotypes they might still be susceptible to infection and transmit wild poliovirus.

The injected inactivated poliovirus vaccine has excellent immunogenicity that does not vary between populations.

However, “it does not induce an effective mucosal immune response — poliovirus-specific IgA is undetectable in serum or saliva in most children after administration of IPV — and offers restricted protection against poliovirus shedding in the intestine after challenge with OPV,” the paper states.

As a result, IPV’s ability to prevent transmission in areas where faecal-oral transmission is efficient stands compromised.

“I believe pulse polio campaigns were critical to the polio eradication strategy, in that short period of time mucosal immunity was raised across the nation - this possibly helped decrease transmission of poliovirus in the environment by creating an immune barrier for long enough to decrease environmental transmission,” Jacob John, Department of Community Health, Christian Medical College, Vellore, told this Correspondent.

“However, mass campaigns for immunisation in general are an admission that we are not reaching people through routine public health services and, therefore, is not the first choice for getting things done. Having said that, campaigns with IPV would be targeted in communities that have poor immune response to oral vaccines and as a VDPV (vaccine derived poliovirus) or circulating VDPV response measure. Injectable IPV should ideally be used in the UIP [universal immunisation programme] and slowly replace OPV.”

The inclusion of IPV in the immunisation programme was more of a “risk mitigation effort” as part of the polio end game.

“Giving vaccines via a mucosal route would be preferable as it is less likely to cause discomfort and because it mimics natural route of infection.

However, not all vaccines can be delivered this way and even those that can be delivered thus appear to perform poorly in settings that require the vaccines most,” Dr. John said while citing the example of Indian children who require up to 15 doses of OPV to be protected against poliovirus whereas only two or three doses are needed in high income countries.

On why IPV is unable to cut transmission in areas where faecal-oral transmission is high, he said: “We are trying to understand why this is the case but the human gut is a fascinatingly complex environment and it is likely to be a while till we decipher it sufficiently to optimise oral vaccines.”

IPV could be used as a complement to OPV in several ways: to prevent international spread by boosting intestinal immunity among travellers, to accelerate eradication in infected areas with poor OPV immunogenicity through use in campaigns, and to maximise herd immunity in advance of the planned global withdrawal of serotype 2 OPV in 2016.

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