IJBPAS, July, 2023, 12(7): 3408-3415

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

ERADICATING POLIO: PROGRESS AFFECTED BY COVID 19 PANDEMIC

LEMRABET S[1, 2*], FILALI-MALTOUF A[2], MEDRAOUI L[2] AND OUMZIL H[1, 3]

1: Virology Department, National Institute of Hygiene, Ministry of Health, Rabat, Morocco

2: Microbiology and Molecular Biology Team, Research Center for Plant and Microbial Biotechnology, Biodiversity and Environment, Faculty of Sciences, Mohammed V University in Rabat, Morocco

3: Pedagogy and Research Unit of Microbiology and Genomic Center of Human Pathologies, School of Medicine and Pharmacy, Mohammed V University in Rabat, Morocco

***Corresponding Author: Dr. Sanae Lemrabet: E Mail: sanae.lem@gmail.com**

Received 14th July 2022; Revised 20th Sept 2022; Accepted 2nd Nov. 2022; Available online 1st July 2023

https://doi.org/10.31032/IJBPAS/2023/12.7.7319

ABSTRACT

Since the 1988 World Health Assembly (WHA) resolution to eradicate polio, considerable progress has been made in ending the transmission of wild poliovirus throughout the world. The number of polio endemic countries in the world fell from over 125 in 1988 to just two countries in the Easter Mediterranean Region EMRO after the Polio-free declaration of the remaining five WHO regions. Cases of paralytic polio have declined enormously, from some 350000 cases in 1988 to only 2 cases in 2021. Wild poliovirus type 2 (WPV2) was last detected in 1999, WPV type 3 (WPV3) in 2012, and WPV type 1 is still endemic in Pakistan and Afghanistan.

The recent coronavirus disease (COVID-19) pandemic has had an immense impact on health systems around the world, which must face the challenge of simultaneously meeting the needs of COVID-19 patients and managing other programs including the polio eradication program. This review presents the epidemiology of the poliovirus, progress for the polio eradication and the impact of the COVID-19 pandemic on the objectives of the GPEI.

Keywords: Global Eradication Poliomyelitis Initiative; Acute Flaccid Paralysis; Poliovirus; COVID-19

INTRODUCTION

Prior to the launch of the Global Polio Eradication Initiative (GPEI) in 1988, polio left more than 350,000 children paralyzed in 125 countries. Today, only WPV1 continues to circulate in two countries: Afghanistan and Pakistan **[1]**.

GPEI defines four pillars of polio eradication: a/ **Routine immunization:** In worldwide immunization programs, oral polio vaccine (OPV) and at least one dose of injectable inactivated poliovirus vaccine (IPV) are routinely used. b/ **Supplementary immunization:** "National Immunization Days" are organized to provide supplementary doses of oral polio vaccine to all children under five years old. c/ **Surveillance:** Active surveillance for wild poliovirus by reporting all cases of acute flaccid paralysis in children under 15 years old and laboratory confirmation of infection. d/ **Targeted "mop-up" campaigns:** Targeted "mop-up" campaigns once wild poliovirus transmission is restricted to a specific focal area **[2]**.

Childhood vaccinations, including the polio vaccine, have been halted in Afghanistan and Pakistan since the COVID-19 pandemic struck in March 2020 to avoid the risk of disease transmission within the community and left 50 million children without their polio vaccine **[3]**.

In the middle of the global COVID-19 pandemic, African region was certified polio free on August 25, 2020 **[4]**. And in 2021, only two WPV1 cases were reported in Afghanistan (one case) and Pakistan (one case).

The occurrence of the COVID-19 pandemic and the measures put in place for its elimination provide an opportunity to recognize the value existing infrastructure to eradicate polio and ensure its long-term sustainability. This is how the extensive polio networks were rapidly adapted to the COVID-19 context **[5]**.

Poliovirus:

Poliovirus is a representative member within the Picornaviridae, a family that contains many human and animal pathogens. All three serotypes of poliovirus cause paralytic disease. The viral genome, a single-stranded RNA with positive polarity and 7.1–7.2 kb long is enclosed in a nonenveloped capsid comprising 60 copies of four different polypeptides arranged with icosahedral symmetry **[6]**.

Poliovirus replication is rapid, as up to 10,000 infectious virus particles are released upon cell lysis and death at 6 h post-infection. This rapid rate of cellular destruction accounts for the sudden onset of acute flaccid paralysis (AFP) when poliovirus infects motor neurons **[7]**.

Poliomyelitis:

Poliomyelitis, commonly shortened to polio is an acute viral infection that influences the motor neurons within the spinal cord and brain leading to the classic manifestations of paralysis **[8]**. Polio is transmitted by the fecal-oral route. Shedding the virus in the stool makes polio a highly transmissible disease. Maximum virus shedding is observed 2-3 days before and 1 week after symptom onset. The spread is rapid in areas with poor sanitation, especially among the non-immune population. The spread of the virus is mainly observed during the summer months in temperate regions **[9]**.

In the prevaccine era, polio had a virtually worldwide distribution, and nearly all young children in endemic areas were infected early in life. WPV1 is associated with widespread outbreaks and WPV2 and WPV3 with more localized circulation **[10]**.

AFP surveillance:

In order to achieve polio eradication, WHO has recommended that countries carry out surveillance of AFP cases, which allows new cases to be identified and wild poliovirus imports to be detected. Performance indicators established for AFP surveillance require that all AFP cases be reported and investigated as prospective polio cases, including collection of 2 stool samples 24 hours apart and within 14 days following the onset of paralysis **[11]**.

Poliovirus vaccines:

Poliovirus infections have been effectively controlled in many parts of the world since the late 1950s by the use of two vaccines, one inactivated (IPV) developed by Jonas Salk **[12]**, the other attenuated (OPV) developed by Albert Sabin **[13]**.

In a number of countries, OPV is used instead of IPV for several reasons included reduced cost for OPV, ease of administration, relative availability of IPV, and perceived increased efficacy of OPV in protecting the vaccinees from intestinal infection and in immunizing the unvaccinated by contact spread **[14]**.

However, the attenuated virus in the OPV vaccine can undergo genetic changes during replication, leading to vaccine-derived poliovirus (VDPV) infection in populations with low vaccination coverage, and which can cause polio-like paralysis **[15]**.

The use of monovalent OPV of sabin strain type 2 (mOPV2) is reserved for responses to VDPV2 outbreaks. The updated GPEI Polio Eradication Strategy 2022–2026 includes expanded use of the type 2 novel oral poliovirus vaccine (nOPV2) - genetically stabilized -to avoid new emergences of VDPV2 during outbreak responses **[16]**.

Global Polio eradication initiative:

Global eradication is defined as "the worldwide absence of a specific pathogen in nature as a result of deliberate control efforts which may be discontinued when

the agent is deemed to no longer present a significant risk from extrinsic sources. eg smallpox" **[17]**. WHO launched the GPEI at the 1988 during the World Health Assembly, a year when 125 countries around the world were still reporting endemic polio. Polio eradication can be completed for a number of reasons including: (a) the existence of an effective, inexpensive and easy to administer polio vaccine (b) the absence of an animal reservoir since humans are the only host of the virus and (c) polio gives immunity to long term and there are no long-term carriers of the disease **[8]**.

Global certification:

WHO has established a formal process for the certification of polio eradication, modeled on the International Smallpox Certification Commission. Until the beginning of 2020, four regions were certified polio-free: the Americas in 1994, the Western Pacific in 2000, Europe in 2002, and South-East Asia in 2014. No indigenous WPV has been detected in these regions postcertification. On August 25, 2020 African region was certified polio free; right in the middle of a global COVID-19 pandemic **[17]**.

Following the certification of the African Region as free of wild poliovirus, the Eastern Mediterranean Region is the only region in the world still harbouring wild poliovirus.

Impact of COVID-19 pandemic on Polio surveillance

Health programs including polio eradication have been impacted by the onset of the COVID-19 pandemic. As a result, the risk of re-introduction of polio has probably increased.

The impact of the COVID-19 pandemic on polio surveillance was assessed by comparing surveillance data between January and September 2019 to the same period in 2020. The number of cases of acute flaccid paralysis (AFP) reported worldwide decreased by 33% and the average number of days between the second stool collected and reception by the laboratory increased by 70%. Continued analysis of AFP case reporting and stool collection is critical to ensure timely detection and response to interruptions of polio surveillance **[18]**.

Childhood vaccinations, including the polio vaccine, have been halted in Afghanistan and Pakistan since the COVID-19 pandemic struck in March 2020 to avoid the risk of disease transmission within the community **[19]**.

In contrast, the COVID-19 pandemic has created opportunities to jointly increase the effectiveness of polio eradication activities and promote the integration of health services. For example, the global rollout of COVID-19 vaccines provides an opportunity to build demand for both

COVID-19 and polio vaccines. Thousands of polio eradication officers around the world continue to play a critical role in implementing COVID-19 responses in countries. Maintaining these partnerships will be important to eradicate WPV1 and end transmission of VDPV while addressing other health priorities **[5, 16]**.

Despite the COVID-19 pandemic, efforts continue to be made to end polio. Africa was certified polio free in August 2020 **[4]**. As of August 3, 2021, one WPV1 case was reported in Afghanistan in 2021, a 97% decrease compared with the first 6 months of 2020. And one WPV1 case has been reported during January–June 2021 in Pakistan, a 98% decrease from the 60 WPV1 cases from during the same 2020 period **[16]**.

As health systems around the world focused on addressing the pandemic of COVID-19, the GPEI launched an intensive review to identify barriers to eradication and develop a new strategy to achieve the goal of: a polio-free world. The program then had to list the challenges faced in the years leading up to COVID-19 and define solutions that will work in a world perhaps forever altered in the wake of COVID-19 **[20]**.

Polio eradication strategy 2022-2026:

GPEI is focusing efforts on two goals: a) interrupting persistent WPV1 transmission in Pakistan and Afghanistan, and b) stopping all current outbreaks of VDPV2.

To reach the first goal, the GPEI plans to limit poliovirus circulation to core reservoirs and shared corridors of transmission and then interrupt all poliovirus within the reservoirs by 2023, with the global eradication of all wild poliovirus certified by 2026. The program continues to progress to stop transmission of VDPV2 **[20]**.

By 2026, the GPEI plans to end VDPV2 and the validation of the absence of VDPV2 in all foci of the current epidemic by moving to an emergency management structure with clearly defined roles and responsibilities, and strengthening regional and national capacities for sensitive surveillance and rapid, high-quality response. Innovative tools and methods, as well as new partnerships, will be sought to strengthen outbreak response operations **[16]**.

The Post-Certification Strategy (PCS) describes the roadmap for maintaining a polio-free world, including containment, vaccination with appropriate polio vaccines, poliovirus surveillance and outbreak response. A Global Plan of Action (GAPIII), has been developed by WHO outlining the containment requirements for poliovirus to minimize the risk associated with poliovirus installations after wild poliovirus eradication and cessation of administration of poliovirus. oral polio vaccine **[20, 21]**.

CONCLUSION

In the first half of the 20th century, as smallpox began to disappear, polio (infantile paralysis) was the disease most feared in resource-rich countries.

Actually, only Pakistan and Afghanistan have endemic transmission of wild poliovirus type1 (WPV1). The WPV2 was eradicated in September 2015, and the WPV3 was eradicated in 2019.

Since the outbreak of the COVID-19 pandemic in March 2020, routine vaccination campaigns have been interrupted, leaving 23 million children worldwide without basic immunization and causing new epidemics of VDPV. However, the extensive polio networks were rapidly adapted to the COVID-19 worldwide. New polio eradication strategy has been developed to respond to the polio eradication goal and adapted to the global COVID-19 situation.

Acknowledgments

The authors would like to thank all the WHO partners in the Eastern Mediterranean Region for their efforts related to end the polio disease.

Conflict of Interest

There is no conflict of interest to declare

REFERENCES

[1] Global Poliomyelitis eradication Initiative. Available at: https://polioeradication.org/wp-content/uploads/2020/04/GPEI-fact-sheet-20191113.pdf. Accessed September 2nd, 2021.

[2] Centers for Disease Control and Prevention. CDC and the Global Polio Eradication Initiative. Available at: https://www.cdc.gov/polio/gpei/index.htm. Accessed October 8th, 2021.

[3] Haqqi A, Zahoor S, Aftab MN, Tipu I, Rehman Y, Ahmed H, Afzal MS. COVID-19 in Pakistan: Impact on global polio eradication initiative. J Med Virol 2021; 93(1):141-143

[4] Mohammed A, Tomori O, Nkengasong JN. Lessons from the elimination of poliomyelitis in Africa. Nat Rev Immunol 2021; 21(12):823-828.

[5] World Health Organization. Contributions of the polio network to the COVID-19 response: turning the challenge into an opportunity for polio transition 2020; World Health Organization. Available at: https://apps.who.int/iris/handle/10665/336261. Accessed September 2nd, 2021.

[6] Racaniello VR. One hundred years of poliovirus pathogenesis. Virology 2006; 344(1):9–16.

[7] Bodian D. Histopathologic basis of clinical findings in poliomyelitis. Am J Med 1949. 6:563–78

[8] Ahmad T, Arif S, Chaudry N,

Anjum S. Epidemiological Characteristics of Poliomyelitis during the 21st century (2000-2013). Int J Public Heal Sci 2014; 3(3).

[9] Mehndiratta MM, Mehndiratta P, Pande R. Poliomyelitis: Historical Facts, Epidemiology, and Current Challenges in Eradication. The Neurohospitalist 2014; 4(4):223-9.

[10] Kew O, Pallansch M. Breaking the last chains of poliovirus transmission: Progress and challenges in global polio eradication. Annu Rev Virol 2018; 5:427–51.

[11] World Health Organization. Manual for the virological investigation of poliomyelitis. Geneva, Switzerland: World Health Organization 2004.

[12] Tan SY, Ponstein N. Jonas salk (1914–1995): A vaccine against polio. Singapore Med J 2019; 60(1):9–10.

[13] Horaud F, Albert B. Sabin and the development of oral poliovaccine. Biologicals 1993; 21, 311–6.

[14] Wassilak S, Orenstein W. Editorial: Challenges faced by the global polio eradication initiative. Expert Rev Vaccines 2010; 9(5):447–9.

[15] Famulare M, Chang S, Iber J, Zhao K, Adeniji JA, Bukbuk D Baba M , Behrend M, Burns C, Oberste S. Sabin Vaccine Reversion in the Field: a Comprehensive Analysis of Sabin-Like Poliovirus Isolates in Nigeria. J Virol 2016; 90(1):317–31.

[16] Bigouette JP, Wilkinson AL, Tallis G, Burns CC, Wassilak SGF, Vertefeuille JF. Progress Toward Polio Eradication — Worldwide, January 2019-June 2021. MMWR Recomm Reports 2021; 70(34):1129–35.

[17] Cochi SL, Dowdle WR. Disease eradication in the 21st century: implications for global health. Cambridge (MA): MIT Press Books; 2011. Available at: http:// mitpress.mit.edu/books/disease-eradication-21st-century. Accessed October 20, 2021.

[18] Smith J, Leke R, Adams A, Tangermann RH. Certification of polio eradication: Process and lessons learned. Bull World Health Organ 2004. 82(1):24–30.

[19] Abba Ahmed B. Impact of COVID-19 Pandemic on Global Economy. SSRN Electron J 2020; 69(51).

[20] UNICEF. Polio vaccination campaigns resume in Afghanistan and Pakistan after COVID-19

disruptions leave 50 million children unimmunized. https://www.unicef.org/press-releases/polio-vaccination-campaigns-resume-afghanistan-and-pakistan-after-Covid-19. Accessed October 20, 2021.

[21] Global Polio Eradication Initiative (GPEI). Polio Eradication Strategy 2022-2026 Delivering on a promise. Geneva: World Health Organization 2021. Available at: https://polioeradication.org/wp-content/uploads/2021/10/9789240031937-eng.pdf. Accessed November 15, 2021.

[22] World Health Organization: Polio eradication and endgame strategic plan 2013-2018. Poliovirus detection and interruption. WHO; 2013:20–23.