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Local Polio Eradication Programs in Key Endemic Regions in Pakistan: A Scoping Review

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Abstract. This scoping review aims to identify and map the existing programs deployed in Pakistan to improve polio vaccination rates and understand the factors contributing to the persistent challenges in eradicating the disease. The review followed the Joanna Briggs Institute (JBI) methodology for scoping reviews. A comprehensive search of PubMed was conducted, limited to publications within the last 6 years (2019-2025), yielding 96 publications. Data extraction and synthesis focused on program descriptions, target populations, implementation timeframes, geographic regions, and reported successes or shortcomings. The review provides a landscape of polio eradication efforts in Pakistan, highlighting gaps and opportunities for future interventions. The review identifies that complete eradication of polio in Pakistan is inhibited by a lack local strategies to target specific context. Such contexts can have barriers that are circumstantial or systemic. Circumstantial problems refer to unavoidable environments that deter vaccination efforts, such as the incidence of natural disasters that destroy sanitation systems or the prevalence of terrorism in a region, deeming it unsafe for healthcare workers to enter. Systemic problems are structural issues that lead to the spread of vaccine hesitancy, which is often rooted in significant mistrust for the healthcare sector. This may reflect both a lack of trust in healthcare stemming from limited access to basic medical facilities and misinformation fueled by conspiracy theories embedded within religious, social, or political narratives. In either case, the most effective response is one that is context-specific, drawing on community resources to rebuild trust and strengthen healthcare systems.

Keywords: Polio; Eradication; Programs; Pakistan.

1. Introduction

Poliovirus is a non-enveloped RNA enterovirus that has 3 serotypes: type 1, type 2, and type 3. Their divisions are attributed to the slight differences in their respective capsid proteins [1]. Poliomyelitis is a highly infectious disease caused by a virus that enters the human body's nervous system, able to cause complete paralysis within hours. It is transmitted mainly through the faecal-oral route, or sometimes through a common medium, i.e contaminated water or food, after which it multiplies in the intestine. The disease's main targets are children under the age of 5, but those unvaccinated of all ages are able to contract the disease. For every 200 cases, one results in permanent paralysis and 5-10% result in death due to immobilised breathing muscles. Polio is a condition that cannot be reversed, only prevented through the administration of the oral polio vaccine or inactivated polio vaccine. The complete eradication of polio is important to eliminate risk of a global resurgence. In so far as even one child is infected with the virus, the risk of it spreading exists for every child [2].

The Global Polio Eradication Initiative (GPEI) was launched in 1988, and has since then worked to achieve its aim of global eradication of all wild, vaccine-related and Sabin polioviruses [3]. Today, the initiative stands largely successful with over 90% of the world's population residing in polio-free regions- a result of the elimination of wild polio from five of the six WHO regions. It has eradicated 2 of the 3 strains of wild poliovirus, leaving behind traces of cases of wild poliovirus type 1. Type 2 and 3 were confirmed completely eradicated in the years 2015 and 2019 respectively. However, two nations remain where polio is still endemic: Pakistan and Afghanistan [4]. This research paper focuses on the gaps in eradication efforts within Pakistan specifically. Polio eradication efforts began in Pakistan in 1994 through the development of the Pakistan Polio Eradication Programme. The

Pakistani Government has invested approximately US$387 million from the Islamic Development Bank, US$121 million from the Japan International Cooperation agency, and US$58 million from other national governments into the GPEI from 1985 to 2019; the US has contributed an additional US$17 billion since 1985[1]. Following the GPEI's "Endgame Strategy 2019-2023", Pakistan adopted the WHO Polio Eradication Strategy 2022-2026 [5], which saw $4.8 billion in funding to attempt to free the world from polio in 5 years [6].

There are three broad reasons for why polio eradication efforts in Pakistan have failed: poor infrastructure, vaccine hesitancy and political instability. In flood prone regions, poliovirus is spread due to contaminated water supplies and weak avenues for sanitation following heavy rains and subsequent flooding. Erratic weather patterns have exacerbated this effect. Additionally, vaccine hesitancy has been fueled by heavy misinformation that includes a blend of religious criticism and distrust in the healthcare system to propel suspicion of the vaccine's potential side effects or involvement of foreign parties. Local beliefs are often responsible for shaping public attitudes towards the vaccine and can be further spread by rumours on social media. Examples of popular conspiracies include the idea that the polio vaccine causes infertility, or that it is made from swine. Rebuilding trust within local communities is key in addressing the gaps within eradication efforts, depending on those localities' specific barriers. In other cases, political instability and security concerns have a critical role in obstructing eradication. Particularly in tribal areas in Pakistan that border Afghanistan there are militant groups that target healthcare workers administering the vaccine. A growth in violence has stimulated fear that disallows vaccination teams from reaching high risk areas, significantly reducing access and allowing the virus to spread unchecked [7].

Reported cases of polio have seen an upward trajectory in the years following the drop in 2017- 12 cases in 2018, 147 in 2019, and 84 cases in 2020. With the emergence of coronavirus disease in 2019 (COVID 19), eradication efforts in Pakistan saw a new barrier. The healthcare system compensated for its increased efforts to control the spread of COVID-19 by halting polio eradication efforts, inadvertently making vulnerable children susceptible to its contraction[3]. As of May 2025, there have been 10 newly confirmed cases of polio in Pakistan- 5 from Khyber Pakhtunkhwa, 4 from Sindh, and 1 from Punjab [8].

This research paper focuses on details of trends in polio eradication from the past 6 years in order to assess the effectiveness of the most recent and relevant eradication activities to provide suitable recommendations for forthcoming efforts. Based on the original literature review, there were observed gaps in efforts to focus on local strategies, according to unique social contexts, towards countering the issue. Therefore, the objective of this paper is to landscape existing polio eradication efforts in Pakistan, highlighting gaps and opportunities for future research and interventions.

2. Method

The polio scoping review was conducted in accordance with the JBI methodology for scoping reviews [9]. The objectives, inclusion, and methods for this scoping review were specified in advance, documented in a protocol, and published on Figshare [10].

2.1. Primary Research Question

What programs have been deployed in Pakistan to improve vaccination, and why have they not been effective enough to eradicate polio?

2.2. Sources of evidence

The evidence included all published materials including articles, studies, systematic reviews available in Pubmed. PubMed® comprises more than 38 million citations for biomedical literature from MEDLINE, life science journals, and online books.

2.3. Search strategy

The search strategy located published studies related to polio eradication programs in Pakistan. An initial limited search of Pubmed was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles, as well as the index terms used to describe the articles, were used to develop a full search strategy.

A comprehensive literature search was conducted in PubMed to identify studies on polio eradication programs in Pakistan published between February 1, 2019, and February 1, 2025.

The following search string was used in PubMed: (("poliomyelitis" [MeSH Terms] OR "poliomyelitis" [All Fields] OR "polio" [All Fields]) AND ("eradicate" [All Fields] OR "eradicated" [All Fields] OR "eradicates" [All Fields] OR "eradicating" [All Fields] OR "eradication" [All Fields] OR "eradications" [All Fields] OR "eradicative" [All Fields]) AND ("program" [All Fields] OR "program s" [All Fields] OR "programe" [All Fields] OR "programed" [All Fields] OR "programes" [All Fields] OR "programing" [All Fields] OR "programmability" [All Fields] OR "programmable" [All Fields] OR "programmably" [All Fields] OR "programme" [All Fields] OR "programme s" [All Fields] OR "programmed" [All Fields] OR "programmer" [All Fields] OR "programmer s" [All Fields] OR "programmers" [All Fields] OR "programmes" [All Fields] OR "programming" [All Fields] OR "programmings" [All Fields] OR "programs" [All Fields]) AND ("pakistan" [MeSH Terms] OR "pakistan" [All Fields] OR "pakistan s" [All Fields])) AND (2019/2/1: 2025/2/1[pdat])

This search was filtered to include only articles published within the specified date range. The search yielded 96 results for additional screening.

2.4. Sources of evidence screening and selection

All identified citations based on the search strategy from PubMed databases were collected and put in Microsoft Excel. The resulting studies were carefully screened within the excel by titles and abstracts by two independent reviewers for assessment against the inclusion criteria. The primary reviewer screened all studies, while the second reviewer (M. Akbari) screened 20% of the total studies in alignment with new guidance for restricted reviews [11]. The screening resulted in a sub-set of studies for full-text screening. The relevant sources were retrieved in full, and their citation details were imported.

Table 1. Inclusion Criteria

P: Population	Unvaccinated population in Pakistan where polio is endemic (Khyber Pakhtunkhwa and Baloshistan)
C. Concept	The concept (C) is to uncover the reasons of vaccine hesitancy and what measures should be taken to identify and understand underlying factors to inform the creation of effective and targeted local programs.
C: Context	Pakistan healthcare system and vaccination context in particular where polio is endemic (Khyber Pakhtunkhwa and Baloshistan)

Table 1 shows the inclusion criteria. The full text of selected citations was assessed in detail against the inclusion criteria by two independent reviewers to different degrees. Similar to the title and abstract screening, the primary reviewer screened the full text for all sources, while the second reviewer screened the full text of 20% of the studies in line with guidance on restricted reviews [11]. Reasons for the exclusion of sources of evidence during the full-text screening that did not meet the inclusion criteria were recorded and reported (See Results Section). Any disagreements that arose between the reviewers at each stage of the screening and selection process were resolved through discussion. The screening and selection process was presented using the PRISMA framework [12].

3. Results

The search yielded 96 publications from PubMed. The primary reviewer screened all 96 studies based on title and abstract, while the second reviewer (M. Abari) screened 20% of the total publications (19 publications). The screening resulted in 44 studies for full-text screening. The 44 relevant sources were retrieved in full, and their citation details were imported into Microsoft excel. The full text of selected citations was assessed in detail against the inclusion criteria by two independent reviewers to different degrees. Similar to the title and abstract screening, the primary reviewer screened the full text for all 44 sources, while the second reviewer (M. Akbari) screened the full text of 10% of the studies (5 publications). Of the 44 studies, 32 were excluded, and the reasons were documented (See PRISMA below). The results of the search and screening were presented using the PRISMA framework [12] (Figure 1). At the end of the screening and selection process, 12 publications were left for data extraction and analysis.

The twelve publications short-listed were reviewed thoroughly and data was extracted to identify the key eradication programs implemented in Pakistan and their effectiveness. Tables 2-4 highlight the key programs and strengths and weaknesses. Figure 2 shows the polio eradication policies in Pakistan based on the information from included papers.

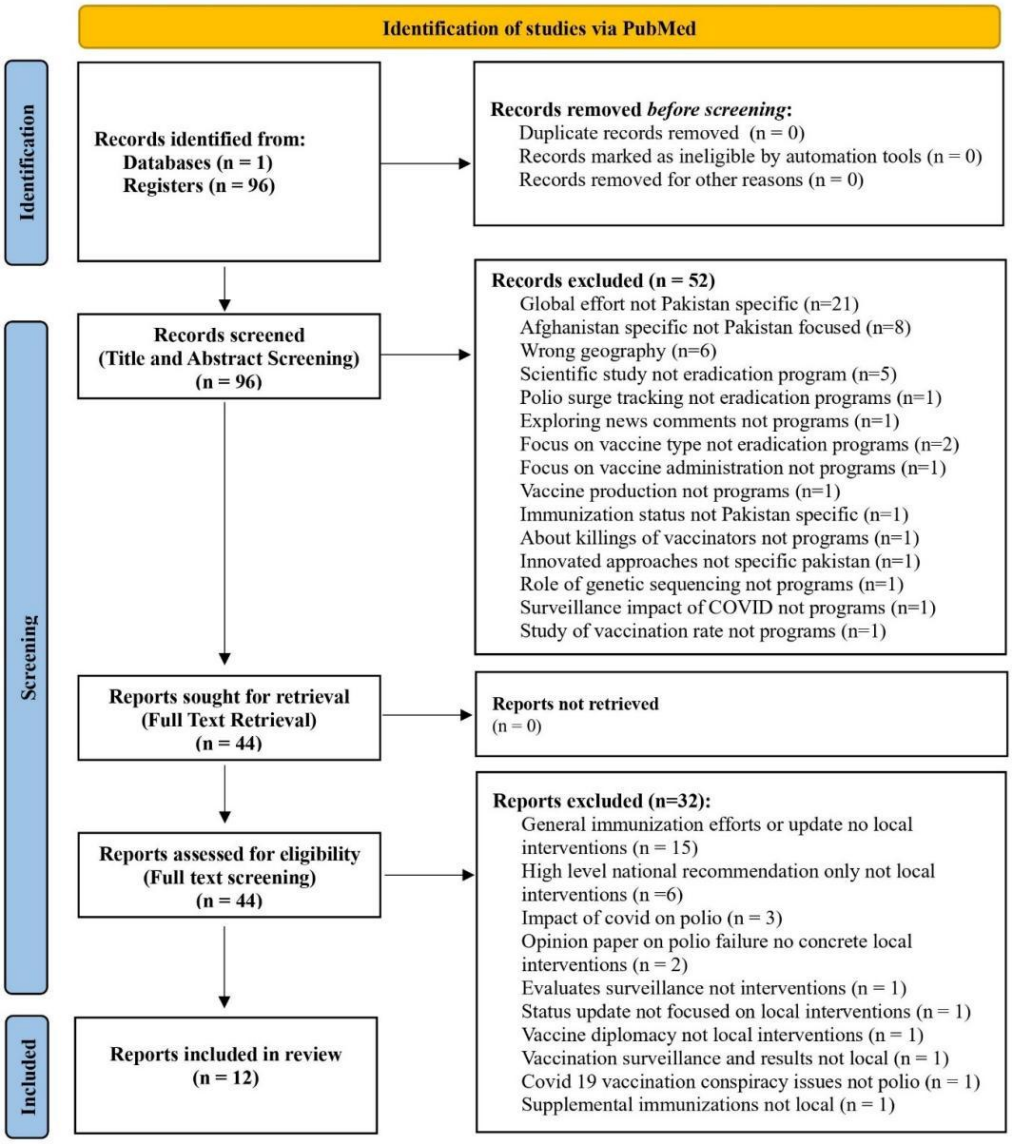

Figure 1. PRISMA to illustrate the publication screening and selection

Table 2. Review and Synthesis of the Short-listed Publications (2019-2021)

Source article	Khan et al. 2020		Ittefaq et al., 2021	Ataullahjan et al. 2021						Shafique et al. 2021	
Local Polio Eradication Programs in Pakistan	Awareness and Advocacy Campaigns	Religious Support Persons (PEI staff)	Emergency Operations Center Khyber Pakhtunkhwa (KPK) counter-misinformation campaign	Pakistan Polio Eradication Programme (1994)	Acute Flaccid Paralysis (AFP) surveillance (1995)	House-to–house vaccination strategy (1998–1999)	Environmental surveillance (2009)	Sehat ka Insaf' (health justice) campaign – Khyber Pakhtunkhwa (2014)	'Sehat Ka Ittehad' (health unity) program – Khyber Pakhtunkhwa (2015)	Government's clinical camps and door-to-door oral vaccination program	Polio Eradication Initiative (PEI) program
Target Population	General population	Religious communities	Parents and the general public in Khyber Pakhtunkhwa (KPK), Pakistan.	Children under five years of age in Pakistan.	Children aged less than 15 years	Children under five years of age in Pakistan.	Poliovirus reservoirs	Children in Khyber Pakhtunkhwa	Children in FATA and other regions of Khyber Pakhtunkhwa	Children under 5 years of age	General, with a focus on children under 5 years of age
Timeframe of application	Ongoing	Ongoing	Launched in April 2019 (after the misinformation event).	1994 - Present	1995 - Present	1998 - Present	2009 - Present	2014	2015	Ongoing	Very active from 2015-2019
Region	Charsadda, KPK	Charsadda, KPK	Khyber Pakhtunkhwa (KPK), Pakistan	Nationwide, Pakistan	Nationwide, Pakistan.	Nationwide, Pakistan	Lahore and Karachi, Pakistan	Khyber Pakhtunkhwa, Pakistan	Khyber Pakhtunkhwa, Pakistan	Pakistan	Khyber Pakhtunkhwa (KPK), Pakistan
Success of Program / or Reason for falling short	Falling short: Content is insufficient and not culturally tailored; fails to address specific community concerns. Social media disinformation outpaces official messaging.	Mixed: Some success if key religious leaders are convinced, but overall impact limited by politicization of religion and anti-state sentiment.	The article does not provide a definitive assessment of the campaign's success. However, it notes that vaccine refusal numbers skyrocketed after the misinformation incident, suggesting that the campaign may have had limited immediate success in fully countering the negative impact of the misinformation.	The program has reduced wild poliovirus cases by up to 99% since the early 1990s. However, the transmission of wild poliovirus persists. Variable governance, insecurity, and community misbeliefs have hindered success.	AFP surveillance was fully functional by 1998, helping in the early detection of polio cases.	Improved vaccination coverage by reaching children in their homes	Allowed for targeted interventions in high-risk areas.	Launched to protect children in Khyber Pakhtunkhwa against vaccine-preventable diseases, including polio.	Launched to provide polio vaccination and vaccinations against other diseases to children in FATA and other regions of Khyber Pakhtunkhwa, who had not been vaccinated due to inaccessibility or security reasons.	Cases increased. A few religious leaders believe that the immunisation cause infertility and HIV infection. This misconception led to hostility towards healthcare workers even caused life-threatening situations.	The study was conducted in view of the rise in polio incidence from 2015–2019 despite a very active Polio Eradication Initiative (PEI) program.

Table 3. Review and Synthesis of the Short-listed Publications (2022-2023)

Source article	Zarak et al., 2022		Das, J.K. et al. 2023	Irwin, 2023	Sodhar et al., 2023
Local Polio Eradication Programs in Pakistan	Supplementary Immunization Activities (SIAs)	Islamic Advisory Group (IAG)on Polio Eradication	Community Engagement and Conditional Incentives (C3I) Intervention	Incentivizing Communities Project	Permanent Transit Points (PTPs) and Cross Border Points (CBs)
Target Population	Children under five years of age in Pakistan, specifically in Quetta Block	Communities with religious concerns about the polio vaccine.	Households with at least one child under the age of five years and permanent residents of the selected HRUCs	Communities in Pakistan	Migrant families, high-risk mobile populations, and children crossing the Pakistan-Afghanistan border.
Timeframe of application	Data collected from campaigns in April and June 2019. These are ongoing.	Since 2015	One year	Ongoing	Timing not explicitly stated, but implied to be ongoing as of 2023
Region	Quetta Block, Balochistan, Pakistan	Pakistan	Peri-urban Karachi (Haji Mureed Goth) and rural Bannu (Mira Khel), Pakistan	Pakistan	Border regions between Pakistan and Afghanistan, (Chitral, Peshawar, and Waziristan.
Success of Program / or Reason for falling short	The article highlights that refusal rates were 8.6% and 8.1% during the April and June 2019 campaigns, respectively. The most prevalent reason for refusal was "misconceptions about vaccines." This indicates that, despite the campaigns, a significant number of children are not being vaccinated due to these misconceptions, hindering the goal of polio eradication.	Positive impact. Helped decrease the rate of refusals. Refusal based on religious beliefs significantly declined when approached in a context-appropriate manner, indicating that sustained efforts by the IAG can result in significant decline of vaccine refusals due to religious beliefs.	Anticipated Success: The study hopes to demonstrate that community mobilization, combined with C3Is, can significantly reduce polio vaccine refusals and increase coverage in high-risk areas. This will primarily be achieved by the intervention clusters achieving the targets	No evaluation of success or failure is specified. "A lot of backlash" because people feel "we don't have food, we don't have hygiene - why is the government after polio only?"	The article suggests that despite the establishment of these points, porous borders and security challenges in Afghanistan and KP limit coverage, hindering full success of immunization efforts

Table 4. Review and Synthesis of the Short-listed Publications (2023-2025)

Source article	Habib, et al., 2023		Sultan et al., 2023	Abbasi et al. 2023			Singh et al. 2025		
Local Polio Eradication Programs in Pakistan	National Expanded Program of Immunization (EPI)	Polio Vaccination Campaigns (National Immunization Days - NIDs/SIAs)	Social Mobilization' - Community level	Polio Eradication Initiative (PEI)	Routine Immunization (EPI)	Community Engagement (Recommendation to involve medical doctors, religious figures)	Localized Community Engagement Initiatives	Enhanced Surveillance (including Environmental)	Security Measures for Vaccination Workers
Target Population	Infants and young children in Pakistan	Children under five years of age in Pakistan, particularly those in high-risk areas.	Communities in the SHRUCs, particularly those with high refusal rates.	General, but focused on high-risk and underserved areas	Children	High-risk communities in Karachi	High-risk and resistant communities	All communities	Polio vaccination workers
Timeframe of application	Ongoing (mentioned in the context of 2020 data collection)	Ongoing (mentioned in the context of 2020 data collection).	Ongoing (as part of SIA/NID campaigns and inter-campaign activities)	Ongoing	Ongoing	N/A (Recommendation from study participants)	Ongoing	Ongoing, with calls for expansion	Urgently needed
Region	Nationwide, Pakistan	Nationwide, with a focus on high-risk areas: Karachi, Northern Sindh, Southern Punjab, Peshawar, and the Quetta	18 SHRUCs in one district in Pakistan.	Pakistan, specifically Karachi (Sindh province), with focus on 34 high-risk UCs.	Sindh, Pakistan	Karachi, Sindh, Pakistan	High-risk and resistant areas	Nationwide, especially outbreak districts	Khyber Pakhtunkhwa, Balochistan, other high-risk areas
Success of Program / or Reason for falling short	Despite EPI efforts, gaps in routine immunization mean some children still miss polio doses, sustaining transmission. Coverage improved in all areas, yet a proportion remains unimmunized.	The article points out that despite numerous campaigns, misperceptions about polio vaccines persist, leading to refusals and hindering the success of these campaigns in achieving complete eradication.	The article suggests that social mobilization efforts are not always effective due to various factors, including: Lack of trust in the program. Misinformation and rumors. Community fatigue. The FLWs suggest engaging religious influencers, managing refusals by doctors and government workers, and using educational videos.	Low coverage and high refusal rates lead the program to initiate new strategies and innovative approaches to address vaccination in the community. To date, the challenge of persistently missed children (PMCs) remains a big worry for the polio eradication program.	Low: A large portion of refusals comes from slum areas of the province where there is a lack of routine immunization coverage and WASH infrastructure. This indicates that those refusing OPV also refuse essential immunizations.	No evaluation of success or failure is specified but there is hope for better acceptance.	Not fully implemented: Article stresses these are urgently needed. Lack of local trust and engagement is a major reason for campaign disruption and non-compliance.	Partially successful: Environmental surveillance has detected WPV1 in several samples, but gaps remain. Surveillance is hampered by lack of resources and need for better integration with local actors.	The article suggests that social mobilization efforts are not always effective due to various factors, including: a) Lack of trust in the program. b)Misinformation and rumors. Community fatigue. The FLWs suggest engaging religious influencers, managing refusals by doctors and government workers, and using educational videos.

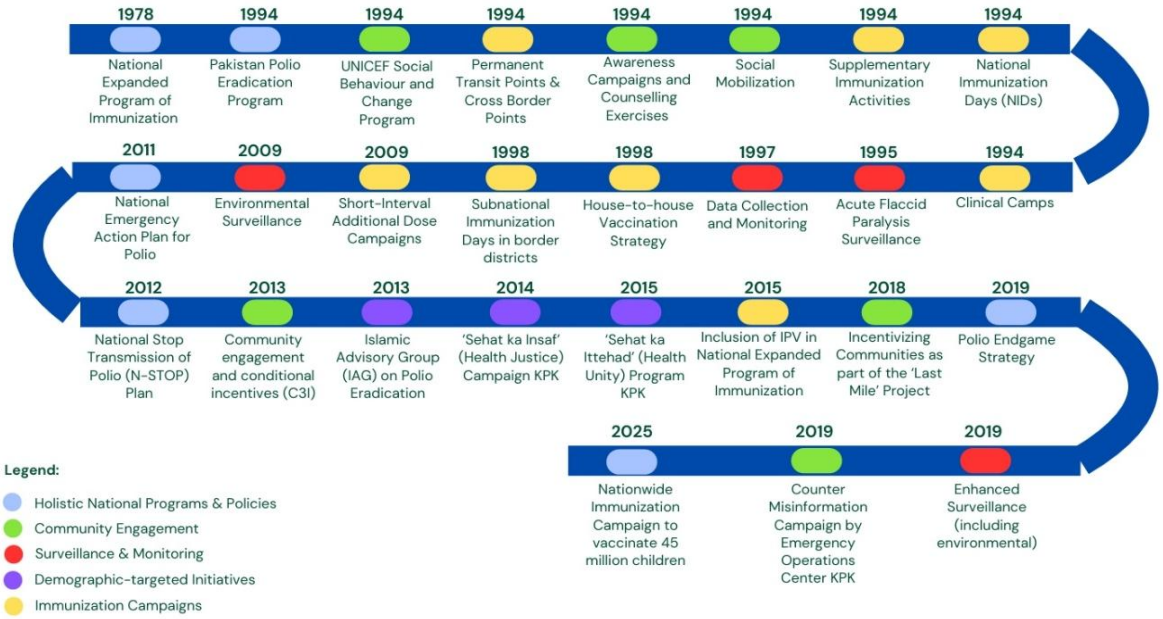

Figure 2. Polio Eradication Policies in Pakistan – Date of Initiation

4. Discussion

The analysis of the twelve shortlisted articles illuminated numerous polio eradication programs and strategies for evaluation (See Table 2, 3 and 4 above for detailed analysis). Overall, the articles indicated that that failure within programs have been caused by a lack of specificity of the eradication strategies to address key roadblocks. Broadly, programs faced setbacks because of the inability to adequately combat local problems under four major contexts: 1) fragile areas bordering Afghanistan 2) disaster-stricken areas and weak hygiene systems, 3) religious and social beliefs and 4) undereducated regions. This paper discusses the implications of each context and provides recommendations for polio eradication in accordance with their gaps.

4.1. Fragile Areas Bordering Afghanistan

In the areas bordering Afghanistan, polio is difficult to tackle due to two reasons: a threat to polio workers' security and displacement and disruption in the population. The first reason renders vaccination efforts lacking manpower and determination to limit the incidence of polio, as workers fear for their lives because of regular terrorist attacks on their teams. To address this, the government can make reforms to solidify security forces for polio workers, such as in 2015 when the security plan for workers in Peshawar was revised to include civil armed forces.

The second reason highlights the lack of stability required for a reliable healthcare system and, by extension, monitored and effective polio eradication programs. In other cases, uncertainty in tribal areas due to low security and high levels of violence sparks conspiracy theories that antagonize the Pakistani Government. For example, in Khyber Pakhtunkhwa, where drone strikes were used to counter terrorism, the belief that vaccination programs had an ulterior motive became increasingly prevalent in the early days of polio eradication (1994–2001).

Given this context, polio eradication programs working in tribal, terrorism-prone areas should do their best in negotiating efforts. Without sustained access and security, healthcare workers will continue to face the threat of violence, and populations will remain hesitant. A case where this strategy proved successful is evident in Khyber Pakhtunkhwa, where approximately 30,000 children in the Torah Valley were vaccinated for the first time in three years following negotiations. However, this solution is not always accessible in more extreme circumstances, such as in 2012 in North and South Waziristan, where local tribal leaders instituted a complete ban on immunization campaigns, voiding around 20,000 from the polio vaccine until drone strikes ended [1].

4.2. Disaster Stricken Areas and Weak Hygiene Systems

The incidence of natural disasters may affect the effectiveness of local programs for the eradication of poliovirus. In one instance in October 2005, the Kashmir earthquake resulted in the disruption of the delivery of polio vaccination campaigns in affected regions, as 50 medical officers part of the programs were critical first responders to the environmental disaster [1].

Furthermore, without a clean and healthy environment, with proper sanitary facilities, the spread of poliovirus cannot be stopped, and so efforts may always fall short in communities affected by unclean drainage systems. In addition, weak essential immunization services for maternal and child healthcare in underdeveloped communities have aided in the growing burden of polio cases in Pakistan [13].

During door-to-door campaigns, numerous front line workers encountered pleas for health services such as basic medicinal, maternal and nutrition services. For most unvaccinated populations, the polio vaccine is secondary to the dire need for basic health needs being met. As a result, this frustration translated to oral polio vaccine refusals, along with major distrust in the healthcare system. Specifically, these populations deal with abhorrently poor infrastructure with open sewers running in front of residences and heaps of solid waste piling up in the environment, making them especially vulnerable to transmissible diseases like polio [14].

Moreover, some communities in Quetta Block demanded cash, food or materials with electrical or constructional value in exchange for vaccinating their children, highlighting the desperation of their circumstances [15].

In light of these challenges, several recommendations have been made to address the issues outlined above, particularly those identified regarding frustrations towards the system's inability to deliver basic necessities. First, the provision of free consultations and medicines through health camps can build credibility for the healthcare system and allow populations to be more willing to accept the polio vaccine. Secondly, improving government clinics by setting up responsive and accessible feedback systems for publicly available healthcare setups is key in rebuilding trust within local communities. Lastly, by merging polio eradication strategies with the provision of basic healthcare in a dual-purpose campaign, low-investment localities may be persuaded rather than be hesitant of the vaccine [14].

4.3. Religious and social beliefs

Many individuals who choose not to take the vaccine are influenced by multiple social beliefs embedded within their communities. Some suggest the vaccine harms reproductive health, leading to infertility, and frame this as a deliberate attempt to reduce their population. This belief has pushed many communities to stick to traditional, non-medicinal healing practices [13]. These suspicions are compounded by political history, particularly following the capture of Osama bin Laden, during which the polio vaccine campaign was used as a front for an intelligence operation. This revelation caused widespread mistrust, especially in conservative and marginalized communities, where vaccination campaigns came to be viewed as tools of political manipulation [16].

Furthermore, misinformation is propelled by social media’s role in spreading unsupported rumors about the polio campaign [13]. Such narratives often gain traction by offering confirmation bias tailored to specific regional contexts. In this way, localized rumors become more compelling than centralized messaging. This reveals a major challenge: the inability of top-down digital regulation to respond to nuanced cultural and regional biases. Instead, polio eradication efforts require culturally and relationally informed approaches, best led by local health departments rather than global tech companies overseeing broad online platforms [15].

Religious beliefs have also served as barriers to vaccination. In many tribal or conservative areas, particularly those affected by conflict or terrorism, conspiracies suggesting that the polio vaccine violates Islamic Shariah have circulated widely. These beliefs, sometimes fueled by distrust of state-led health interventions or foreign involvement, have undermined the credibility of polio programs.

In response to these challenges, several successful strategies have been implemented. One such initiative is the Sehat Ka Ittehad Program in Peshawar, the 'world's largest reservoir' of the poliovirus, which effectively addressed religious concerns about the vaccine. By involving the Islamic Advisory Group (IAG), a new anti-polio action plan was introduced in 2015 that emphasized advocacy and communication. Likewise, in 2014, religious advocacy through the Ulema (prominent Muslim scholars) helped counter conservative conspiracies by issuing a Fatwa declaring the vaccine fully permissible under Islamic law. These interventions directly targeted religious conservatism with culturally sensitive strategies tailored to the specific needs of local communities.

The Islamic Advisory, established in November 2015, proved highly effective in reducing religion-based refusal rates. By working through respected clerics embedded within communities, it rebuilt trust and improved vaccine acceptance [16]. Similarly, the Inter-Provincial Committee for Polio (IPCP), formed by the Federal Ministry of Health in 2009, improved outreach by collaborating with healthcare workers at the provincial, district, and union council levels. This tapped into existing community networks, promoting trust and reducing the need for security force involvement—whose presence often reinforces fears of ulterior political motives [3].

To strengthen these efforts, a coalition campaign involving religious scholars, community leaders, civil society stakeholders, and the media should be developed. Such a coalition could help close information gaps and promote healthier, evidence-based social attitudes within hesitant localities [13]. Additionally, religious influencers must be thoroughly trained before representing polio campaigns so they can incorporate public health knowledge into their messaging. This would allow accurate information to be spread in high-impact settings, such as Friday congregations, thereby reducing the appeal of misinformation.

Lastly, involving influential female leaders in tribal communities is vital. In matriarchal households, younger women often look up to these leaders. Their endorsement of vaccination could convince more mothers to protect their children against polio [17].

4.4. Undereducated Regions

Furthermore, polio vaccination hesitancy is rooted in educational deprivation. Most hesitant populations are unaware of basic details relating to the poliovirus and therefore do not have sufficient information regarding immunization to make an informed choice for their children. This lack of foundational knowledge includes unawareness of the symptoms of polio, its irreversible nature, and its preventability through vaccination. As a result, communities with limited access to education remain especially vulnerable to misinformation and uncertainty, which fuels continued resistance to polio campaigns.

To address this issue, it is recommended that necessary information on poliovirus and immunization be included in the educational experiences of newer generations, particularly in regions that are educationally underfunded. This may be effectively implemented through reforms in school curricula that ensure children learn the core facts about polio early on. Additionally, public education efforts should be expanded to reach adults and broader communities. One effective approach would be to connect with local populations by producing educational videos in the local language. Ideally, these videos should feature locally influential figures to increase credibility and relatability, making it more likely for the message to resonate with the target audience [15].

4.5. Strengths and Weakenesses of the Scoping Review

This paper is a comprehensive review on the literature regrading polio eradication programs and its activity from the past 6 years. Hence, it is based on the most relevant information by virtue of recency, and can be taken as highly reliable findings that can assist development towards future strategies for polio eradication.

All papers used have been extracted from one source: PubMed. This is a weakness as it limits the scope of the paper to largely biomedical and life sciences, PubMed's focus, and misses out on

exploring content that also highlights other dimensions, such as a socio-political angle to the issue. At the same time, using one publishing source for all the data risks introducing any form of bias that exists within that engine, particularly one that favors Western publications. Summary

This analysis of the twelve shortlisted papers highlights the complexity of eradicating polio in Pakistan due to a range of contextual and systemic barriers. Key challenges hampering the success of eradication efforts include insecurity in conflict-prone areas, poor infrastructure and sanitation, deep-rooted religious and cultural resistance, and widespread educational deprivation. These barriers have led to program failures where eradication strategies failed to adapt to local dynamics. Success, on the other hand, was observed in cases where interventions were contextually sensitive, community-informed, and supported through intersectoral collaboration.

5. Conclusion

This analysis of the twelve shortlisted papers highlights the complexity of eradicating polio in Pakistan due to a range of contextual and systemic barriers. Key challenges hampering the success of eradication efforts include insecurity in conflict-prone areas, poor infrastructure and sanitation, deep-rooted religious and cultural resistance, and widespread educational deprivation. These barriers have led to program failures where eradication strategies failed to adapt to local dynamics. Success, on the other hand, was observed in cases where interventions were contextually sensitive, community-informed, and supported through intersectoral collaboration.

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Authors' contributions

Z.I: Conceptualisation, data curation, formal analysis, methodology, software, validation, writing – original draft, writing-review & editing.

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The author has given her consent for the publication of this paper.

Competing interests

The author declares no conflicts of interest.

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