

# Wild Poliovirus Type 1 in Oman

## A re-emerging threat that requires urgent, targeted and strategic preparedness

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## فيروس شلل الأطفال البري من النوع 1 في عمان تهديد جديد يستلزم الاستعداد العاجل والموجه والاستراتيجي

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**P**OLIOMYELITIS, ALSO KNOWN AS POLIO, IS A highly infectious viral disease, predominantly affecting children under five years old. The virus is transmitted from person-to-person and mainly spreads through the fecal-oral route. The virus multiplies in the intestine, from where it can invade the nervous system via the bloodstream, potentially causing paralysis. Polio symptoms include fever, fatigue, headache, vomiting, neck stiffness and pain in the limbs. The disease causes permanent paralysis in one out of 200 infections. Currently, there is no cure for polio; it can only be prevented by immunisation.<sup>1</sup>

### Past Global Successes

In 1988, the World Health Assembly declared its commitment to eradicate wild poliovirus (WPV), which had been reported in 125 endemic countries. Since then, there has been a decline of over 99% of cases globally, from an estimated 350,000 cases in 1988 to 33 reported cases by the end of 2018 [Figure 1]. A number of the World Health Organization (WHO) regions have been certified polio-free for many years, namely the Americas (1994), the Western Pacific region (2000), the European region (2002) and the South-East Asian region (2014). To date, no WPV type 1 cases have been reported in the African region in more than 41 months. This achievement marks a significant step towards global eradication of WPV, with 80% of the world's population now living in certified polio-free regions.<sup>2</sup> The WHO estimated that 1.5 million childhood deaths have been prevented and more than 18 million people, who would have been paralysed, are able to walk today due to systematic polio immunisation activities. In addition, the eradication of WPV would save at least \$40–50 billion USD, mostly in low-income countries.<sup>1</sup>

### Current Failures

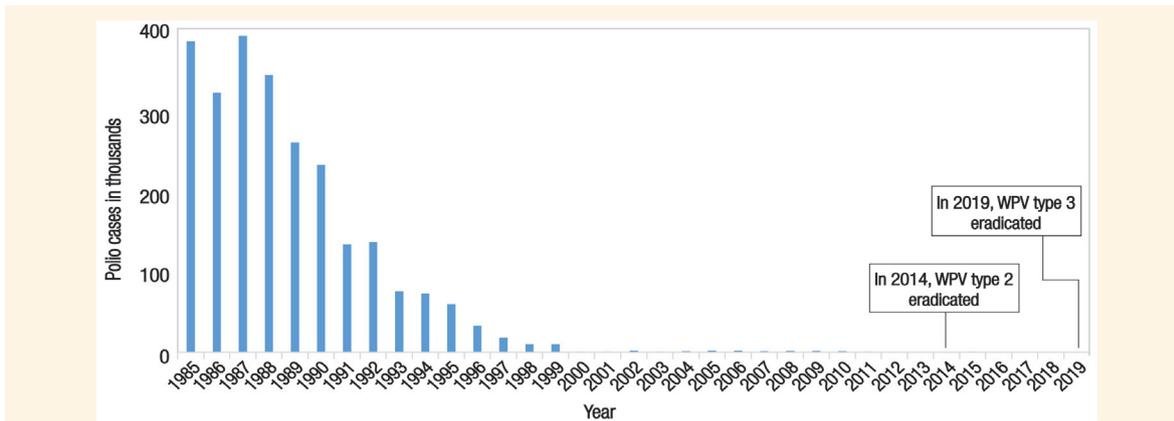
There are three strains of WPV (i.e. type 1, type 2 and type 3). The trivalent oral polio vaccine (tOPV) induced a high type 2 sero-conversion rate;<sup>3</sup> hence, transmission was easily and quickly interrupted and type 2 was eradicated globally by 1999.<sup>4</sup> Meanwhile, a bivalent OPV for type 1 and 3 was introduced, which showed superiority over the tOPV and higher immunogenicity to type 3;<sup>5</sup> global eradication of type 3 was officially announced in October 2019 [Figure 1].<sup>6</sup> Despite achieving the eradication of types 2 and 3 and a reduction by over 90% in the prevalence of type 1 since 2014, child paralysis from WPV type 1 infections was still evident in two remaining endemic countries.<sup>2</sup>

The remaining two countries with reported ongoing WPV type 1 transmission are Afghanistan and Pakistan, which harbour the only global reservoir of WPV type 1.<sup>7,8</sup> Since early 2019, WPV cases from Pakistan have increased dramatically. This followed an 18-month period from January 2017 to mid-2018 in which Pakistan had achieved the lowest number of WPV type 1 cases in its previous 10 years, including several months without a single reported case. Globally, the annual number of WPV type 1 cases was 22 in 2017 and 33 cases in 2018, indicating a missed opportunity for halting WPV transmission.<sup>7,8</sup>

As of 21<sup>st</sup> December 2019, the reported cases of WPV type 1 in Pakistan has risen to 111, representing 80% of the global WPV cases; 44% of the environmental samples collected have been positive for WPV type 1, indicating widespread virus circulation across the country.<sup>9</sup> In addition, there are reported exports of the virus to Iran, with Pakistan-linked WPV type 1 isolated from an environmental sewage sample collected on 20<sup>th</sup> April 2019 in the Konarak district, Sistan-Baluchistan province, Iran. However, no associated cases of para-

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**Figure 1:** Globally reported wild poliovirus cases from 1972–2019.<sup>20</sup>

WPV = Wild poliovirus.

lysis have been found.<sup>10</sup> Meanwhile, Afghanistan has reported 26 cases of WPV type 1 as of 21<sup>st</sup> December 2019.<sup>10,11</sup> Endemic transmission of WPV continues in border areas of Afghanistan and Pakistan.<sup>7</sup> The main factors attributed to the current outbreak are issues related to coordination and implementation of vaccine delivery and unresolved issues with campaign quality, monitoring, accountability and community engagement.<sup>4,6,8</sup>

The surge in polio cases in 2019 has threatened the goal of its global eradication. Until WPV transmission is interrupted in these countries, all countries remain at risk of WPV importation, especially vulnerable countries with weak public health systems, suboptimal immunisation services and travel or trade links to endemic countries. As per global estimation, failure to eradicate WPV could result in as much as 200,000 new WPV cases yearly in the next 10 years. Therefore, it is vital to ensure WPV is globally eradicated.<sup>1,2</sup> Herein we highlight the lessons learnt to date and propose steps to reach eradication.

## How to Set it Right

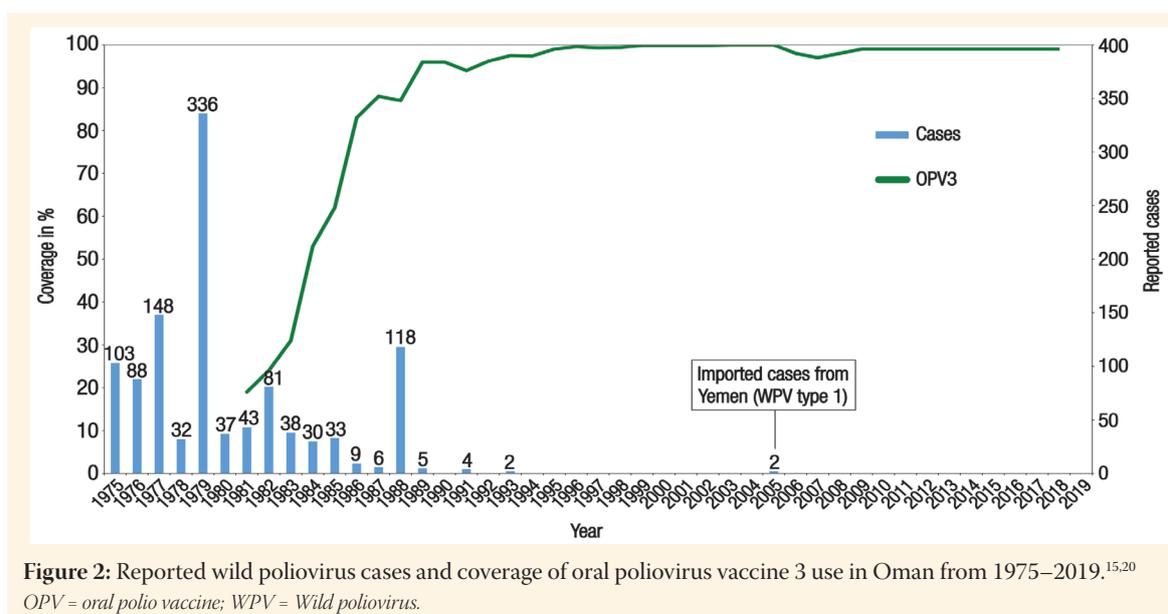
The global polio eradication strategic plan identified five priority strategic interventions which included: 1) high levels of routine immunisation; 2) supplementary immunisation activities (SIA; target coverage above 95%); 3) acute flaccid paralysis (AFP) surveillance (target = 2/100,000 among those aged ≤15 years); 4) mop-up campaigns (if required); and 5) care for post-polio paralysis.<sup>12</sup> Failure to implement strategic approaches leads to risk of either unidentified imported cases or a dangerous delay in responding to WPV importation.

In Oman, the last major WPV outbreak was caused by the type 1 strain in 1988–89. The last two cases of WPV were reported in 2005 in Yemen and had type 1 WPV [Figure 2].<sup>13,14</sup> Over the years, Oman

has implemented some important components of the polio eradication strategies such as ensuring that the third dose of the oral polio vaccine (OPV3) coverage is >95% through routine immunisation services among infants aged <1 year. This has been maintained for more than a decade.<sup>15</sup> Additionally, polio SIA were implemented from 1995–99 and again in 2005. AFP surveillance was launched in 1993 and since then the rate of non-polio AFP has remained above 2/100,000 people among those aged ≤15 years, with adequate testing of stool specimens above 80%.<sup>15,16</sup> The performance of AFP surveillance is assessed through the annual detection rate of non-polio AFP recommended by the WHO. The AFP rates in Oman have been in constant decline, from 4.5 to 3.2 to 2.8 cases per 100,000 people aged <15 years in 2017, 2018 and 2019, respectively.<sup>17</sup> Sensitive surveillance is the gold standard of polio eradication and the only tool to identify importation.<sup>1,11</sup> These rates have so far been considered sensitive enough to detect a case of WPV. The second performance indicator is the collection of adequate stool specimens (i.e. two stool specimens collected >24 hours apart, within 14 days of paralysis onset and arrival at the laboratory in good condition from ≥80% of reported cases of AFP patients). These targets have also been successfully met in Oman.<sup>1,12</sup>

## Recommendations

The risk of exportation of WPV type 1 to Oman exists. Apart from the geographical proximity of Oman to the endemic countries, there are also many individuals from endemic countries who frequently visit and have visitors from endemic countries. The population of expatriates (approximately 44% of the country's total population) includes 219,901 (4%) Pakistanis.<sup>18</sup> Two essential pillars for preparedness against the importation of WPV includes robust AFP surveillance



**Figure 2:** Reported wild poliovirus cases and coverage of oral poliovirus vaccine 3 use in Oman from 1975–2019.<sup>15,20</sup> OPV = oral polio vaccine; WPV = Wild poliovirus.

and high population immunity among non-polio AFP and SIA.<sup>19</sup>

To prevent transmission of the virus across borders, early detection of the virus is critical and can be achieved by strengthening both active and passive AFP surveillance to identify potential AFP cases among Oman's residents. This would ensure that the entire population, whether residing or visiting Oman are vaccinated, as is appropriate for their specific age group, prior to entering the country.

In addition, the polio programme has to establish standard protocols for the care and long-term follow-up of post-polio paralysis patients, as well as ways to reduce the psychological and financial burdens on patients. An ongoing problem is the difficulty of keeping the polio vaccine stockpiled in Oman. Finally, proper attention should be given to rigorous evaluation of the national polio programme and its successes and failures should be shared with others.

To date, WPV type 1 transmission has not been interrupted in Afghanistan and Pakistan.<sup>4</sup> The increasing WPV cases have secured the disease's status as a global public health emergency and the global community has expressed concern over ongoing transmission in these countries. These two countries constitute one epidemiological block and must continue to be treated as such to achieve eradication. In order to end transmission of WPV1, complete population immunity must be achieved and doing so requires delivering polio vaccine to all children. Failure to eradicate polio would have major global repercussions. Importation of WPV cannot be prevented until global WPV eradication is attained making early detection of WPV in polio-free states a public health priority.

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