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Gaza's First Polio Case in 25 Years: Is Health Infrastructure Collapse Threatening Resilience?

Francesco Branda[a] Giancarlo Ceccarelli[b] Marta Giovanetti[c, d]
Massimo Ciccozzi[a] Fabio Scarpa[e]

[a]Unit of Medical Statistics and Molecular Epidemiology, University Campus Bio-Medico of Rome, Rome, Italy; [b]Department of Public Health and Infectious Diseases, University Hospital Policlinico Umberto I, Sapienza University of Rome, Rome, Italy; [c]Sciences and Technologies for Sustainable Development and One Health, University Campus Bio-Medico of Rome, Rome, Italy; [d]Instituto René Rachou, Fundação Oswaldo Cruz, Belo Horizonte, Brazil; [e]Department of Biomedical Sciences, University of Sassari, Sassari, Italy

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The intersection of conflict and deteriorating health infrastructure greatly amplifies the risk of infectious disease outbreaks, particularly in vulnerable regions with compromised health systems. A case in point is the Gaza Strip, where the ongoing conflict has created ideal conditions for "rampant epidemics" [1], reinforcing the need for immediate action to strengthen immunization campaigns and restore basic health services. Poliomyelitis, commonly known as polio, is a highly infectious disease caused by the poliovirus, a member of the *Picornaviridae* family [2]. This single-stranded RNA virus primarily spreads through the faecal-oral route, often in areas with inadequate sanitation, but it can also spread via contaminated food or water [3]. Once ingested, the virus replicates in the intestines before invading the central nervous system, where it can cause irreversible damage to motor neurons, resulting in paralysis [4]. Poliovirus has three serotypes, types 1, 2, and 3, all of which can cause polio [3]. While types 2 and 3 have been eradicated globally, type 1 remains endemic in some areas [4]. The introduction of the oral polio vaccine (OPV), containing a weakened live virus, has helped reduce polio cases by more than 99% since the launch of the Global Polio Eradication Initiative in 1988 [4]. However, in regions with low vaccine coverage, OPV can occasionally mutate into vaccine-derived poliovirus, causing outbreaks [5]. Polio primarily affects children under the age of five but unvaccinated individuals of any age are vulnerable.

In August 2024, the Gaza Strip reported its first case of paralytic poliomyelitis in 25 years, affecting a 10-month-old boy [6]. This case is believed to be vaccine-derived, highlighting the challenges that arise when weakened vaccine strains mutate in populations with insufficient immunization coverage. Prior to the conflict, Gaza had achieved a 99% vaccination rate by 2022, but prolonged unrest has reduced this below 90% by 2024 (https://www.emro.who.int/images/stories/Polio_Sitrep_-_issue_1.pdf), increasing the risk of vaccine-preventable diseases, particularly polio. In response to this situation, a vaccination plan was developed for children in Gaza, as illustrated in

karger@karger.com
www.karger.com/che

Correspondence to:
Francesco Branda, f.branda@unicampus.it

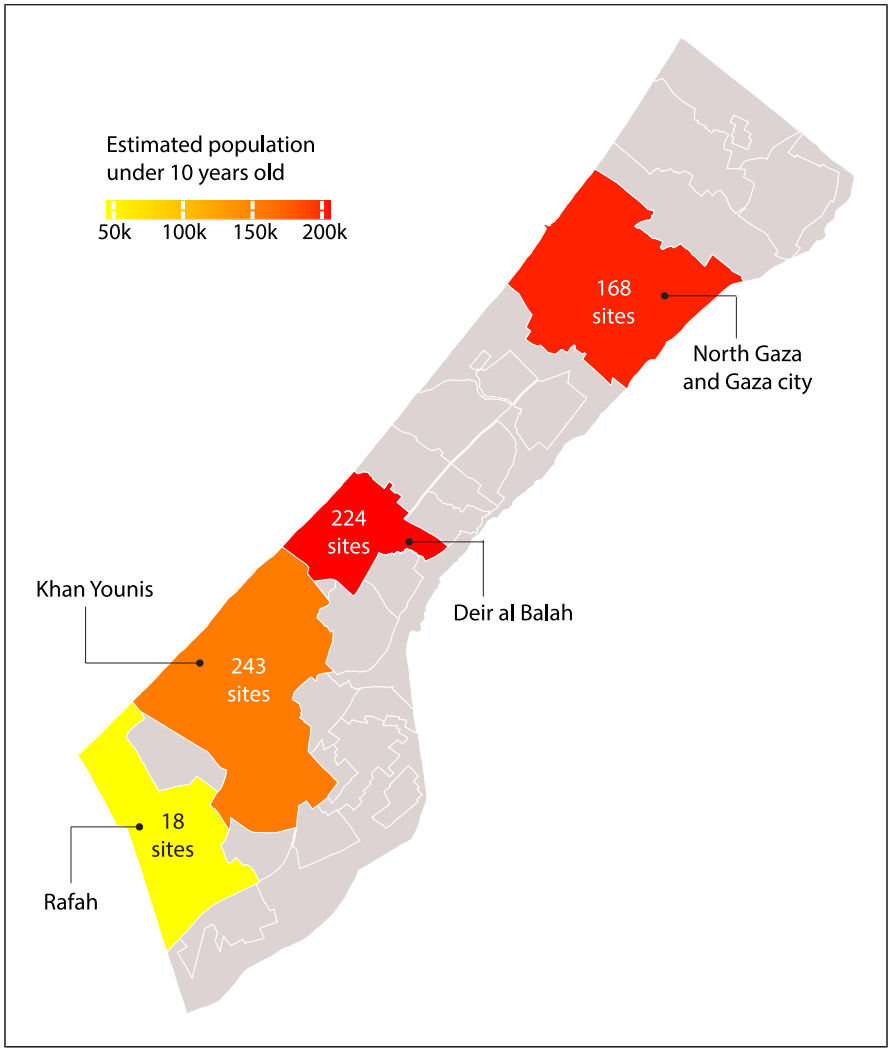

Fig. 1. Plan to vaccinate children in Gaza [6].

Figure 1, which shows the geographical distribution of vaccination sites and the estimated population of children under 10 in the different areas. In September 2024, more than 187,000 children under the age of ten were vaccinated with the new oral polio type 2 vaccine in the first phase of a two-part campaign in central Gaza [7], surpassing the target of 157,000 due to population movement, and expanded coverage in areas outside the humanitarian pause zone. The campaign, which involved over 2,180 health workers across 143 sites, reached displaced families and hard-to-reach areas. Special missions in insecure areas ensured no children were missed. Preparations are underway for the second phase, targeting 340,000 children in southern Gaza, with nearly 300 community workers already engaged with families. At least two rounds of vaccination with the new oral polio type 2 vaccine will be required to contain the outbreak, but flight disruptions and insecurity may delay vaccine distribution and outreach efforts, especially in areas near active conflict.

The resurgence of polio in Gaza is a clear sign of the profound weaknesses in the local health system, already severely compromised by prolonged conflict and deteriorating essential infrastructure. In such a context, preventable diseases such as polio, which had been nearly eradicated, can find fertile ground to re-emerge. This highlights how imperative it is to take an approach that goes beyond the immediate response to health emergencies. To achieve lasting impact, the focus must be on structural strengthening of health systems, integrating long-term measures with emergency response. The case of Gaza is particularly significant: it shows how the disruption of basic infrastructure, such as access to clean water and sanitation, increases the risk of spreading infectious diseases. Without proper management of water resources and wastewater

treatment systems, vaccination campaigns, however well organized, may not be sufficient to prevent new outbreaks. Polio, transmitted mainly through the faecal-oral route, disseminates in environments where sanitary conditions are inadequate. Therefore, investing in water and public health infrastructure is critical to creating the basic conditions that prevent the spread of preventable diseases.

At the same time, the role of the international community becomes crucial not only in providing vaccines and medical resources, but also in supporting local capacity building. Without a strong local health system and properly trained health personnel, conflict-affected populations remain extremely vulnerable to future crises. Global cooperation, therefore, should not be limited to emergency response, but should include sustainable development plans that ensure greater health system resilience even after the conflict is over. The polio epidemic in Gaza raises a global issue: the risk of spreading infectious diseases knows no borders. In an increasingly interconnected world, failing to address these vulnerabilities in a timely manner can have consequences on an international scale. This means that commitment to public health in conflict areas is not just a local responsibility, but a global imperative. Any failure to contain outbreaks in unstable regions could undo years of progress, as the case of Gaza demonstrated, and put global health security at risk.

Finally, this crisis highlights the need for a broader ethical dialogue on global health justice. The health inequalities that emerge in conflict contexts call for deep reflection on how health resources are distributed. The fight against polio, and other preventable diseases, reminds us that health is a universal right that must be protected regardless of geographic boundaries or political circumstances. Only with sustained and concerted efforts can a more equitable and secure future be built for all populations, including those affected by conflict.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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F.B. and G.C. have substantial contributed to the conception and design of the work; F.B., G.C., M.G., M.C., and F.S. drafted the work and revised it critically for important intellectual content; M.C.: supervised and validated the work. All authors have approved the final version to be published.

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