SARC Research Proposal Submission

Research Topic:

One Geographical Block, One Virus: Evaluating the Role of Cross-Border Migration in Sustaining WPV1 Transmission Between Pakistan and Afghanistan

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Abstract: This Paper aims to explore how Wild Poliovirus Type 1 (WPV1) eradication in the rural areas of Pakistan stems not only from local communities' refusal for vaccination, but instead due to unchecked mass cross border migration, particularly after the repatriation of Afghan Refugees by Pakistani Authorities (2023-2026, ongoing). It argues that despite localized successes, the Enduring Reservoirs within the Pakistan-Afghanistan Epidemiological Block (Quetta, Kandahar, Peshawar, Jalalabad) act as a revolving door for WPV1; This project will examine if Permanent Transit Points (PTPs, Border Vaccination Booths) along the porous 2,640 Kilometer Durand Line are catching enough high-risk children to effectively combat the cross-border spread of WPV1 amidst rising informal migration through mountain passes.

Adopting a Retrospective Secondary Data Analysis approach, this study integrates retrospective analysis of GPEI Interactive Map and WHO polio case reports with IOM Flow Monitoring data on Pakistan-Afghanistan border crossings, to conduct Geographic Information System based comparative analysis (using QGIS, Mapping Software) linking WPV1 detections between Peshawar and Jalalabad within 14-30 days as a proxy for migrant-driven transmission.

Ultimately, the paper contends that the GPEI's 2026 Action Plan will be yet again prolonged if Cross-Border Eradication Effort Synchronization is not maximized across the Durand line, while also offering critical insights into the relationship between forced repatriations and inadequate PTPs in the Pak-Afghan Epidemiological Block

Keywords: Pakistan, Afghanistan, Poliovirus, Eradication, Cross-Border Migration

Introduction: Pakistan and Afghanistan have long been the stomping grounds of Wild PoliovirusType 1 (WPV1) as its last endemic stronghold, which has bypassed the Durand Line border regularly and proven time and time again that it treats the region as a single epidemiological bloc (*Statement of the Forty-fourth Meeting of the Polio IHR Emergency Committee* 2026). Enduring reservoirs in the geographical block: Peshawar, Jalalabad, Quetta, and Kandahar sustain transmission through informal mountain passes acting as transmission corridors in the region, despite PTPs along the border at key passes like Chaman and Torkham vaccinating 27,000 people daily at their peak during the start of the Afghan refugee repatriation program in 2023 (Billing et al., *Polio doesn't respect borders - but neither do vaccines* 2023). These evasion routes undermine localized vaccination successes, creating a viral "revolving door" that threatens the Global Polio Eradication Initiative (GPEI)'s 2026 interruption target.

Pakistan's 2023-2026 repatriation of over 2.1 million Afghan refugees (UNHCR & IOM, 2026) materialized this threat just as 2026 marks GPEI's critical pre-certification milestone under the Action Plan targeting WPV1 interruption in the Pakistan-Afghanistan epidemiological bloc's highest-risk reservoirs. Yet a $323 Million funding cut threatens multi-year setbacks (GPEI, 2025). Despite joint efforts vaccinating 1.3 million at borders in 2023 (Billing et al., *Polio doesn't respect borders - but neither do vaccines* 2023), WHO warns desynchronized campaigns enable unvaccinated returnees to reseed transmission corridors, risking global certification delay (WHO EMRO 2024). Current literature mainly addresses vaccination refusals from local communities but ignores this repatriation-driven mobility, which this study aims to examine.

Literature Review: While literature extensively documents vaccination refusals, security threats for healthcare workers and gaps in Polio surveillance quality between the district and subdistrict levels as WPV1 eradication's primary barrier (MMWR, Mbaeyi, et al. 2024), it overlooks repatriation-driven geographic mobility during 2023-2025 surges. CDC's Morbidity and Mortality Weekly Report confirms "Both countries constitute a single epidemiologic block because of substantial cross-border population movements" but fails to factor in the timing of forced repatriations when analysing WPV1 spread between its historic reservoirs (MMWR, Mbaeyi, et al. 2024). Similarly, Sodhar et al. 2024, document "substantial population mobility" between Afghanistan-Pakistan and Afghan children's low immunization in Karachi, yet attribute persistence to local gaps and asymptomatic transmission rather than repatriation timing.

Gap in Literature: No studies quantify how Chaman/Torkham repatriation surges (2.1M+ returns) correlate with WPV1 case spikes 14-30 days later in adjacent reservoirs. Current research pathologizes communities while neglecting the Durand Line's porosity; where informal mountain passes enable 10-20% PTP evasion. This study fills that void, testing geographic mobility as viral persistence's primary driver.

Methodology: This study adopts a Retrospective Secondary Data Analysis approach to examine how repatriation-driven mobility through informal mountain passes undermines PTP effectiveness, sustaining WPV1 reservoirs in the Pakistan-Afghanistan epidemiological bloc.

Step A: Data Collection
Public datasets from the GPEI Polio Today Case Map (2023-2024) and GPEI Archives provide weekly WPV1 case data for Peshawar-Jalalabad reservoirs (2023-2024), capturing case locations at district/village-level locations near Chaman/Torkham border routes, demographic variables including age under 5 years, onset dates for 14-30 day temporal analysis, travel history documenting recent migration status and Afghan origin where recorded, and environmental surveillance from sewage sampling sites within 50km of border crossings. This comprehensive dataset enables precise correlation between geographic proximity to border routes and case timing patterns essential for testing repatriation-driven transmission.

Step B: Migration Proxy
UNHCR-IOM Flash Updates Flow Monitoring Reports track weekly Chaman/Torkham crossings during repatriation surges, providing population movement denominators that, when combined with GPEI patient demographic data, enable predictive modeling to test if surges predict WPV1 cases in Peshawar-Jalalabad reservoirs 14-30 days later, distinguishing migrant-driven transmission from local infections beyond simple correlation.

Step C: Comparative Temporal Analysis
In QGIS, overlay IOM border volumes with GPEI case timelines and patient-level data from WHO surveillance summaries, including case-by-case demographics, onset locations near Chaman/Torkham routes, and recent migration status. Predictive modeling tests if repatriation peaks predict new WPV1 cases 14-30 days later in Peshawar-Jalalabad reservoirs, quantifying PTP leakage through unvaccinated returnees evading formal crossings.

Conclusion and Feasibility: All data open-source and QGIS free of cost, findings will support the argument for synchronized cross-border Synchronized National Immunization Days (SNIDs).

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