

Polio in Afghanistan: a systemic review on eradication interventions and challenges

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Abstract. After the Global Polio Eradication Initiative was established, the global incidence of polio decreased by 99 percent. However, from a global perspective, the number of polio cases in Afghanistan is still increasing, therefore more attention should be brought to the issue of polio eradication in Afghanistan. This article is set out to revisit and analyze the interventions and challenges of polio eradication in Afghanistan. Data in the article are obtained from various academic journals and official public health websites. After reviewing the research results of public health experts throughout the years, it is evident that despite using multiple intervention measures in the eradication process, more effort is needed to address the challenges that are specific to different areas of Afghanistan. In the recent future, more cases of polio are expected due to the COVID-19 pandemic. Therefore, public health workers must increase the intensity of polio surveillance in Afghanistan and ensure that there are sufficient vaccines in stock when house-to-house vaccination begins again.

1 Introduction

Polio is an infectious disease caused by the poliovirus that has been threatening the lives of children for decades. The virus spreads from person to person, infecting the spine, causing paralysis. It is transmitted mainly via contact with feces of an infected person [1]. Type 2 and type 3 wild poliovirus have already been eliminated, while wild poliovirus type 1 (WPV1) remains endemic only in Afghanistan and Pakistan [2]. Since the establishment of the Global Polio Eradication Initiative (GPEI) in 1988, polio cases worldwide have decreased by 99% [3, 4].

Despite the number of polio cases worldwide have decreased in the past decades, some countries, including Afghanistan, are still witnessing rising number of cases in recent years. In Afghanistan, although the number of WPV1 cases decreased gradually from 2015 to 2017, cases have begun to increase annually since 2018 [5]. 41 cases of WPV1 are detected during January to July in 2020, compared to 15 cases detected during the same period in 2019 [6].

Once infected with polio, 24 percent of children would show symptoms of abortive poliomyelitis that have no significant damage to the central nervous system. 1 to 5 percent of infected children would experience stiffness of the neck, back, or legs due to non-paralytic aseptic meningitis. Less than 1 percent of infected children would develop flaccid paralysis, but the symptoms could progress within two to three days, often causing permanent asymmetrical or even proximal paralysis [1].

It is important to measure the current state of polio

eradication and identify the challenges, so that public health workers can better understand the reasons behind the rising number of cases and plan for the eradication of polio in the future. Currently, measures such as routine immunization, supplementary immunization activities, AFP and environmental surveillance, targeted campaigns, and community engagement are employed as interventions to stop the transmission of polio. Meanwhile, various challenges hinder the eradication of polio in Afghanistan. This article collected the data from the CDC, UNICEF, GPEI, and various articles published by public health experts on *The Journal of Infectious Diseases*, *The Lancet*, *Science*, etc., aiming to systemically review the interventions and challenges of the polio eradication process in Afghanistan. However, due to language limitations, the articles incorporated in this review only include articles written/translated in English.

2 Intervention Measures

2.1 Routine Immunization

Routine immunization is the first pillar of the World Health Organization's (WHO) strategies to eradicate polio worldwide. Since 1978, Afghanistan has started the implementation of a 3-dose OPV schedule for infants less than one year of age. The Expanded Program on Immunization (EPI) monitors the administration of OPV by non-governmental organizations (NGOs) who came in charge of routine vaccinations beginning from 2003 [7]. The WHO estimated that in 2018 and 2019, 73% of

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children under one-year-old in Afghanistan had taken the third dose of bivalent oral poliovirus vaccine (bOPV) [8].

High coverage of routine immunization is critical to the eradication of polio as demonstrated by countries in which polio had already been eradicated [9]. Countries in which routine vaccination coverage is high have no need for campaigns, whereas, in countries like Afghanistan where there is a significant insufficiency in routine immunization, large-scale SIAs and mop-up campaigns are required to administer additional doses of OPV [9, 10].

2.2 Supplementary Immunization Activities

Supplementary immunization activities (SIAs) are one of the four pillars of the polio eradication initiative. SIAs are mass house-to-house campaigns widely used especially in low- and middle-class countries for the eradication of poliovirus, providing additional vaccination services to children under the age of 5 years who may have been missed in routine immunization [8, 11]. Polio SIAs provide OPV doses to both children who have been vaccinated through routine immunization services and those who have yet to complete their vaccination [11]. National immunization days (NIDs), a nationwide campaign, and sub-national immunization days (SNIDs), focusing on specific districts and regions, are two main campaign measures included in SIAs. NIDs provide the administration of two rounds of OPV, approximately one month apart, to children, regardless of their vaccination status; SNIDs conduct campaigns at subnational levels while utilizing the same approaches as NIDs [12]. Vaccines administered through SIAs are extra to the routine immunization procedures, so they may not replace the vaccines administered in routine immunization.

NIDs and SNIDs are strategic means of achieving high vaccination coverage in a short period of time, though in Afghanistan, due to its low routine immunization coverage, more than three to five years of NIDs are required to eradicate polio [13, 14]. Originally, 3 NIDs and 5 SNIDs were planned to be conducted in 2020 in Afghanistan, SNIDs having a target of 5.6 million children <5 years, with a focus on high-risk districts in the South and Southeast, including Kandahar, Helmand, and Uruzgan [15]. However, due to the COVID-19 pandemic, a pause was put on house-to-house immunization campaigns [16]. SIAs are essential processes to the eradication of polio in Afghanistan, especially in regions where polio transmission is most likely to occur.

2.3 Surveillance

Acute flaccid paralysis (AFP) surveillance was first implemented in Afghanistan in 1997 to detect areas with potential occurrence of polio transmission. AFP surveillance acts as the primary means of detection of transmission of wild-type poliovirus (WPV). Especially as the number of polio cases is gradually decreasing, AFP surveillance is more critical than ever by focusing

SIAs and other public health responses on regions where polio cases are more likely to appear [17]. In recent years, up to 25% of WPV1 has been detected through environmental surveillance (Figure 1).

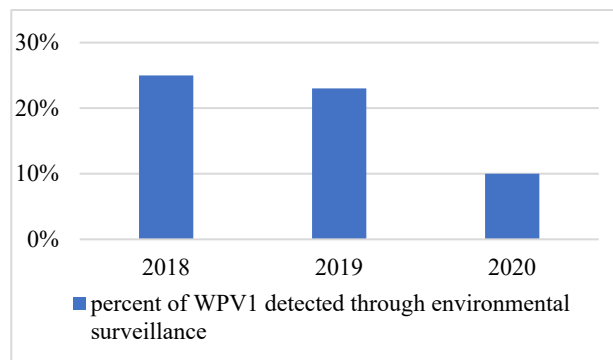


Fig. 1. Percent of WPV1 detected through environmental surveillance from 2018 to 2020 [8].

Several indicators demonstrate the effectiveness of a country's AFP surveillance system. The sensitivity of surveillance is indicated through whether at least one case of non-polio AFP (NPAFP) is detected per 100,000 children under 15 years of age within a year, regardless of the presence of polio in the area [18]. Surveillance reports are considered complete when at least 80% of the routine AFP surveillance reports are received on time, which includes zero reports, i.e., reports which state no AFP cases are detected within a certain region. AFP cases are required to contain two adequate stool specimens from at least 80% of all persons with AFP, "adequate" meaning the quantity of stool specimens reaches a certain target and the two specimens are taken within two weeks of the occurrence of paralysis, 24 hours from each other [18].

In 2019, a reported number of 18 per 100,000 persons under 15 years of age was reported with NPAFP nationally in Afghanistan; 94% of stool specimens of AFP cases were adequate [8]. This indicates that Afghanistan's AFP surveillance system has met the minimum standard of surveillance. Despite meeting the standards, wild-type poliovirus (WPV) is still able to transmit due to surveillance gaps in the subnational AFP surveillance systems [10]. These gaps need to be amended so as to contribute to polio eradication efforts. Also, surveillance indicators may differ at subnational levels, with some regions underperforming. The surveillance performance of these regions may be obscured by national reports [5].

In addition to AFP surveillance, environmental surveillance acts as a complement to further detect potential regions of polio transmission. Environmental surveillance involves periodic testing of sewage for poliovirus. In 2013, Afghanistan began the surveillance of sewage samples, which successfully detected a strain of WPV1 in 2014 [19]. Dr. Ali Ahmad Zahed, Surveillance Officer at WHO Afghanistan states that from 2013 to 2018, the sewage sampling system in Afghanistan tested over 750 sewage samples, indicating an ever-growing surveillance system in Afghanistan, providing a larger possibility of eradicating polio [20].

A sensitive and accurate surveillance system is an

essential procedure to the detection and eradication of polio, so public health workers must report observed data promptly and scrupulously so that any potential polio case can be dealt with immediately, contributing to the eradication of polio in all regions of Afghanistan.

2.4 Targeted “mop-up” Campaigns

Mop-up campaigns target regions where the poliovirus is suspected or known to be still circulating, including areas where the virus has been detected within the past three years and where people have difficulty accessing health care programs [21]. Places with high population density, high population mobility, poor sanitation, and low routine immunization coverage also fit the criteria for mop-up campaigns [22]. When the number of unvaccinated persons within a certain “lot”, i.e. the population division of a certain sample size, is above a preset level, then the lot is highly recommended to conduct mop-up campaigns [19]. Mop-up campaigns can be paired with AFP surveillance to interrupt the remaining chains of transmission within an area [23]. Between January 2018 and May 2019, five mop-up campaigns were conducted in Afghanistan, with a focus on districts in the southern and western regions where polio cases have been detected [6, 24]. Combined with SIAs and regular surveillance reports, targeted mop-up campaigns may assist in achieving higher coverage of vaccination within a short period of time with a more specified and vulnerable lot.

2.5 Community Engagement

Community support is essential to the eradication of polio in the remaining countries where polio is endemic [25]. This support may potentially be achieved and increased through multiple means. At a subnational level, communication between local polio workers and local governments are crucial for the guarantee of high quality of immunization activities. Through engaging with local governments, the quality of SIAs can be vastly improved as shown in districts of India and Pakistan [12]. Awareness of the severity of polio transmission and the importance of immunization may also be raised through regional and local media and religious leaders [16]. In Afghanistan, mullahs—religious leaders—collaborate with polio eradication programs, go door to door and make announcements in public assemblies to help increase awareness of polio and its eradication efforts [26].

There are many misconceptions in the communities that hinder vaccination procedures, which is why efforts to strengthen community engagement is important for the eradication of polio. UNICEF actively employs guidelines from Communication for Development (C4D), which analyzes the specific needs of a community to develop a context specific plan to increase the acceptance and demand for the polio vaccine among parents; at the meantime, local polio workers reach out to communities to answer questions and dispel rumors in order to encourage participation and support of the

system of eradication [27]. Improvements in basic healthcare and public services may also indirectly boost community support and trust in the polio eradication initiative [6]. Especially now that vaccination campaigns have come to a halt due to the COVID-19 pandemic, the revitalization of SIAs and other house-to-house campaigns relies heavily on community engagement [5].

3 Challenges

Obstacles like parental refusal, political instability, and, more recently, the COVID-19 pandemic, have hindered the eradication process. In general, the refusal size in Afghanistan is not too high; however, in the South and South East where the majority of the recent polio cases have been detected, refusal rates are highest [15]. Parents often refuse vaccination for their children due to religious concerns. 600,000 children missed vaccination in 2019 because their parents didn't trust the immunization purpose and believed that it was prohibited in Islam [28]. Illiteracy and misinformation of parents also caused many children to miss polio vaccination. In 2012, within the data of 22 available cases, 64% of parents knew about polio, with only half knowing that it could be prevented; within these parents, 14% of the fathers were literate and none of the mothers were literate, demonstrating that illiteracy has caused many cases of polio that could have otherwise been prevented [7].

The political instability in Afghanistan is also one of the main challenges faced by public health workers. Since May 2018, the Anti-Government Elements (AGE) has caused 3.4 million children to be missed in each round of NIDs, negatively impacting the eradication process [29]. The conflict between the AGE and pro-government forces in Afghanistan continues to slow down eradication efforts [16]. On one hand, there is a close geographical relationship between districts with more armed conflict and a higher number of polio cases [30]; on the other hand, groups like the Taliban and other religious forces tell people in communities that vaccination will cause sterility in Muslim children and that it is a Western conspiracy used to spy on Afghanistan's military activities, which discourages communities from being vaccinated [31]. In areas under Taliban control, pro-polio leaders would be punished and killed, instilling fear in the community, causing those who support polio eradication to be afraid to speak out, and therefore constrains vaccination efforts [29]. These political conflicts allow people to consider polio eradication as a political issue, a part of the foreign agenda; until polio eradication is seen as a social issue, it would not gain the attention it deserves and needs [32]. Therefore, polio eradication must be seen as a social problem in order to provide an incentive for the Taliban and other groups to help secure access to vaccination in attempts to win the support and favor of the people.

Currently, the COVID-19 pandemic has greatly hampered the process of eradicating polio in Afghanistan. On 24 March 2020, campaigns have been postponed by the GPEI to support the WHO's call to end the pandemic

[33]. An estimate of 50 million children in Afghanistan and Pakistan have missed polio vaccines this year [34]. In the meantime, Michel Zaffran, GPEI head at WHO, said that polio surveillance systems will remain alert, pairing with surveillance for COVID-19, to ensure that there is enough vaccines would be ready for public use once campaigns may begin again [33]. GPEI also states that they will continue to provide support on problems such as management disruptions and stool sample shipments, etc., so that even during the pandemic, countries including Afghanistan won't see a surge in polio cases.

The challenges posed to the immunization process have proven to hinder the eradication of polio, causing many children to miss vaccination due to inaccessibility (Fig. 2).

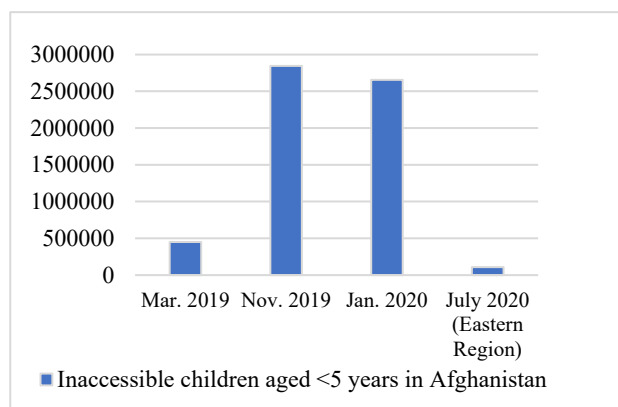


Fig. 2. Inaccessible children aged <5 years in Afghanistan from March 2019 to July 2020 [8].

However, in the meantime, polio workers in Afghanistan and other countries are working actively to counter these obstacles. The continuously growing team of public health workers combatting polio in Afghanistan often proves to show how much time and energy have been put into polio eradication. However, faced with numerous obstacles, more efforts are still needed to completely eradicate polio.

4 Conclusion

Due to the rising number of polio cases in Afghanistan in recent years, interventions and challenges of polio eradication must be re-examined. With challenges posed by refusals, political instability, and, most recently, COVID-19, more initiative should be taken by public health workers to actively deal with these challenges. Only through putting more effort into the eradication process can polio transmission be stopped. The increasing number of polio cases poses a problem for the public health system and threatens the lives of millions of children worldwide. Considering the immediate challenges to polio eradication, public health workers need to guarantee that there will be enough vaccines available once SIAs are permitted and that the surveillance efforts are efficient and effective during the COVID-19 pandemic.

References

- Centers for Disease Control and Prevention. (2019) [Available from: <https://www.cdc.gov/polio/what-is-polio/index.htm>]
- Global Polio Eradication Initiative. [Available from: <https://polioeradication.org/polio-today/polio-prevention/the-virus/>]
- Centers for Disease Control and Prevention. (2019) [Available from: <https://www.cdc.gov/polio/gpei/index.htm>]
- UNICEF. [Available from: <https://www.unicef.org/immunization/polio>]
- A.N. Chard, S.D. Datta, G. Tallis, C.C. Burns, S.G.F. Wassilak, J.F. Vertefeuille, et al. *MMWR Morb Mortal Wkly Rep.* **69**, 784-9 (2020)
- M. Martinez, H. Shukla, J. Nikulin, C. Mbaeyi, J. Jorba, D. Ehrhardt. *MMWR Morb Mortal Wkly Rep.* **68**, 729-33 (2019)
- D.M. Simpson, N. Sadr-Azodi, T. Mashal, W. Sabawoon, A. Pardis, A. Quddus, et al. *The Journal of Infectious Diseases.* **210 Suppl 1**, S162-72 (2014)
- M. Martinez, I.E. Akbar, M.Z. Wadood, H. Shukla, J. Jorba, D. Ehrhardt. *MMWR Morb Mortal Wkly Rep.* **69**, 1464-8 (2020)
- K. Kostermans. *World Bank [Internet]* (2012). [Available from: <https://blogs.worldbank.org/health/routine-immunization-a-systemic-approach-to-polio-eradication>]
- B. Aylward, R. Tangermann. *Vaccine.* **29 Suppl 4**, D80-5 (2011)
- S. Helleringer, J. Abdelwahab, M. Vandenant. *The Journal of Infectious Diseases.* **210 Suppl 1**, S531-9 (2014)
- R.W. Sutter, C. Maher. *Curr Top Microbiol Immunol.* **304**, 195-220 (2006).
- L.M. Santos, R. Paes-Sousa, J.B. Silva Junior, C.G. Victora. *Bulletin of the World Health Organization.* **86**, 474-9 (2008)
- Global Polio Eradication Initiative. [Available from: <https://polioeradication.org/who-we-are/polio-endgame-strategy-2019-2023/supplementary-immunization/>]
- Global Polio Eradication Initiative. National Emergency Action Plan (2020)
- A. Ahmadi, M.Y. Essar, X. Lin, Y.A. Adebisi, D.E. Lucero-Prisno. *Am J Trop Med Hyg.* **103**, 1367-9 (2020)
- World Health Organization. Field guide for supplementary activities aimed at achieving polio eradication, 1996 revision. 150 (1997)
- Global Polio Eradication Initiative. [Available from: <https://polioeradication.org/polio-today/polio-now/surveillance-indicators/>]
- N.H. Farag, J. Alexander, S. Hadler, A. Quddus, E. Durry, M.Z. Wadood, et al. *MMWR Morb Mortal*

- Wkly Rep.* **63**, 973-7 (2014)
20. Global Polio Eradication Initiative. (2018) [Available from: <https://polioeradication.org/news-post/afghanistan-expands-environmental-surveillance/>]
 21. Global Polio Eradication Initiative. [Available from: <https://polioeradication.org/who-we-are/strategic-plan-2013-2018/targeted-mop-up-campaigns/>]
 22. KFF. (2020) [Available from: <https://www.kff.org/global-health-policy/fact-sheet/the-u-s-government-and-global-polio-efforts/>].
 23. M.E. Birmingham, R.B. Aylward, S.L. Cochi, H.F. Hull. *The Journal of Infectious Diseases.* **175 Suppl 1**, S183-8 (1997)
 24. UNICEF. Polio Snapshot Afghanistan. (2018) [Available from: <https://polioeradication.org/news-post/afghanistan-polio-snapshot-october-2020/>]
 25. S. Closser, K. Cox, T.M. Parris, R. M. Landis, J. Justice, R. Gopinath, et al. *The Journal of Infectious Diseases.* **210 Suppl 1**, S504-13 (2014)
 26. Global Polio Eradication Initiative. (2017) [Available from: <https://polioeradication.org/news-post/afghanistans-mobile-mullahs-on-a-mission-to-eradicate-polio/>]
 27. UNICEF. [Available from: <https://www.unicef.org/esa/communication-for-development>]
 28. A. Yusufzai. *The Lancet.* **4**, 1 (2019)
 29. UNICEF Afghanistan. (2020) [Available from: <https://www.unicef.org/afghanistan/polio-eradication>]
 30. A. Norris, K. Hachey, A. Curtis, M. Bourdeaux. *PLoS One.* **11**, e0149074 (2016)
 31. Medicalxpress. (2020) [Available from: <https://medicalxpress.com/news/2020-06-polio-cases-afghanistan-coronavirus-halts.html>]
 32. S. Abimbola, A.U. Malik, G.F. Mansoor. *PLoS Med.* **10**, e1001529 (2013)
 33. L. Roberts. *Science.* (2020) [Available from: <https://www.sciencemag.org/news/2020/04/we-have-no-choice-pandemic-forces-polio-eradication-group-halt-campaigns>]
 34. R. Kumar. (2020) [Available from: <https://undark.org/2020/11/30/covid-19-pandemic-drives-polio-in-afghanistan/>]