

Opportunities and challenges of conducting vaccine research in low and middle-income countries in the Asia-Pacific region: perspectives from the Asia-Pacific Vaccine Research Network



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Summary

During the COVID-19 pandemic, vaccine technology and development advanced substantially in high-income countries, but this progress was not followed by the equitable knowledge transfer and accessibility and uptake of vaccines, particularly among low-and middle-income countries (LMICs). The Asia-Pacific Vaccine Research Network is a collaborative platform that aims to address common challenges faced by Asia-Pacific LMICs in undertaking vaccine research and barriers to evidence-based immunisation policy and practice. A network workshop was held in 2023 that aimed to identify critical challenges and opportunities to advance vaccine research to inform immunisation policy in LMICs in the Asia-Pacific. We found common themes to be challenges and opportunities in vaccine research capacity and infrastructure, workforce availability, financing and regulatory issues. To help to address some of these common challenges across the region, the Asia-Pacific Vaccine Research Network aims to facilitate the upskilling of vaccine research capability and knowledge exchange by bringing together experts and stakeholders from diverse backgrounds and through collaboration.

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Introduction

Vaccine research in low- and middle-income countries (LMICs) faces many challenges including vaccine research capability and funding, limited manufacturing capability and regulatory hurdles.^{1,2} Inconsistent alignment with international standards prolongs vaccine trial initiation and approval, creating bottlenecks during pandemics. While some nations have technical expertise, they lack the infrastructure to produce vaccines locally, increasing dependence on external suppliers. Regulatory challenges, including fragmented, complex,

and slow approval processes, further hinder research. Addressing these challenges requires fostering partnerships with global organisations for technology transfer and infrastructure development.

The vaccine research ecosystem in the Asia-Pacific region varies substantially. Vaccine research funding is fragmented, relying heavily on international grants that lack long-term stability, with sustainable domestic sources being scarce.³ Inconsistencies in the adherence to Good Clinical Practice, may prevent quality research from being undertaken, which reduces competitiveness in international research grant applications.^{4,5} Workforce support also differs; countries with strong public health systems integrate research initiatives, whereas those with under-resourced systems often depend on private or external funding, impacting trial sustainability.^{1,6} These challenges affect the region's ability to

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conduct and scale high-quality vaccine trials and research effectively.

Network activities and objectives

The Asia–Pacific Vaccine Research Network was established in 2023 and is a collaborative platform which bringing together experts and stakeholders from diverse backgrounds. APVRN aims to facilitate vaccine research capability and knowledge exchange and collaboration, by identifying common challenges and discussing potential solution, with the overall goal of sharing knowledge and fostering vaccine research partnerships in the region. The founding members include National Immunisation Technical Advisory Group (NITAG) members, senior Ministry of Health immunisation personnel, vaccinologists, clinicians and vaccine researchers based in universities, government bodies, or research centres across eight countries in the region: Australia, Fiji, Indonesia, Lao People’s Democratic Republic (PDR), Mongolia, Thailand, The Philippines and Vietnam.

In response to the first World Health Organization (WHO) Global Clinical Trials Forum⁷ and the 2022 World Health Assembly resolution on building equitable clinical trial capabilities,⁸ the APVRN hosted the series of workshops between 2023 and 2024, including a four-day vaccinology workshop and training at Universitas Gadjah Mada, Yogyakarta in October 2023. The workshop discussed the critical challenges in vaccine research among LMICs in the Asia–Pacific. The workshop, driven by the COVID-19 pandemic’s exposure to vaccine research capacity gaps, aimed to help equip LMICs with strategies for resilient research ecosystems capable of rapid vaccine development and deployment in future crises.

Participants were founding members of APVRN from eight Asia–Pacific countries, including seven LMICs, offering diverse insights into both policy-level and practical challenges. Structured focus group sessions used guided questions to explore challenges and opportunities to facilitate group discussion, followed by thematic analyses to prioritise findings. This consensus-building process ensured that outcomes reflected collective agreement with broad applicability across LMICs.

Identification of vaccine research challenges and opportunities

APVRN members Vietnam identified several challenges and opportunities (Table 1). Key opportunities and challenges were categorised into (a) capacity and infrastructure, (b) workforce, and (c) financing and regulatory issues. Table 1 highlights country-specific efforts to address vaccine research challenges and leverage opportunities for better outcomes. Several common themes emerged to strengthen the ecosystem of vaccine research and trials in the region, including improving research skills, enhancing infrastructure and capacity,

better access to grant funding, collaboration & public engagement, and strategic priority planning (Table 1). Despite some shared challenges in the region, some countries also faced unique challenges such as regulatory issues, cultural diversity and limited local expertise.

While it was identified that countries such as Thailand and the Philippines have robust research frameworks supported by public-private partnerships, others, such as Lao PDR and Mongolia, face infrastructure and capability limitations. Research infrastructure is uneven, with some possessing advanced laboratory capacity and data systems, while others, like Vietnam and Indonesia, relying on external partners due to challenges in meeting international standards.

The common theme found amongst APVRN members was the need for upskilling in research capability through collaboration. The network members learned from each other by sharing local experiences and successful efforts in solving various immunisation challenges. For example, Fiji has recognised the importance of providing incentives for healthcare staff to undertake research and implementing digital health technology to integrate research into routine healthcare practices. Meanwhile, Indonesia and Vietnam highlighted the necessity of establishing a robust regulatory framework and enhancing local laboratory capability. Lao PDR and Mongolia emphasized enhancing surveillance and research skills. Additionally, Mongolia is focusing on upskilling healthcare personnel in rural areas to conduct research. Thailand prioritises vaccine safety, while the Philippines identified the importance of expanding the research network and utilising big data for policy-making, along with establishing a NITAG. Vietnam identified the need to improve clinical trial capabilities and establish a digital data management and analysis centre.

Collaborative approaches and future directions

To address some of identified challenges, the APVRN offers various training opportunities including: basic vaccinology; an understanding of data and research needs (including vaccine trials) to inform immunisation policy and programs; training in knowledge translation so that knowledge gained through research can be translated into policy; the process of collating quality information and making policy recommendations using the WHO Global NITAG Network evidence to recommendations approach⁹; understanding and applying vaccine economics; the implementation of policy recommendations through advocacy and policy briefs; and addressing vaccine hesitancy and integrated health services to improve vaccination equity and vaccine uptake.¹⁰

Key to the success of the Network is the South–South, North–South and North–North participatory approach, which is critical to learning and building equitable partnerships and working through local case

Country	Fiji	Indonesia	Lao PDR	Mongolia	Thailand	The Philippines	Vietnam	Summary
Challenges								
• Capacity and Infrastructure	Limited laboratory research infrastructure and capacity.	Maintaining research infrastructure, including establishing GCLP and GCP-compliant centers.	Limited quality research capacity and infrastructure.	Insufficient laboratory capacity and unanalysed data.	Limited infrastructure, particularly ensuring comprehensive data management systems and resources for large-scale clinical trials.	Laboratories and data management systems, may not be uniformly available, affecting the quality and scale of vaccine trials.	Laboratory systems that do not meet international standards.	Infrastructure for vaccine research is often inadequate, affecting the ability to conduct comprehensive and high-standard clinical trials.
• Workforce	Few skilled human resources and an ongoing brain drain without incentives.	Limited skilled human resources for leading protocol development and research centers.	Limited skilled and experienced human resources and limited professional development opportunities.	Inadequate professional development skills among human resources.	The need for training and professional development to maintain a workforce that can manage the clinical trials	Limited skilled personnel are available to manage and conduct clinical trials nationwide.	The need to train staff how to design and implement clinical trials.	Professional development, training, and retention strategies are needed to build a competent workforce capable of conducting vaccine research.
• Financing and regulatory issues	Funding constraints and insufficient government commitment to health research.	Challenges in securing funding and navigating regulatory processes for technology transfer.	Limited financial resources and government commitment toward research.	Funding sustainability is a major concern.	Ensuring vaccine safety communication requires dedicated funding and resources	Historical reliance on limited funding sources for vaccine trials.	Funding for vaccine research often relies on government budgets, which is insufficient to support large-scale or long-term clinical trials.	Sustainable funding and streamlined regulatory frameworks are essential to support vaccine research in LMICs.
Opportunities								
• Capacity and Infrastructure	Enhance local research laboratory capacity and implement digital health for better data management.	Establishing a robust regulatory framework to ensure that research centers, hospitals, and clinics adhere to international standards, for high-quality vaccine research.	Strengthening surveillance and integrating research into routine healthcare services and prioritizing VPD research with stakeholders.	Develop tools & protocols AEFI and enhance laboratory capacity.	Leveraging VPD data analysis to inform policymakers allocate resources effectively and strengthen research infrastructure.	Expand the research network to other regions, requiring training and establishment of institutional review boards.	Establish a data management centre and enhance the laboratory system to meet international standards.	Investing in and upgrading research infrastructure, creating digital platforms for data management, and developing tools for surveillance are key to advancing vaccine research capabilities.
• Workforce	Increase staff availability and support local researchers through regular training.	Improve public awareness, well-trained personnel and address vaccine hesitancy.	Enhance research skills for study protocol, design, and data analysis. Make vaccinology and health economic evaluation training compulsory for NITAG members, relevant healthcare workers, and policymakers.	Provide regular training and upskill healthcare personnel, especially in rural areas, to identify and respond to AEFI and VPDs.	Fostering strong collaborations between public health authorities and academic researchers to provide learning opportunities and enhance data-sharing capabilities.	Continue training programs to strengthen research quality and develop the next generation of researchers.	Improve staff training in clinical trial design and implementation.	Expanding professional development & regular training programs are essential for building a robust research workforce.
• Financing and regulatory issues	Address funding challenges through collaborative networks and ensure sustainable funding for future pandemics.	Establish a robust regulatory framework that aligns with international standards and supports equitable research practices.	Improve policymakers' awareness and support to enhance funding allocation for vaccine research. Enhancing collaborations with national and international funders	Fostering collaborations with international stakeholders to secure sustainable funding and align regulatory practices with global standards.	Use VPD data analysis to inform policymakers and allocate resources more effectively.	Advocate for the establishment of a NITAG and leverage big data for evidence-based policymaking.	Strengthen the research ecosystem by developing laws and regulations that set standards for clinical trials.	Addressing regulatory barriers & ensuring sustainable funding is critical for advancing research capabilities. Collaborative efforts and government support are vital.
Abbreviations: LMIC = Low- and Middle-income Countries; GCLP = Good Clinical Laboratory Practice (GCLP); GCP = Good Clinical Practice; VPD = Vaccine-preventable Disease; AEFI = adverse event following immunisation; NITAG= National Immunisation Technical Advisory Groups.								
Table 1: Challenges and potential opportunities identified by the Asia-Pacific Vaccine Research Network LMIC members to enhance vaccine research capability.								

studies. The APVRN's participatory approach has delivered tangible outcomes through these collaborations. Additionally, during COVID-19 pandemic, Indonesia and Vietnam shared expertise on trial management and regulatory practices, enhancing trial efficiency and knowledge dissemination. Partnerships involving Thailand improved vaccine safety communication strategies, tackling vaccine hesitancy and public trust. These collaborations addressed challenges such as boosting regulatory capacity, refining trial protocols, and shaping public health strategies.

Our APVRN allows broader partnerships across countries with varying socioeconomic and development statuses within the region. The Network allows space for discussion, problem-solving and the development of innovative ideas to address common immunisation problems and potential solutions. Ongoing professional development is planned where participants can apply their learnings to develop new projects and share their learnings within the Network, with mentoring of the next generation of leaders. This established partnership will also aid readiness for future health crisis. The APVRN is committed to improving pandemic preparedness by streamlining research processes and enabling rapid adaptation during a crisis by swiftly sharing technical knowledge and resources on the emergence of Disease X and facilitating the development of a new vaccine within 100 days.^{11–13}

Conclusion

Networks at global and regional levels have been identified as important approaches to strengthen vaccine research and applying the knowledge gained through learning health systems approach.^{3,14} We acknowledge that the diversity in APVRN members' background, positions, and institutions along with varying topic of interests may not have captured every opportunity and challenge from each country. However, we believe that each member's role, experience, and expertise involved in the vaccine research and policy making have already provided a sufficient representative foundation for our initial collaborative effort and priority setting. Furthermore, while the applicability of these findings to countries outside the Asia-Pacific region may vary, we believe that many of the challenges and opportunities identified are common across most LMICs, particularly issues such as the lack of skilled human resources and insufficient funding.

In addition to the identified APVRN activities, local government investment in health research is a priority, and institutionalising and resourcing a learning health systems approach to policy and programs¹⁵ is a critical need to improve health outcomes.³ Accelerating vaccine development can be achieved by investing in research and development in vaccine manufacture, building capacity in academic institutions, and technology transfer

through collaborations and partnerships. Aligning local regulatory frameworks with WHO standards can streamline approval processes and enable cross-border trials. Establishing regional regulatory hubs can expedite approvals and ensure consistency. Diversifying funding sources through partnerships with the Coalition of Epidemic Preparedness and Innovation and Gavi, the Vaccine Alliance, promoting government investment, and developing sustainable funding models, such as pooled regional funds and risk-sharing, can create a resilient financial base for ongoing vaccine research and production. Additionally, manufacturing capacity in Asia-Pacific LMICs is constrained by outdated facilities, limited technology transfer, and reliance on imported materials, hindering vaccine production and timely public health responses. Global financing and collaborative efforts can mitigate these issues and help enhance vaccine development, production and delivery in the Asia-Pacific region.^{16,17} Addressing these challenges requires fostering partnerships with global organisations for technology transfer and infrastructure development. Regional collaborations, such as those promoted by APVRN, can support shared expertise. Public-private partnerships can co-invest in scalable technologies.

Our APVRN helps contribute to safeguarding public health in the Asia-Pacific through regional collective and collaborative efforts by growing our longstanding regional friendships and creating opportunities for scientific collaboration. Regional collaborations, such as those promoted by APVRN, can also support shared manufacturing and expertise distribution. Through its activities, APVRN seeks to contribute to the development of evidence-based immunisation policy and improve vaccination uptake that benefit the health and well-being of populations in the Asia-Pacific region. These findings are relevant not only to the Asia-Pacific but potentially transferable to LMICs in regions like Africa and Latin America, which may face similar issues. Universal strategies for capacity building, collaborative research, and regulatory harmonisation are essential for improving global vaccine research capabilities.

Declaration of interests

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