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Review Article

Poliomyelitis Eradication in 2026 -A Conundrum Amidst Geo-Political Conflicts and Health Funding Cuts? A Goal So Close Yet So Far"

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Abstract

Background: The transmission rates of Poliomyelitis are nearing historic lows. 2026 will prove to be a defining year in public health history where the disease may either get eradicated or continue simmering as periodic outbreaks. The goal of achieving a 'Polio-Free World' appears near, thanks to decades of hard work, global collaboration, unprecedented funding and, certainly, the power of vaccines. Unfortunately, polio is proving to be a tenacious opponent. The challenges in polio eradication increase manifold, 2026 onwards, due to current geo-political conflicts and health funding cuts. ***Text:*** Poliomyelitis is an exclusive human disease caused by polio virus, belonging to the Picornaviridae family. The primary mode of transmission is through the faeco-oral route. Around 95% of cases are asymptomatic and about 1% cases present as aseptic meningitis. Paralytic poliomyelitis, which is seen in less than 1% of patients presents as excruciating episodes of pain in back and lower limbs and can present as Spinal polio, Bulbar polio or Bulbospinal polio which is a combination of bulbar and spinal paralysis and is most severe. The ratio of inapparent to paralytic infections could be as high as 1000 to 1 in children and 75 to 1 in adults, depending on the polio virus type and the social conditions. The microbiology of the virus has been studied in detail and the intricacies of its interaction with the human host are being decoded effectively. The innumerable milestones achieved till date have helped in keeping the morale to end polio, high. Nonetheless, many questions still persist and need to be answered. In the mid-20th century, the efforts to combat the polio epidemic, succeeded through introduction of vaccines. Over 3 billion children have been immunized against polio and 20 million people are walking today, who otherwise would have been paralyzed. Along with the goal of eradicating wild polio virus [WPV], circulating Vaccine-Derived Polio virus [cVDPV] outbreaks are proving to be formidable to control. In 2022, closely related strains of polio virus were detected in New York State County and London boroughs. This constituted the first encounter with polio virus in the United States and United Kingdom for a generation, people and public health officers alike! The potential of a possible resurgence of polio cases, like in the past, concerns health scientists. To end polio in the face of challenges, new tactics and novel innovative tools are being deployed. Will this be sufficient in the current ever-changing political scenario? ***Conclusion:*** The Polio Oversight Board [POB] of the Global Polio Eradication Initiative [GPEI] launched its eradication strategy in year 2022. The target was polio eradication up to 2026. After critical analysis, expert consultations and revisions in budget, the timeline has been extended to 2029. Political instability, humanitarian crisis and most importantly, global health funding cuts are threatening the progress made. Year 2026 will prove to be a crucial year in this fight to the finish. This article intends to summarize the microbiology and complex pathogenesis of poliomyelitis, epidemiology of the disease through various timelines, the major campaigns organized globally, their achievements, resurgence of poliomyelitis amidst geo-political conflicts and global health funding cuts. This article makes an attempt to understand the practical implications for health and social scientists as they struggle to learn from the past and search for useful heuristic in an attempt to save our children from disability and eradicate poliomyelitis.

Keywords: Poliomyelitis, Poliovirus, Disease Eradication, Faeco-oral Route, Paralytic Polio, Wild Polio Virus (WPV), Vaccine-Derived Poliovirus (cVDPV).

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BACKGROUND

Poliomyelitis, will go down in the corridors of public health history as one of the most intriguing and challenging disease, ever known to mankind. It has presented itself in numerous guises keeping the medical fraternity on its toes. In the 19th century, epidemics of Poliomyelitis haunted the population of United States and Europe because of its variable progression and possible physical sequelae. Starting in 1920's, increased funding of the research led to newer, innovative methods to control the disease. Poliomyelitis will also be remembered as the disease for which one of the most successful public health campaigns was established on an unprecedented and global scale. In the present era, 'eradication' strategies have undergone numerous changes. In 2024, Polio Oversight Board [POB] extended the 'Eradication Strategy 2022-2026' to 2029. This comes at a critical juncture amidst geographical and political challenges. To understand the end-game, it is imperative to understand the various timelines. By putting forth a microbiological and epidemiological interpretation of successive time-periods, the trials and tribulations of the innumerable people involved with poliomyelitis, directly or indirectly can be understood.

In the words of the great C.H Lavinder, who, in 1916, gave the world phenomenal insight into the epidemics of Poliomyelitis [later shortened to Polio], 'Statistics of the disease have never been possible before on such a large scale. The collection and tabulation, even if they do not lead to immediate results of value, will undoubtedly, prove of great importance to students of later epidemics.' His words sound golden in the year 2026.

This article intends to summarize the microbiology and pathogenesis of poliomyelitis, epidemiology of the disease through various timelines, the major campaigns organized globally, their achievements, resurgence of poliomyelitis amidst geo-political conflicts and global health funding cuts in 2026. The future game-plan in the eradication of poliomyelitis also involves power differentials that shall determine which global public health initiatives are taken on to combat infectious diseases, how they are structured and ultimately, who will be the beneficiaries.

THE MICROBIOLOGY OF POLIO VIRUS:

Polio virus is a non- enveloped, RNA virus which constitutes 60 sub-units, consisting of four viral proteins [VP1-VP4] which are arranged in icosahedral symmetry. The virus was identified by Landsteiner and Popper in 1908, more than a hundred years ago! [1] Poliomyelitis is an exclusive human disease caused by the virus belonging to the Picornaviridae family where the source of infection is either the patient or a symptomless carrier [2]. The contribution of Dr. David Bodian cannot be undermined in our understanding of the disease [3-4]. He elaborated on the pathogenesis and the three antigenic types of polio virus along with his team.

Antigenicity:

The virus has been categorized into three types- 1, 2 and 3 based on neutralization reactions. The prototype strains are Brunhilde and Mahoney strains for type 1, Lansing and MEFI for type 2 and Leon and Saukett for type 3. Two antigens have been identified on the virus body. The C antigen [H antigen] is the capsid antigen and is less specific in nature. Antibodies to C antigen do not neutralize the polio virus. The D antigen [N antigen] is type specific. Anti-D antibodies are protective and hence, the potency of injectable polio vaccines is measured in D antigen units [5]. Tracing the origin of isolates to determine their antigenicity is a prerequisite for all epidemiological surveillance and is essential for the study of vaccines too.

Understanding The Complex Pathophysiology:

As it has been mentioned earlier, humans are the only known source of poliovirus. Studies on the reasons behind this have elucidated the presence of CD155, a glycoprotein found in humans [7]. This glycoprotein demonstrates the capacity to bind with all the serotypes of the virus. CD 155 is composed of three extracellular immunoglobulin like domains- a membrane distal V-type domain and 2 C2 type domains that bind to polio virus. CD155 is also a receptor for natural killer [NK] cells. CD 226 and CD 96 on NK cells stimulate their cytotoxicity. Interaction of polio virus with V- type domain leads to conformational changes in the virus particle [8-10]. The subsequent steps in the replication are depicted in **Figure 1**.

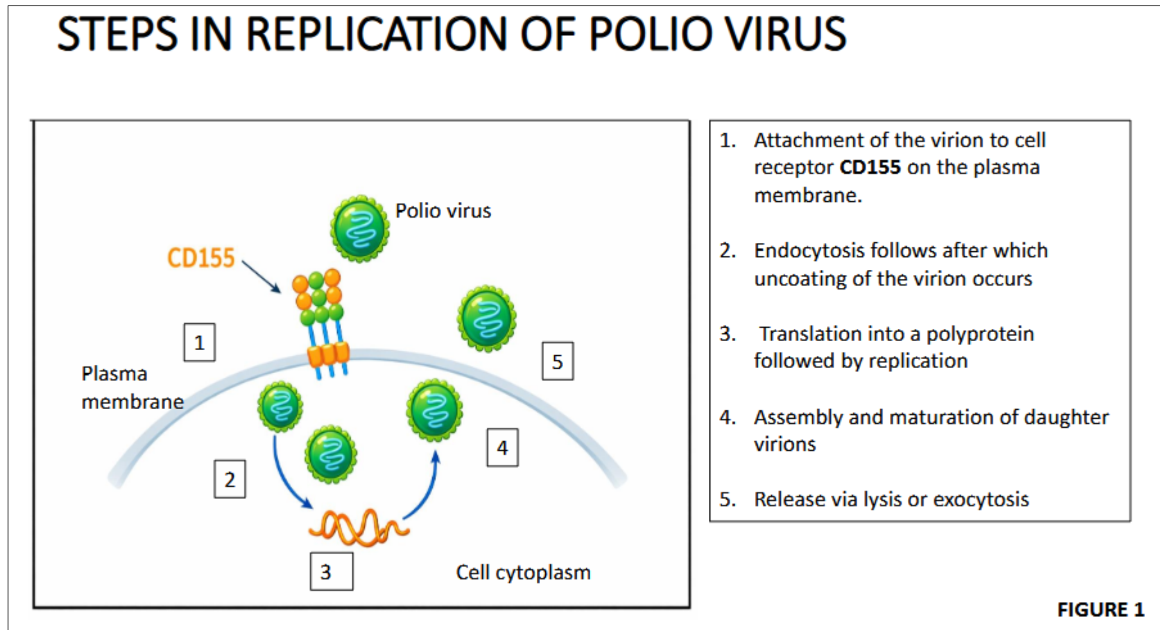
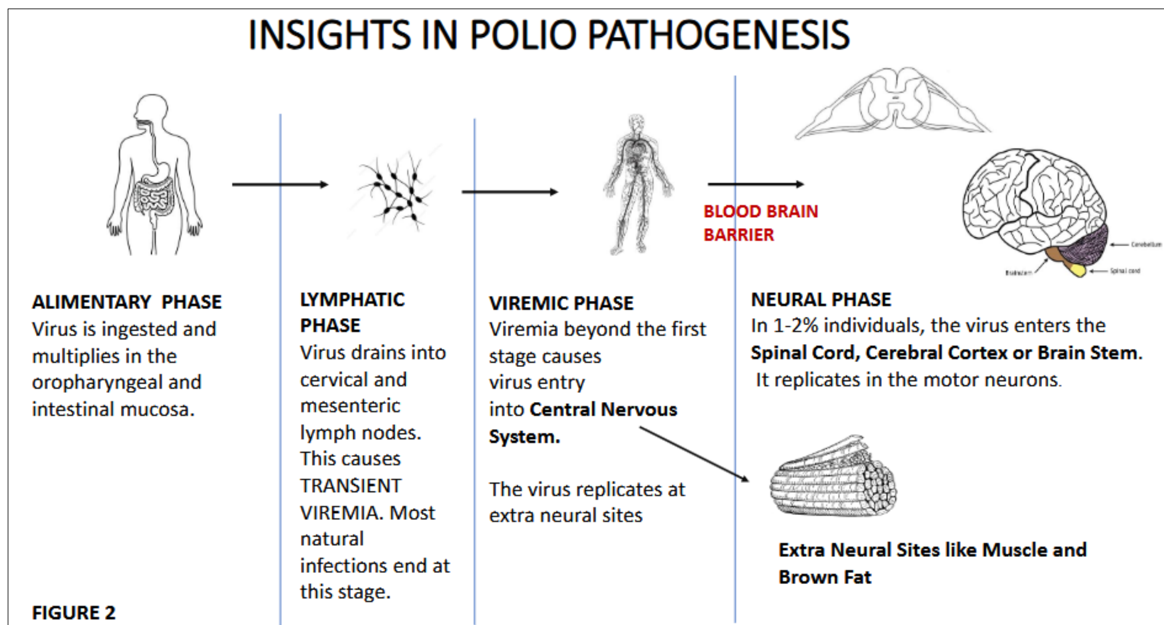


Figure 1: Elucidates the pathogenesis of the virus

The identification of the cell receptor propelled the development of transgenic mice models. These were found susceptible to polio virus and the advancement benefited the health community in understanding the pathogenesis better [11-12].



Vaccine Derived Polio Virus:

Vaccine Derived Polio Virus [VDPV], which resembles Wild Polio Viruses biologically, have garnered attention globally since the year 2000. In fact, low vaccination coverage has been found to be strongly associated with increase in VDPV cases [13]. To summarize briefly, GPEI, defines VDPV as “OPV virus strains that are 1% divergent [or ≥ 10 nucleotide [NT] changes, for types 1 and 3] or > 0.6% divergent [or ≥ 6 nucleotide [NT] changes, for type 2] from the corresponding OPV strain in the complete VP_1 genomic region”. For the VDPV to be classified as circulating, an epidemiological link has to be established [14]. Excreted vaccine-derived poliovirus begins to circulate in a vaccinated community and after a prolonged, uninterrupted spread, the virus begins to mutate. This new virus acquires neuro-virulence and becomes capable of causing paralysis. Type 1 serotype of Polio virus has contributed to 13% of cVDPV, Type 2 around 86% and Type 3, only 1% cVDPV [15-17]. There is also evidence of genetic recombination between vaccine Polio viruses and other human Enteroviruses of species C [HEV-C].

HEV-C includes Polio and related Coxsackie A virus serotypes [18].

During the Polio outbreak of Madagascar in the year 2001-2002, partial genomic sequencing suggested that the sequences of several Coxsackie A virus were closely related to circulating-VDPV sequences. These Coxsackie serotypes were isolated from the stools of children residing in nearby areas in the vicinity of the poliomyelitis outbreak. There is now ample evidence of efficiently replicating variants enabling emergence of new pathogenic Polio Virus lineages [19-20]. More research and live simulation models are required to study this novel genetic recombination.

The August 2022 case of paralytic polio in an unvaccinated man belonging to an orthodox Jewish community in Rockland County, NewYork, is "the first case of polio reported in the United States in nearly 10 years, and only the second instance of community transmission identified in the U.S. since 1979." Furthermore. cVDPV2 has been detected in the sewage water of New York city. Genetic analysis showed that the strains were related to the cVDPV2 isolates from Quebec, London and Jerusalem [21].

From September-December 2024, VDPV2 was reported in the waste water systems of 4 European countries-Spain, Poland, Germany and Finland. The isolated VDPV2 strain has been genetically linked to the strain NIE-ZAS-$_1$, first detected in Nigeria in July 2020. Additionally, analysis also indicates considerable genetic variation between the European isolates. This has been termed unusual wherein multiple, simultaneous and apparently independent importations occurred from a location missed by polio surveillance systems [22-24].

Although no new cases of polio were reported later, recent wastewater findings sparked concerns of poliovirus being present in these communities, posing a risk to those who are un-vaccinated. Centers of Disease Control and Prevention [CDC] and epidemiologists have been concerned about the Rockland patient because one case of paralysis could be the tip of iceberg and might represent a large pool of people who are infected with polio and are asymptomatic, thus continuing to shed infectious virus into the sewage systems.

The Cross-Roads Analyzed!

There has been considerable research into the genetics and molecular biology of the virus, yet we still stand at cross-roads and some pertinent questions are yet to be answered:

1. There exist grey areas as to the exact human sites for replication of polio virus. Whether these viruses multiply in lymphoid cells or epithelial cells in the oropharyngeal and intestinal mucosa is still not clear! Some studies in non- human primate models have emphasized that the replication occurs in both type of cells [25].
2. Some studies have raised queries as to whether people with primary immunodeficiencies [PID] and infected with VDPV [iVDPV], are a reservoir of poliovirus and can contribute to the spread. According to this informative article by Aghamohammadi *et al*, these patients with PID are a potential reservoir for neurovirulent strains [26]. These patients can possibly be potential foci of outbreaks in the post-eradication world. This study postulates and reiterates the fact that it is essential to include such PID patients in poliomyelitis surveillance programs.
3. Does the pathophysiology of Paralytic Poliomyelitis [PPM] include alterations at the genetic level? It is commonly believed that the manifestations of PPM is a result of viral-induced cell death of the motor neurons. Interestingly, Autret et al identified 6 variants in the genes involved in the apoptotic pathway. Their research indicates that the virus triggers apoptosis through the mitochondrion-dependent intrinsic pathway and there are some genetic variations in patients with paralysis [27]. More research with defined cases and controls is required to highlight this groundbreaking postulate. This will drive new and innovative modalities for poliomyelitis containment.
4. What is the most plausible route of transmission for wild polio virus and circulatory vaccine-derived polio virus? Epidemiological analysis has suggested the respiratory route too. John TJ et al have put forward an interesting perspective to be pondered upon [28].
5. It is a well-documented fact that CD155 in epithelial cells is the receptor to which all the three serotypes of polio virus bind. Notingly, this receptor does not exist in the central nervous system cells. It is challenging to understand how exactly the viral spread occurs. Mizutani et al have put forward their research to provide an insight regarding the same [29]. A more in-depth analysis is required to understand the potential pathways via which the polio virus crosses the blood brain barrier [BBB].
6. Circulating vaccine-derived polio viruses [cVDPV] have emerged through evolution of the OPV virus. These pose a significant obstacle to the eradication efforts. What are the early genetic changes that occur when this evolution occurs? Sequence analysis of VDPV strains isolated from within a European country highlighted genetic diversity within individual waste water sites and, surprisingly, high genetic proximity among isolates from different countries [30-31]. Decoding the evolutionary

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dynamics of live attenuated vaccine virus has implications for the success of next generation polio vaccines.

It is imperative to make rapid inroads to provide satisfactory answers for these scientific questions. With the everchanging geo-political scenario and global health agencies' funding cuts, it is definitely proving to be "a fight to the finish" and decoding the complex pathogenesis will help us combat poliomyelitis better.

TIMELINES – POLIOMYELITIS DECONSTRUCTED

Our able historians talk about the existence of Poliomyelitis in ancient times. This disease pre-dates recorded history. Egyptian paintings from the period 1403-1365 B.C depict children with deformed limbs, walking with sticks. There is a picture on an Egyptian stele dating from the 18th century, showing an adult with a withered leg and a crutch [32]. As described in literature, the famous writer, Walter Scott, suffered from a mild limp after an episode of fever in 1773. Unfortunately, at that time, Polio, as a disease, had not been identified [33].

In 1789, an English physician Michael Underwood came across a clinical case and described it as "debility of the lower extremities". He stated 'the disease usually attacks children, previously weakened by fever; rarely those under one year of age or over four years of age.' [34]. Poliomyelitis was also known as Heine-Medin disease as described by specialists Jakob Heine and Karl Oskar Medin in 1840 [35-36]. They are credited for early elucidation of poliomyelitis and presenting it before the scientific community.

For much of the 2nd half of 19th century, there was focus on the other infectious diseases like cholera, plague and tuberculosis. Poliomyelitis did not seem like an urgency. The polio cases were geographically dispersed subject to fragmented research. However, historical records suggest continuous polio outbreaks throughout Europe and the United States [37].

The extent of morbidity and mortality due to poliomyelitis was visible only in the late nineteenth century when major outbreaks of paralysis occurred across the United States, Europe and rest of the world. These epidemics became increasingly severe and this crippling disease penetrated all sections of society. This phenomenon, so striking, has been well documented and paradoxically, the reason was the improvement in standards of hygiene and sanitation. In the pre-endemic era, enteric infections affecting infants of 6-12 months of age were extremely common. These infants acquired passive antibodies from their nursing mothers. These antibodies were sufficient to prevent viremia and consequently, infections of the nervous system. Once the local sanitation levels improved, some of these infants, in late infancy [specifically after 12 months of age], suffered from enteric infections. By this time, the protective passive antibodies had diminished leading the virus to cross the blood brain barrier and causing paralysis. Evidence supporting this hypothesis has been described in detail by Paul JR *et al.,* [38].

Poliomyelitis in the United States [1915-1944]

During these years, it was observed that the average age of the cases afflicted by the virus gradually increased. Initially, only cases of paralytic poliomyelitis were archived. From 1945 to 1954, data recorded included both paralytic and non-paralytic cases. Detailed demographics can be retrieved from historical archives [39-43].

During the time when polio was rampant in the United States, data was also collected regarding the virulence of the three polio serotypes. Strikingly, the regions where polio cases were maximum, 94% of isolates were type 1, while only 6% were types 2 and 3 combined. In the low-incidence areas, 59% were type 1 and 41% were type 2 and 3 combined. In the later years, a similar pattern was seen emerging in polio-endemic developing countries. [44-45]

The frequent epidemics of poliomyelitis left thousands suffering and there was ignorance as to the management of this calamity. Immediate relief had to be provided in the acute cases and rehabilitation was required in those with deformities. A lot of experimentation took place during those years. In early 1900, Sister Elizabeth Kenny used hot packs to relieve muscle spasms in early stages of the disease [46]. This therapy came as a great relief and a large number of patients benefited. Sister Kenny also discouraged the practice of prolonged immobilization of affected limbs. The first modern rehabilitation center was set in 1926 by president Franklin Theodore Roosevelt [47]. It was dedicated to polio- stricken patients. He can be credited as to putting a spotlight on the fight against polio in the United States. Unfortunately, he himself contracted polio at the age of 39. President Roosevelt created the National Foundation of Infantile Paralysis where new inventions to offer relief to the sick patients were introduced. One such instrument was the Iron Lung Machine [48]. It was used in patients with respiratory paralysis to prolong their lives by assisted respiration, the drawbacks being the mammoth size, repeated technical adjustments and cost factor.

Celebrations And Heartbreaks [1950-1988]

The chronology in the development of polio vaccines, following the first human trials include both celebrations and heartbreaks. There were success stories bittered by tragic incidents which nearly hampered the vaccination program [49]. The global population applauds the two giants of the 'Polio Vaccine Program'- Jonas Salk and Albert Sabin. But there were other scientists also who toiled day and night to find an

effective vaccine. One such prominent and famous virologist, Dr. Hilary Koprowski succeeded in attenuating polio virus through adaptation to mouse brain. After ingesting the crude oral vaccine himself first, he conducted a clinical trial, without formal authorization from his superiors on a few institutionalized mentally challenged children. The trail, though successful, was treated with disdain and frowned upon by contemporary scientists. Dr. Hilary continued his clinical research but unfortunately, it did not culminate in the success he had anticipated. The 2006 article by Dr. Koprowski himself makes for a very interesting read [50]. Meanwhile, in 1951, Salk could carry out experiments in finding a suitable vaccine, thanks to the largest ever public fund-raising activity 'March of Dimes'. On 23rd January, Jonas Salk presented the results of a clinical trial including 161 children, successfully to the Immunization Committee. He was confident about a 'killed' or inactivated vaccine which was then tested in the largest ever conducted field trial. Thomas Francis, a highly respected virologist took charge of these trials which involved nearly 600,000 school children [51]. The vaccination program in United States was emulated in other parts of Europe too. In erstwhile Democratic Republic of Germany, vaccination was encouraged with the catchy slogan, "Oral vaccination is sweet, Polio is horrible" [52]. The success and jubilation were short-lived, as in 1955, the infamous, tragic 'Cutter Incident' occurred. California based, Cutter Laboratories, involved in the mass production of Salk's vaccine [inactivated polio vaccine, IPV], owing to negligence and lack of expertise, mixed up batches of killed virus with live polio virus. The effects were devastating as it caused 40,000 cases of polio, 200 cases of paralysis and 10 dead children [49]. The Cutter Incident snatched away the credibility of the Salk Vaccine and led to the introduction of the alternative Sabin vaccine.

Mass immunization with the oral Sabin vaccine started in the United States in 1963. The vaccination program was declared a phenomenal success as the incidence of polio cases in the United States fell from 13.9 cases per 100,000 in 1954 to less than 0.5 per 100,000 in 1965 [46]. By 1970, endemic transmission ceased. The last domestic case was reported in 1979.

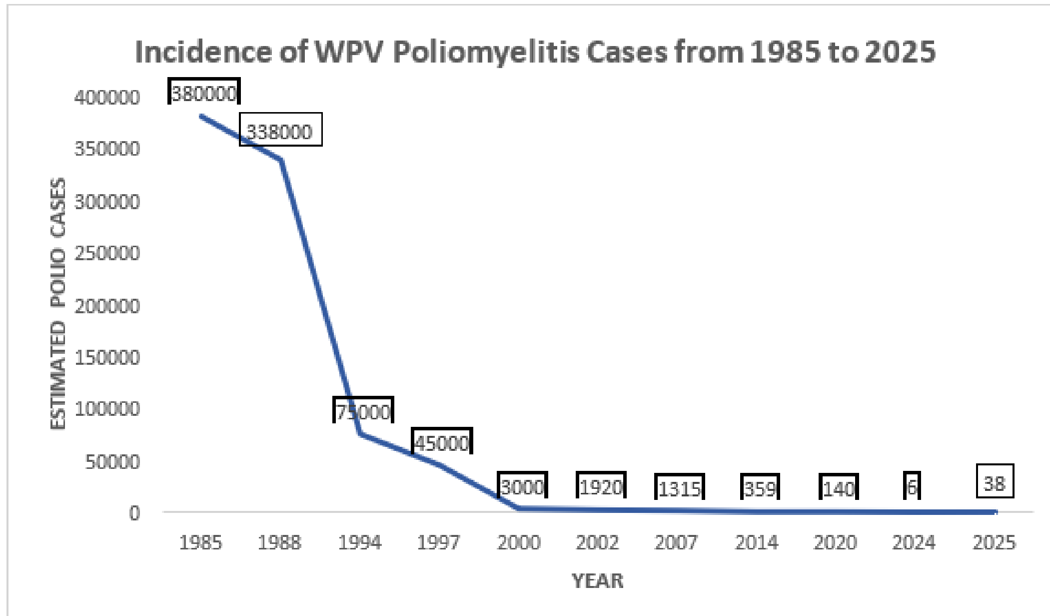
Three doses of this live attenuated vaccine provided immunity against all three polio serotypes in around 95% individuals. This vaccine was easy to administer which made it preferable to IPV. Another excellent feature of OPV was its contribution to herd immunity. Herd immunity, to put in simple words, is when the risk of infection in susceptible individuals decreases due to successful vaccination of others in the same community.

The Expanded Program on Immunization [EPI] had already been launched by WHO in 1974 and piggybacking on the success of OPV in the United States, OPV was included in EPI to be distributed globally. The vaccine, a combination of the three polio serotypes, was soon made available to the poorest countries. The immunization program spearheaded by strong-willed health experts and astute politicians overcame logistical and biological challenges to attempt and vaccinate as many people globally. In 1985, World Health Assembly [WHO] built a Global Polio Laboratory Network [GPLN] encompassing 146 sophisticated accredited technically proficient laboratories to support polio virus surveillance globally. The Global PolioPlus Campaign was launched by Rotary International in the same year, mobilizing funds in support of polio control programs.

All these developments led to the famous 1988 resolution, envisaging a Polio-free world – 'Eradicate Polio by year 2000!'

The Lows, Highs and Challenges [2000-2026]

Worldwide presently, polio cases are at some of the lowest levels in history. This final phase of eradication/control is proving to be the most challenging yet. The last two countries endemic for Wild Polio Virus, Pakistan and Afghanistan, face complex political, technical and operational challenges. Vaccine Derived Polio Virus [VDPV] outbreaks have jolted the global community since the past few years. **Figure 3** depicts the downward trend of poliomyelitis cases since 1985 and the current incidence worldwide [as of February 2026]. This year will be a challenging one as countries battle, competing health priorities and emergencies. The crisis in Pakistan-Afghanistan border areas, Sudan and Gaza causing widespread displacement and deprivation has led to innumerable children being rendered not-reachable and non-vaccinated.



Polio cases as on 26 February 2026:

Afghanistan	**three WPV1 cases and two WPV1-positive environmental samples**
Pakistan	one WPV1-positive environmental sample
Chad	one cVDPV2 case
DR Congo	three cVDPV2 case
Nigeria	seven cVDPV2 case, one cVDPV3 case, two cVDPV2- positive environmental samples
Togo	one cVDPV2 case
Zambia	one cVDPV2- positive environmental sample

Source: http://www.polioeradication.org/. Starting from 2001, all WPV cases were reported on virological confirmation by Global Polio Laboratory Network

	KEY GLOBAL POLIO ERADICATION MILESTONES
1985	Launch of Pulse Polio Program-the first and Largest Public-Private Partnership
1988	WHO Assembly passes resolution to eradicate Polio
1994	Americas certified Polio-free
1997	India immunized 127 million children on a single day- January 1997
2000	WHO Western-Pacific Region declared Polio-free
2002	WHO European Region declared Polio-free
2014	WHO South-East Asia declared Polio-free
2020	WHO African Region declared Polio-free

WPV- wild polio virus, **cVDPV**- circulating vaccine derived polio virus, **WHO**-World Health Assembly

We attempt to cover these crucial years under various headings to try grasp the difficulties on the journey ahead. Also, all the major milestones in the poliomyelitis journey have been depicted in the above-mentioned Figure 3.

Pakistan And Afghanistan in 2026

Pakistan and Afghanistan form a single epidemiological block where Wild Polio Virus transmission continues till date. Gavi, the Vaccine Alliance is constantly innovating to improve operational and communication strategies in Afghanistan and curb transmission rates. Vaccination teams continue to do house to house visits in south Afghanistan to trace any missing children. Immunization has markedly increased in the eastern region, bringing down active polio cases. For the first time in Afghanistan, vaccinators introduced intradermal jet injectors-needle free devices. This will definitely help in improving vaccination rates as needle fear/hesitancy will diminish [53].

Epidemiologists and social scientists are constantly debating on the reasons of continued Wild Polio Virus transmissions. Svea Closser, in her book, excellently describes the reasons for continued circulation of Wild-Polio virus in Pakistan. She blames the district -level employees of GPEI for their apathy. Foot-dragging and false compliance are two major issues

detrimental to the initiative. There is no state protection for the health workers who are being repeatedly attacked by extremists. Moreover, there exist complex interactions of Donor, The United Nations and State Government which are hampering the progress [54].

On the brighter side, efforts are underway and inter-country co-ordination is being promoted to decrease polio transmission. To name a few interventions taken with the help of global health agencies [55-56].

1. Vaccination has been emphasized for all age-groups at official border crossings
2. Bi-annual polio vaccination campaigns
3. Active participation at grassroot levels engaging local politicians, tribal heads, volunteers and religious leaders.
4. Pakistan has developed a road-map to ZERO POLIO [NEAP 2025-2026] consisting of three phases for wild polio virus eradication.

TRAJECTORY OF POLIOMYELITIS AMIDST

a.) DIMINISHING GLOBAL HEALTH FUNDS

Dr. Tedros, Director-general of WHO talked about the impact of recent policy changes by the United States- "We are living through the greatest disruption to global health financing in memory." [57]

Global health research and innovation face a paradigm shift in the year 2026. Until recently, United States has been the single largest donor in public health programs, contributing to over 30% of all health assistance [$ 8.3 billion]. The present Trump government threatens to cut off millions of dollars to crucial health programs [58]. National Institute of Health [NIH], largest funder of biomedical research in the world, has faced major disruptions. As of September 2025, 2.4 billion dollars in grant funding has been halted [59]. United States health and humanitarian funding have worked as a life-saver for millions of children and disabled people globally. In the closing funding cycle 2021-2025, the United States provided 24% of direct contributions to Gavi, the Vaccine Alliance [60]. The American President's FY2026 budget request proposed cutting foreign assistance in half [61]. **Figure 4** depicts the decrease in health development funds from the year 2024 to 2025.

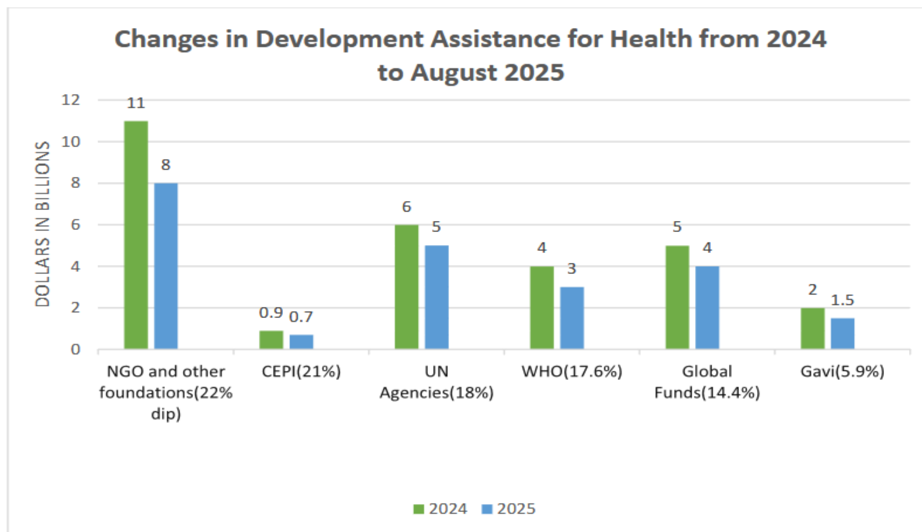


FIGURE: 4

Source: https://www.healthdata.org/sites/default/files/2025-07/FGHReport_2025_2025.07.15_0.pdf

NGO- Non-Governmental Organization

CEPI- Coalition for Epidemic Preparedness Innovations

UN- United Nations

WHO- World Health Organization

Gavi- Vaccine Alliance

UN Agencies- PAHO, UNICEF

With the vaccine funds getting dried up, these campaigns will take a disastrous hit. Centre of Disease Control [CDC] and USAID are directly involved in training, data collection, disease surveillance and epidemiological surveys for the polio programs. Once the programs shut down or diminish in operations, it will be very difficult to undo the harm done. Children shall not receive timely vaccination, volunteers and field workers will not receive necessary logistical support,

people with disabilities shall not receive timely assistance, and more.

This will directly hamper WHO's Health Emergency Program and polio immunization in Pakistan, Afghanistan and Gaza, primarily, will be severely hit. In other words, the premier health agency will be far less able to respond to outbreaks worldwide.

b.) GEO-POLITICAL TENSIONS

The on-going political tensions in the world strain humanitarian efforts and hence hamper polio vaccination programs significantly. WHO responded to health crises in Gaza and Sudan but unfortunately its regional emergency task force has been cut into half due to lack of funds. Cross-border violence in Pakistan and Afghanistan have closed many health clinics and caused mass migrations.

A detailed and hard- hitting study by Headley et al highlights the fact that armed conflict hampers immunization services. It results in substantial reduction in supply of critical Polio vaccines. There is also creation of potential blind spots because Internally-displaced persons [IDP], war refugees and cross-border population are frequently excluded from health surveys [62].

Diana Szanto's detailed ethnography on polio-disabled population of post war Sierra Leone in West Africa highlights the importance of humanitarian aid to the disabled sufferers [63].

ROADMAP AHEAD- OLD WINE IN NEW WINESKINS?

Will a change of strategy from polio eradication to polio control benefit the global population and also contribute to financial savings. There is no definite answer still. One such school of thought proposes the sequential phase-out of OPV with only IPV-phase. Conjecturing the future, there could be complete withdrawal of IPV, at which time the idea of 'optional polio vaccine' could be discussed. Zimmermann et al, in his study, estimated that from year 2032[confidence interval 2027-2051], expenditure from successful polio eradication would be substantially less than expenditure incurred for polio control [64]. However, due to the repeated delays in complete eradication, few public health experts are less optimistic and more wary about the total costs involved [65]. Post Covid-19 pandemic, two major developments have dampened their spirits. Firstly, GPEI has postponed the polio eradication goal from 2026 to 2029. Secondly, immediately after assuming office, President Trump threatened to cut WHO and USAID funding [61]. Potential setbacks include declining immunity levels in the present global population who are not immunized by either OPV/IPV. This can create genetic mutants especially harmful neurovirulent polio serotypes [66]. Stable and improved OPV are on the agenda of GPEI strategy, extended presently to 2029. The first version of novel OPV [nOPV2] has been used in 23 countries. Unfortunately, there have been cases of neurovirulent mutations [67-72].

Notingly, setting a timeline for phasing out of polio vaccines could be an impediment to crucial vaccine research. This might have economic repercussions as major grant providers may lose interest. The flow of capital is imperative to understand more in the pathogenesis and evolution of genetically stable vaccines. **Figure 5** depicts the chronology in development of Polio vaccines.

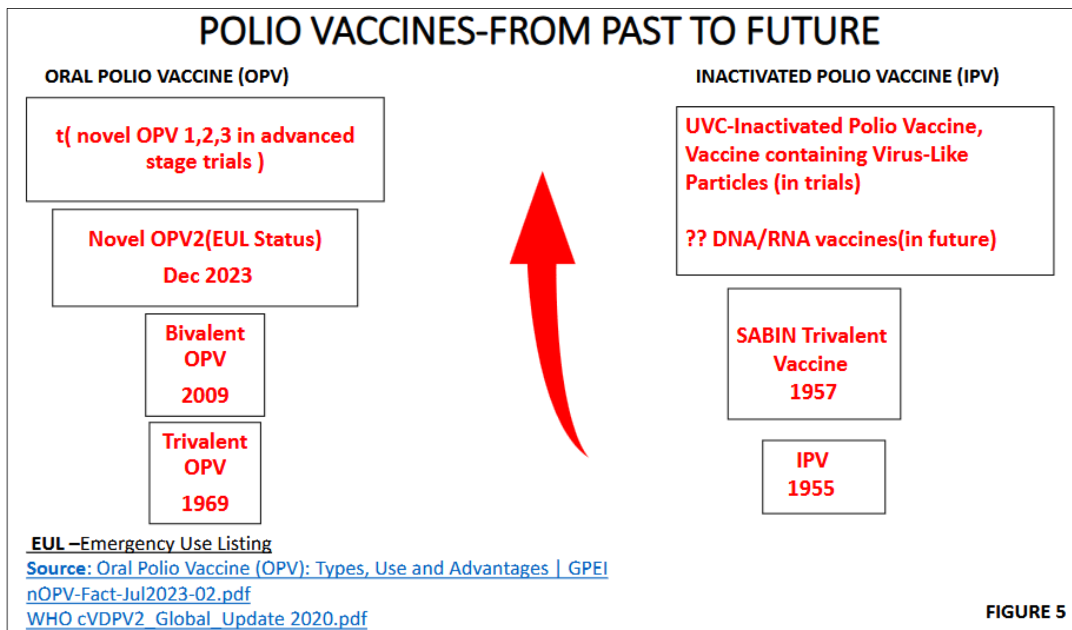


FIGURE 5

The year 2026 shall be a witness to the changing Aid Ecosystem. The funding void created by United States is being successfully bridged by other nations. On 8 December 2025 in Abu Dhabi, a global pledging event was held, hosted by Mohamed bin Zayed Foundation. The tagline was, 'Investing in Humanity: Uniting to End Polio'. They donated 140 million dollars to the polio cause [73]. In a major boost to the Polio Eradication Program, Alwaleed Philanthropy Global Today, pledged 15 million dollars to Global Polio Eradication Initiative. The secretary of the foundation, HRH Princess Lamia Bint Majed Al Saud pledged their commitment to global health [74-75].

It is clear that this momentum should not be lost at this pivotal juncture and more and more countries, United States aside, should join hands to fill in the funding gaps.

CONCLUSION

2024 heralded the 50th anniversary of Expanded Program on Immunization [EPI]. This Public Health Initiative has been a major driving force in combating infectious disease globally, particularly Poliomyelitis and has succeeded in preventing millions of deaths and lowering the global burden. Since the year 2000, an estimated 16 million children, primarily in the most deprived and vulnerable regions of the world, have been spared from lifelong disability. The immunization Agenda 2030 takes forward the legacy of EPI into the next decade. It is a visionary framework focusing on two major ideas- universal access to vaccines and achieving equitable immunization coverage worldwide. Thanks to a unique public-private partnership between WHO, Rotary International, CDC, UNICEF, Gavi and Bill and Melinda Gates Foundation, the world stands on the threshold of eradicating polio. Amidst the various success stories, challenges have appeared along the way. Covid-19 Pandemic proved to be a major setback, disrupting routine immunization services. Vaccine hesitancy or decreased acceptance, driven by mistrust, has become a major public health concern. Political tensions and wars have affected areas with weak health infrastructure. Resurgence of polio cases and the continuous, much-needed research into newer vaccines have raised questions on financial sustainability. Until recently, the United States carried the tradition of strong public health leadership. The famous song of 1985, 'We are the World', carried the tag-line-USA For Africa! Ironically, after nearly four decades, President Trump talks about global health funds' cuts promoting 'America First'. A funding freeze could undermine decades of hard work of nearly 150,000 healthcare personnel, 20 million volunteers and hundreds of millions of care-givers.

Global wild polio cases have been reduced by more than 99% since 1988. As some countries face epidemiological risks requiring continuous supply of OPV, some have transitioned away towards IPV. This fight should continue to the finish-line. The precious assets of Polio Eradication Programs worldwide-dedicated scientific experts, determined volunteers, able policy makers and their effective, tactical control strategies will serve as an enduring legacy for future health campaigns, disarming emerging and re-emerging infectious diseases.

In the famous words of Martin Luther King, Jr 'We must accept finite disappointment but never lose infinite hope.'

STATEMENT OF CONTRIBUTION

All the authors have contributed substantially. They have agreed to the submission of the manuscript.

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