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Perspective

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From COVID−19 to Nipah virus preparedness in low− and middle−income countries: Re−centering points of decision and responsible AI

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Nipah virus (NiV) is a zoonotic pathogen that causes severe neurological and respiratory diseases characterized by high mortality rates[1]. The emergence of sporadic cases in Bangladesh in 2025 and subsequent infections among healthcare workers in West Bengal in early 2026 highlight a significant epidemic potential[2]. This risk is further exacerbated by the absence of licensed vaccines or targeted antiviral therapies[1,3,4]. Consequently, there is an urgent need for strengthened surveillance and operational preparedness in low- and middle-income countries (LMICs), which often face resource-limited healthcare systems and overcrowded settings with inadequate infection prevention and control (IPC) measures[1,5].

The COVID-19 pandemic has profoundly impacted global health and provided critical lessons for confronting emerging infectious diseases. We have identified four key takeaways: First, hospital amplification remains a primary risk, particularly in overcrowded settings with inadequate IPC[1]. Second, symptom-based border screening is insufficient, as asymptomatic or incubating travelers are frequently missed[5]. Third, data fragmentation undermines operational efficiency. Vietnam's experience demonstrated that while rapid digital tools are beneficial, limited interoperability and governance gaps hinder real-time coordination[6]. Finally, technology is only effective when embedded within standard operating procedures (SOPs); without clear triage, referral, reporting, and IPC protocols, digital tools remain ineffective—especially for rare but high-impact threats like NiV.

Drawing from these lessons, we argue that reframing preparedness around 'points of decision' (PODs) is essential for NiV prevention. PODs are defined as specific settings and timeframes where decisions must trigger immediate critical actions (*e.g.*, immediate isolation *vs*. delay; testing *vs*. referral; contact tracing *vs*. observation; or escalating IPC *vs*. routine care). To ensure operational feasibility in LMICs, we recommend prioritizing three specific PODs:

POD-1: Emergency department (ED) and intensive care unit (ICU) triage (highest yield). NiV infection can rapidly progress to encephalitis or severe respiratory illness, rendering the ED and ICU high-risk areas for nosocomial transmission. Preventing healthcare-associated amplification at these points is critical[7]. We propose four operational priorities for POD-1: (1) Syndromic triage linked to exposure risk (*e.g.*, acute encephalitis syndrome or severe respiratory illness combined with plausible exposure history); (2) Immediate isolation upon suspicion, prior to confirmatory testing; (3) Rapid IPC escalation, focusing on personal protective equipment (PPE), environmental bio-decontamination, and limiting caregivers; and (4) Clear laboratory pathways for safe sampling and referral. Outbreaks in Bangladesh have demonstrated that prolonged caregiving and exposure to body fluids significantly increased transmission risk; therefore, minimizing unprotected bedside contact and reinforcing IPC measures are essential[8].

POD-2: Primary care and district hospitals (preventing recognition failures). During the COVID-19 pandemic, missed triage upstream

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led to downstream crises, underscoring the importance of clinical suspicion at the primary and district levels. Specifically, in the West Bengal outbreak, despite clear epidemiological risks and symptoms emerging in December 2025, laboratory confirmation was delayed until January 13, 2026, due to centralized diagnostic capacity at tertiary levels[9]. Consequently, severe NiV cases in LMICs may only reach referral centers after visiting multiple lower-level facilities. POD-2 must ensure early recognition through a "recognize, isolate, notify, and refer" framework. We propose three operational priorities for POD-2: (1) Implementation of standardized suspected-case definitions; (2) Immediate alert/reporting mechanisms (digital platforms or hotlines) at the moment of suspicion; and (3) Clear referral protocols designed to minimize transport-related exposure and prevent overcrowding in waiting areas.

POD-3: Points of entry (airports, seaports, and land borders). Lessons from COVID-19 showed that symptom-based screening at points of entry often fails to detect individuals in the incubation phase or those with asymptomatic infections. We propose that POD-3 activities focus on risk stratification and the identification of potentially exposed travelers requiring public health follow-up, such as health monitoring and symptom surveillance during the incubation period[5]. In Vietnam, authorities now emphasize rigorous border surveillance and 14-day health monitoring for travelers from affected areas, even in the absence of confirmed local cases. The Ministry of Health classifies NiV as a Group A notifiable disease, mandating immediate reporting, mandatory isolation, and stringent IPC to prevent healthcare-associated transmission[9].

NiV preparedness requires a diagnostic strategy aligned with the POD model, emphasizing the critical link between point-of-care (POC) testing and POD action. This involves presumptive detection near the patient (where feasible) coupled with confirmatory testing at centralized laboratories, thereby maximizing the IPC value of early detection. In this framework, NiV diagnostics are not merely clinical tools—they function as 'IPC triggers'. Their utility is measured by their ability to immediately influence decision-making at POD-1 and POD-2.

Furthermore, data sharing must be 'decision-grade' and interoperable, even at a minimal level. A NiV-ready data model for LMICs should prioritize speed, the completeness of essential fields, and interoperability over sheer data volume. During the COVID-19 pandemic, oversized datasets, inconsistent definitions, and fragmented cross-level linkages resulted in dashboards that lagged behind operational needs. Conversely, Vietnam’s digital health experience demonstrates that the rapid deployment of integrated applications can significantly enhance surveillance and care coordination[6]. Vietnam is currently advancing national health data integration, with reports indicating progress in sectoral databases and the piloting of a 'Health Data Coordination System' linked to national population data. These developments provide a feasible pathway to embed 'minimum viable line lists' for NiV into routine surveillance infrastructure, provided that standards and operational ownership are clearly established.

The rapid advancement of artificial intelligence (AI) technology provides tools for the swift and selective implementation of simultaneous monitoring. For NiV preparedness, the role of responsible AI should focus on improving timeliness, consistency, and workload efficiency at the POD. Priority areas for AI application include: First, syndromic anomaly detection for early warning: since NiV outbreaks may manifest as clusters of acute encephalitis or severe respiratory disease, anomaly detection can flag unusual patterns across facilities, prompting rapid verification before an outbreak occurs. Second, AI can enhance decision support at POD-1 through simple tools that prompt clinicians to ask critical exposure questions and trigger isolation workflows. The objective is not predictive perfection, but rather the reduction of omission errors during ED overcrowding. Finally, contact tracing prioritization is vital, as NiV transmission risk is determined by exposure duration and contact with bodily fluids. AI can assist in focusing public health resources on the highest-yield contacts.

We propose the following 3-stage operational plan for implementing a realistic NiV preparedness package:

1. POD hardening (within the first 6 months): establish ED/ICU triage triggers, isolation SOPs, specimen transport logistics, IPC training exercises, and referral protocols.

2. Minimum surveillance data infrastructure (3-12 months): implement standardized case line lists, interoperable identifiers, and rapid reporting systems integrated with existing surveillance and national digital health initiatives.

3. Targeted AI-assisted surveillance tools (6-18 months): support anomaly detection, triage prompts, and contact prioritization, paired with appropriate training and governance structures.

Vietnam’s current emphasis on border gate surveillance and community/health facility readiness can be strengthened by explicitly adopting this POD-centric design and by ensuring that “border screening” is operationally linked to follow-up and facility-level readiness.

In conclusion, NiV preparedness in LMICs should be designed as an operational system—anchored in PODs, supported by minimal and interoperable data, and enhanced by responsible AI to reduce delays and omissions. COVID-19 did reveal an implementable blueprint: speed is a capability, interoperability is a control measure, and technology must serve frontline decisions. For Vietnam, investments in digital health integration and workforce AI training offer a timely opportunity to establish a NiV-ready operating model that is also broadly applicable to other high-threat zoonoses.

Conflict of interest statement

The authors declare that there is no conflict of interests.

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Authors' contributions

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