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Towards A National Dengue Control Policy: A Critical Analysis Of Pakistan's Existing Approaches

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ABSTRACT

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Dengue fever remains a persistent public health challenge in Pakistan, with recurring outbreaks exacerbated by urbanization, climate change, poor sanitation, and fragmented governance. Despite provincial efforts and international support, the national response remains largely reactive—triggered after case surges—rather than proactive or preventive. This study critically examines Pakistan's existing dengue control strategies using a qualitative and thematic analysis of academic research, government reports, and institutional frameworks. It identifies key gaps in surveillance, intersectoral coordination, diagnostic capacity, and community engagement. The findings highlight Pakistan's continued vulnerability, especially during post-monsoon seasons, and reveal that short-term interventions have failed to prevent annual epidemics. Drawing on local and global best practices, the study outlines contours for a comprehensive National Dengue Control Policy. These include establishing a legally mandated National Dengue Control Authority, year-round Integrated Vector Management (IVM), targeted vaccination, real-time surveillance, and strengthened public awareness campaigns. The study also emphasizes the need for sustainable financing, legislative backing, and institutionalized monitoring to ensure long-term impact. A coordinated, evidence-based national policy can help Pakistan shift from emergency response to sustained public health protection against dengue.



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1. Introduction

***"A single mosquito bite can change the course of a life; a fragmented response can change the course of an epidemic."* — WHO EMRO, 2023**

Pakistan, a developing country located near the Arabian Sea in South Asia, is home to the world's fifth-largest population (PID, 2024) and features vast diversity in topography and climate. In recent decades, countries like Pakistan have undergone rapid shifts in demographics, urbanization, and land use, which have significantly influenced the spread and nature of infectious diseases. Among these, dengue fever—a mosquito-borne viral illness—has emerged as a serious and recurring public health threat. The disease is caused by the dengue virus (DENV), transmitted primarily through *Aedes aegypti* and *Aedes albopictus* mosquitoes, which thrive in warm, humid climates and breed in stagnant water. With its prolonged monsoon seasons, densely populated urban areas, and under-resourced health infrastructure, Pakistan provides ideal conditions for dengue transmission. The country reported over 20,000 confirmed cases in 2024 alone, reflecting a staggering fifteen-fold increase since 2018 (NIH, 2024), and placing immense strain on healthcare systems during seasonal outbreaks.

Even after the establishment of dengue response units, provincial surveillance dashboards and the implementation of the vector control measures, frequent outbreaks in Pakistan still reflect the weaknesses in planning, inter-sectoral coordination and community awareness. Tactics that are in place today are still focused more on the response efforts as the long-term prevention strategies are overlooked. The effective control is hindered further by urban sprawl, inadequate sanitation infrastructure, floods caused by climatic conditions and poor laboratory capacity. This study attempts to critically evaluate the current dengue control strategies used in Pakistan by identifying their main shortcomings and emphasizing on the areas that need to be improved. It advises the creation of a National Dengue Control Policy which would complement province-based one-day activities with a coherent, comprehensive and year-long National Policy on Dengue. By analyzing

national data, expert literature, and policy gaps, the study aims to offer practical, evidence-based recommendations to support a coordinated national response. The policy will be also important to reduce the impact of disease burden in the future and to increase the preparedness and resilience of communities to the changing environmental and epidemiological conditions.

2. Literature Review

Masood et al. (2024) gives the historical account of the emergence of dengue in Pakistan with first serological case reported in 1982 and first outbreak confirmed in 1994. As the authors point out, even though a range of interventions by the federal government as well as the provincial provision of the National Guidelines to Dengue Vector Control, and advisories on the topic conducted by the National Institute of Health, the country nevertheless continues to experience more severe outbreaks with every passing year. Notable among them are the 2011 epidemic in Punjab with over 14,000 cases and the 2017 outbreak in Khyber Pakhtunkhwa reporting nearly 25,000 infections. These periodic surges, further exacerbated by the 2022 post-flood outbreak, indicate unrelenting intersectoral coordination, environmental management, and vector surveillance gaps despite the efforts of the provincial units like the Dengue Expert Advisory Group (DEAG) or the regional office of WHO.

Iftikhar (2020) describes the Lahore dengue outbreak of 2010-2011 as a strong example indicating successful multisectoral coordination in the guidelines of the One Health paradigm. With a combination of health, environment, veterinary and administrative department worked in a coordinated manner, supported by a strong political will and boosted with massive grassroots involvement, dengue control was achieved. This episode represents a convincing example of how to introduce One Health at the national level as an economically effective approach to address the problem of vector-borne diseases within the context of low resource implemented in the domain where the sectoral division of labor is still the rule.

Rana et al. (2020) argue that efforts to control dengue in Pakistan still remain insufficient, triggered by persisting flaws in timely case detection, systematic surveillance of the

vectors, and population-based awareness campaigns. Instead of the existing seasonal, reactive measures, the authors request that an ongoing, intertwined approach to the response is prepared based on detailed clinical readiness, active community partnership, and proactive surveillance. Their findings align with the provisions of the WHO to adopt the extended surveillance approach and reinforce the importance of a common national policy framework (Ahmed et al., 2021).

Expanding on these shortcomings, Rasheed and Khan (2020) explain, contributing to the ongoing spread of dengue in Pakistan. First, the study shows the relatively unexplored role of asymptomatic carriers who comprise about 50 % of the infections in the continuing epidemic of dengue. Second, the authors observe a rate that is increasing in the area of insecticide resistance among *Aedes* mosquitoes. Third, they document the co-circulation of all 3 serotypes of the dengue virus-- DENV-1, DENV-2, and DENV-3 in various provinces. With such observation, the study reveals that, existing reactive measures such as fumigation and awareness creation have played insufficient roles. As a result, they argue in favor of such proactive policies that would prioritize both continuous monitoring of the resistance of vectors and increased access to diagnostic testing to asymptomatic individuals.

The study by Khan et al. (2018) finds it necessary to synthesize a longitudinal epidemiological analysis covering the years between 1980 and 2014 to explain the multifaceted drivers of the dengue spread in Pakistan. The study mentions, noticeable factors that have predetermined transmission include climate change, urbanization, viral evolutionary, and population growth. It is worthwhile to mention that the dengue outbreaks are initially observed in the southern coastal provinces and then spread towards the inland areas like Punjab and Khyber Pakhtunkhwa. The research also establishes significant gaps in knowledge about seroprevalence, genotype evolution, and age-stratified transmission dynamics, in turn, justifying the need to use evidence-based interventions to reflect on the WHO Global Dengue Strategy (Farid & Ashraf, 2025).

Addressing another critical component,

Muhammad et al. (2022) in their publication analyze the dengue surveillance operations in the province of Punjab, whereas Khan (2022) reviews similar programs in Khyber Pakhtunkhwa. Taken together, the two articles report the technical advantages of the surveillance system - its ease of use and flexibility, system stability - but at the same time point to obvious gaps: including low data quality (48%), weak sensitivity (14%) and limited representativeness (40%), which affect the overall effectiveness of system for early detection. Such deficiency is regarded as reducing the usefulness of the systems in early detection of outbreaks. The authors thus summarize that stronger funding, increased geographical and community reach and institution of formal monitoring systems will be essential in taking surveillance beyond just another reporting exercise to becoming bona fide early warning system. These findings underscore the need for enhanced funding, wider geographic and community coverage, and institutionalized monitoring mechanisms to transform surveillance from a reporting tool into an actionable early warning system.

Hussain et al. (2019) highlight the structural weaknesses in healthcare preparedness in Pakistan with regard to the slow reaction to 2019 dengue outbreak in Pakistan, which registered more than 44000 cases and 66 deaths. Despite the available support of the World Health Organization, the intervention measures came in too late revealing the weak nature of the surveillance and response systems in the country. These authors suggest that sustainable and long-term planning approach should be employed, and this can be only possible through planning public awareness campaigns at large scale, sharing data real-time and formation of a centralized dengue control authority to oversee national action plans.

Shafae and Khan (2024) assert that fluctuating monsoon patterns, temperature shifts, and stagnant water accumulation—exacerbated by unregulated urban development—provide ideal breeding grounds for *Aedes aegypti*. The *Annals* study reinforces this perspective, emphasizing how the 2022 floods intensified mosquito proliferation and overwhelmed Pakistan's already burdened health infrastructure. These two studies indicate that

environmental surveillance and urban planning need to form part of dengue control programs, hence aiding in creating climate-resistant governance frameworks.

Another study by Iqtadar, Akram and Khan (2024) shifts the discourse, illustrating the persistent nature of the failure in addressing outbreaks in terms of the efficacy of the vector control intervention and urging integrating dengue vaccines into the Pakistani public health policy. With recent vaccine developments showing efficacy even in dengue-naïve individuals, the authors propose that a targeted vaccination program could significantly reduce transmission, relieve pressure on the healthcare system, and complement ongoing vector control efforts. They recommend that immunization be integrated into existing health infrastructure to maximize coverage and cost-efficiency.

Public engagement has emerged as a critical theme in recent dengue literature. A community-based study by Shafae and Khan (2024) in Lahore found that 81.6% of participants were satisfied with government-led dengue control efforts. However, the study revealed a significant lack of public knowledge about transmission and prevention methods. The authors emphasize that consistent awareness campaigns and structured community involvement are essential to reduce household-level mosquito breeding. They argue that long-term dengue control depends not only on government action but also on informed public behavior, highlighting the need for joint efforts to achieve sustainable disease prevention and control (Ashraf & Adnan, 2022).

The literature reveals a critical gap in Pakistan's dengue response—fragmented, reactive efforts fail to match the scale of the problem. Despite some progress, weak surveillance, poor coordination, and limited public engagement persist. Scholars urge a unified, national policy to shift from short-term crisis control to long-term, sustainable prevention.

3. Objectives of Study

- To critically review the existing approaches towards dengue control in Pakistan
- To identify key gaps and challenges in the current frameworks that hinder long-term

dengue prevention

- To design the contours of a comprehensive National Dengue Control Policy for Pakistan, focusing on sustainable, proactive and coordinated measures

4. Research Questions

1. What approaches have been adopted for dengue control in Pakistan and how effective they have been?
2. What are the key gaps and challenges in Pakistan's existing dengue prevention frameworks?
3. What policy recommendations can guide the development of comprehensive National Dengue Control Policy for Pakistan?

5. Research Methodology

This study primarily employs the qualitative research method to examine the Pakistan's existing dengue control frameworks. A critical research approach has been used to assess current practices, highlight structural weaknesses, and propose alternative policy directions for a more effective national response to dengue. Additionally, the research utilizes secondary data sources, including academic articles, government policy documents, health reports, publications from international health organizations such as the World Health Organization (WHO) and the National Institute of Health (NIH), Pakistan and media reports. The collected material was analyzed to examine how current efforts address key areas such as surveillance, vector control, diagnostic capacity, public awareness, and institutional coordination. Thematic analysis was applied to identify recurring gaps, operational weaknesses, and structural challenges within existing frameworks. The study also considers broader contextual factors such as climate change, rapid urbanization, and institutional fragmentation that influence dengue transmission and control efforts. The study outlines parameters that are important in drawing up a National Dengue Control Policy reflecting a proactive, sustainable and integrated public-health planning approach.

6. Significance of Study

The study has significant academic value as it highlights the continuous susceptibility of Pakistan to dengue epidemics and proves that

measures in place are inadequate. Despite several efforts at the provincial level, dengue prevention and control does not have an overall, national structure, which makes the current efforts inadequate. It highlights the major gaps in Pakistan’s existing dengue control efforts, such as weak coordination, poor surveillance, and limited public awareness. By outlining contours for a National Policy for dengue control in Pakistan, this study adds a much needed policy-focused perspective to the existing literature which largely centers on epidemiology or short-term responses. It is relevant not only for public health officials and policymakers but also for researchers, urban planners, and local governments aiming to build more resilient and responsive health systems.

7. An Analysis of Existing Approaches

7.1 An Overview of Major Dengue Outbreaks in Pakistan

Key Years	Nationwide Reported Cases	Hardest-Hit Province	Cases in Province	Notable Features
2011	~25,000	Punjab (Lahore)	22,562	First major epidemic; over 300 deaths; DEAG established
2017	22,938	Khyber Pakhtunkhwa (Peshawar)	~24,000	KP's largest outbreak; exposed urban preparedness gaps
2019	52,476	Sindh (Karachi)	15,521	Largest nationwide outbreak; virus spread to new areas, including Balochistan
2021	48,906	Punjab	24,146	Highest provincial count despite year-round guidelines; implementation gaps exposed
2022	41,746	Sindh	~20,000+	Post-flood outbreak; strong link between rainfall, stagnant water, and case surge
2024	20,000+	Balochistan	6,958	First time Balochistan led national case count; climate change and flood fallout

7.2 Government Efforts for Dengue Control in Pakistan

Dengue control in Pakistan varies markedly in structure, legislative backing, and operational capacity from province to province.

7.2.1 Punjab Province

Punjab has emerged as a provincial leader in

Over the past decade, Pakistan has experienced recurring dengue outbreaks of varying intensity, often peaking during the post-monsoon season. These surges are typically driven by poor sanitation, inadequate vector control, and climate-related events such as floods. According to official data from NIH, WHO, and national media, approximately 25,000 cases were reported in 2011, primarily in Lahore. In 2017, 22,938 cases were recorded, with Khyber Pakhtunkhwa, especially Peshawar, hardest hit. KP (Peshawar) reported ~24,000 cases though NIH officially recorded 22,938 cases nationwide, reflecting data discrepancies. The 2019 outbreak was the largest to date, with 52,476 cases nationwide. After a decline to 3,442 in 2020, cases rose sharply to 48,906 in 2021 and 41,746 in 2022, mostly in Sindh. In 2024, over 20,000 cases have been reported so far, with Balochistan the most affected.

dengue prevention, particularly after the 2011 outbreak that led to the formation of the Dengue Expert Advisory Group (DEAG) to oversee clinical guidelines, vector surveillance, and staff training (DEAG, n.d). In 2014, the province introduced standardized SOPs for case management and vector control (Government of Punjab, 2014). It also launched the

Epidemics Prevention and Control Program, focusing on year-round surveillance, health education, social mobilization, institutional capacity building, and public awareness. These efforts are supported by real-time data reporting through the PITB dashboard, enabling more timely and coordinated responses (DGHS Punjab, n.d.).

7.2.2 Sindh Province

In 2014, Sindh codified its responsibilities under the Sindh Prevention and Control of Dengue Act 2014, mandating pesticide sprays, occupant duties, and notification, though enforcement remains uneven. Recognizing the success of Punjab's model, Sindh has invited DEAG experts to train local health staff, especially in Karachi, which frequently reports the highest dengue burden (Dawn, 2022). Sindh's Health Department has also launched a vector-borne disease strategy with fumigation, diagnostics, and 4 million LLINs distributed (The Nation, 2024). However, urban flooding, poor drainage systems, and inconsistent implementation remain major barriers to sustainable impact.

7.2.3 Khyber Pakhtunkhwa Province

Khyber Pakhtunkhwa's Health Department operates Dengue Response Units (DRUs) and a functional surveillance system, supplemented by a month-wise prevention framework and WHO technical support (WHO, 2022). In 2023, the government launched a **Dengue Action Plan** under the oversight of a high-level committee comprising secretaries of health, local government, irrigation, and information departments (The Express Tribune, 2023). Through this multi-sectoral coordination, the province achieved a dramatic reduction in cases, from over 16,700 in October 2022 to just 629 in October 2023 (Dawn, 2024).

7.2.4 Balochistan Province

Balochistan was previously considered naive to dengue infections due to its harsh climate, sparse population, and limited mosquito presence. However, in 2024, it became one of the hardest-hit regions, reporting 6,958 cases, the highest among all provinces (The Lancet, 2024). Balochistan relies on federal IVM guidelines without a province-specific strategy, resulting in slow, reactive responses and ad-hoc outbreak management. Dengue control is led by

the PDMA, with support from the Health Department and WHO, focusing on high-risk areas like Gwadar, Kech, and Lasbela through fogging, larvicide use, and seasonal awareness campaigns (The Nation, 2024). Poor sanitation, under-reporting, low awareness, and difficult terrain continue to hinder effective control.

7.3 Highlighting the Gaps and Challenges

Despite the presence of provincial dengue control programs and increasing government attention, Pakistan continues to face recurring and increasingly severe dengue outbreaks. These outbreaks highlight several structural and operational gaps that weaken the effectiveness of current frameworks.

I. Fragmented and Reactive Vector Control Measures

Pakistan's dengue response is largely reactive, triggered only after outbreaks surge. Between January and November, 2024, Sindh reported 2,179 dengue cases and one death in Karachi, prompting Dr. Abdul Ghafoor Shoro of the Pakistan Medical Association to warn that, "These stats represent only the tip of the iceberg. The actual number of cases must be higher than what is being officially shared, given the big gaps in our surveillance system and our limited capacity for diagnosis." He attributed the surge in cases to the lack of fumigation drives and regretted that preventive healthcare has never been a priority for officials (Ilyas, 2024). In 2021, Punjab reported 24,146 cases (the highest among provinces) despite its Dengue Expert Advisory Group and 24-hour reporting mandate, indicating gaps in translating policy into effective prevention.

ii. Insufficient Surveillance and Diagnostic Capacity

Effective dengue management requires robust surveillance and diagnostic networks. Pakistan's dengue surveillance system faces major limitations in data quality, coverage, and responsiveness. While Punjab and KPK have digital dashboards, data is often incomplete or delayed, especially at primary healthcare levels. Sindh and Balochistan struggle with weak diagnostics and under-reporting. A 2022 evaluation in KPK revealed surveillance sensitivity and predictive values as low as 14% and 15% (Khan, 2022). Limited NS1 antigen testing in Sindh delays confirmations (Costa et

al., 2015). Although DEAG issues year-round guidelines, the absence of off-season vector monitoring allows unchecked pre-monsoon breeding. Pakistan must strengthen its laboratory infrastructure and standardize real-time data reporting to enable timely outbreak mitigation.

iii. Lack of Community Engagement and Public Awareness

Sustained community participation is pivotal for dengue prevention, yet Pakistan's efforts remain fragmented. The spread of dengue is also fueled by community ignorance and lack of coordinated action. Religious leaders, local residents, and government agencies remains largely unorganized in prevention efforts, leading to limited awareness and poor behavioral practices ultimately increasing vulnerability and facilitating the continued transmission of the virus (Zahir et al., 2016). Studies indicate that a significant portion of the population lacks adequate knowledge about dengue transmission and prevention methods. A PIDE (Pakistan Institute of Development Economics) study found that 52.9% of respondents were unaware of mosquito biting times and dengue transmission routes, highlighting major knowledge gaps in communities (PIDE, 2022). Embedding structured community mobilization and education into policy will enhance Pakistan's control measures.

iv. Environmental and Socioeconomic Drivers

Rapid urban growth, climate variability, and economic disparities hinder effectiveness of dengue control frameworks in Pakistan. The World Health Organization notes dengue as the world's fastest-growing vector-borne disease, with a 30-fold jump in incidence over the last 50 years, disproportionately affecting low- and middle-income nations (WHO, 2014). The economic burden in Pakistan was estimated at USD 56 million annually in 2011, with an average cost of USD 235 per hospitalized patient, highlighting the financial strain on families and health systems (Rafique et al., 2014). Dengue outbreaks in Pakistan are closely linked to climate and environmental mismanagement. Most cases occur between July and September, when ideal conditions— heavy rainfall, high humidity, and moderate temperatures—support mosquito breeding. In

2022, record rainfall, 2.9 times the 30-year average, led to severe flooding, especially in Sindh, displacing over 2 million people and damaging sanitation infrastructure.

Stagnant water and open drains in flood-hit areas and informal settlements created ideal mosquito habitats. Between January and September 2022, over 25,900 dengue cases and 62 deaths were reported, with 74% of cases concentrated in the post-flood months, straining Pakistan's already fragile public health system (Tabassum et al., 2023). Irrational urbanization and poor water management further exacerbate the spread of dengue by enabling unregulated construction, water logging, and inadequate waste disposal in high-density neighborhoods.

8 Key Findings

Critical analysis of Pakistan's dengue control landscape reveals several critical insights:

8.1. Persistent Case Burden and Seasonal Peaks

Pakistan continues to experience a high dengue burden, particularly during and after the monsoon season. By the end of September 2024, 2,795 confirmed cases were reported, with Balochistan and Sindh disproportionately affected during the July–October transmission window. Similarly, in 2022, record-breaking floods resulted in 25,932 confirmed cases and 62 deaths, with 74% of cases occurring in September alone. This recurring pattern underscores the country's environmental vulnerability and the seasonal predictability of dengue outbreaks, yet effective early interventions remain lacking.

8.2 Fragmented and Reactive Response

Despite over a decade of recurring epidemics, dengue control efforts in Pakistan remain largely reactive and fragmented. Larviciding, fumigation, and source reduction activities are typically initiated only after a surge in reported cases, rather than as part of a continuous, pre-emptive strategy. Currently, there is no permanent national authority or legally binding policy to oversee vector control and coordinate efforts across provinces. This absence of central oversight has led to disjointed and inconsistent responses, where each province operates under its own protocols, often with limited inter-provincial learning or data sharing.

8.3 Inadequate Surveillance and Diagnostic Infrastructure

Effective disease control depends on early detection and rapid response. However, Pakistan's dengue surveillance and diagnostic capacity remains insufficient. NS1 antigen and PCR tests are limited to a few laboratories in major cities, leaving vast rural and peri-urban populations without timely diagnostic services. Under-reporting, data discrepancies, and poor integration between federal, provincial, and district surveillance systems further undermine the credibility and utility of reported case figures. Studies estimate that the actual dengue burden may be 1.5 to 2 times higher than official reports. This data gap not only delays outbreak confirmation but also affects resource allocation and public messaging.

8.4 Low Community Engagement and Behavioral Gaps

Community awareness and participation remain weak. Surveys show that over 50% of households are unaware of how dengue is transmitted or how to prevent mosquito breeding. Sporadic public awareness campaigns, particularly during outbreaks, have limited long-term impact. There is currently no institutionalized, community-led dengue prevention program integrated into local governance structures. As a result, domestic breeding sites—particularly water containers, drains, and uncovered tanks—remain a persistent problem across urban and semi-urban households (Sarwar & Farid, 2025).

8.5 Environmental and Climatic Drivers

Environmental mismanagement and climate change have intensified dengue risks. Rising average temperatures and changing rainfall patterns have extended the breeding season and expanded the geographical spread of *Aedes* mosquitoes. It is estimated that vector habitats have increased by 20–30% in high-risk districts over the past decade. Unregulated urbanization, particularly the growth of informal settlements without proper drainage or waste management, has further enabled mosquito proliferation. These factors collectively contribute to the increasing frequency and severity of dengue outbreaks across the country.

Building on the critical gaps identified, the

following evidence-based recommendations outline the structural, technical, and community-oriented measures required to transition Pakistan's dengue response into a proactive, sustainable national programs.

9 Suggestions for A National Dengue Control Policy

Dengue control has been very challenging in Pakistan due to lack of trained entomologist, fragmented responses, adequate monitoring and assessment system, and absence of designated vector authority department for dengue vector control interventions. By designing a National Dengue Control policy on the following lines, dengue prevention can be better in future.

9.1 Establish a National Dengue Control Authority

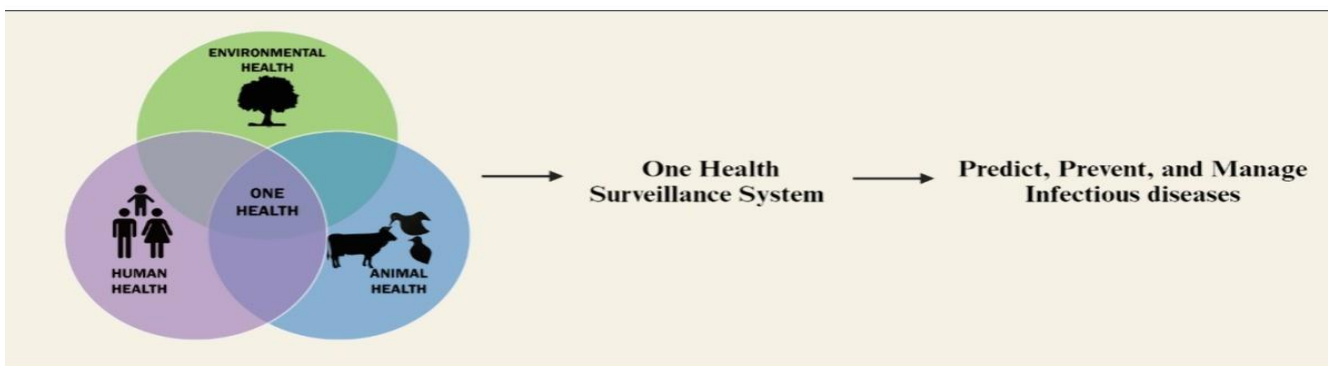
A legally mandated, high-level National Dengue Control Authority (NDCA) should be created under the Ministry of National Health Services to coordinate federal, provincial, and district operations, ensure dedicated budget allocations, and oversee policy implementation. Embedding the NDCA within existing public health structures while granting it autonomous decision-making powers will foster accountability and cross-sector collaboration, aligning with WHO's call for a global coordinated response to *Aedes*-borne diseases.

9.2 Integrating One Health Approach

To effectively control dengue outbreaks at a national level, Pakistan should adopt the One Health approach, a strategy successfully implemented during the 2010–2011 Lahore dengue epidemic, which resulted in a substantial reduction in cases through intersectoral collaboration. This approach brings together human health, animal health, and environmental management to address the interconnected factors driving dengue transmission. Under the proposed National Dengue Control Authority (NDCA), National One Health Task Force should be established to coordinate the efforts at the health, veterinary, environmental and public infrastructure sectors.

One Health Approach would involve the implementation of larval surveillance, controlling the spread of the vectors, and knowledge vibration in the community, as well

as waste management activities by such a task force.



Source: Singh et al., 2024

9.3 Strengthen Surveillance and Diagnostic Systems

An effective dengue surveillance system is desirable to Pakistan a system that emphasises the speedy detection of cases, sensitive laboratory testing and assessments designed to monitor the mosquitoes. Standardized NS1 antigen and PCR testing facilities should be maintained at provincial level within the public-health laboratories and all clinically confirmed dengue cases should be reported in real-time on a national dashboard managed by a National Dengue Control Authority (NDCA).

9.4 Implement Continuous Integrated

Vector Management (IVM)

Integrated Vector Management is an evidence-based systematic way of optimizing resource usage in control of vector-borne diseases. In this paradigm, the World Health Organization proposes systematic use of a package of measures- e.g. routine removal of larval habitats of mosquitoes, judicious use of spatially targeted fogging, and strategic use of bio-control where data on current surveillance, e.g. the Ovitrap index and the House Index- are available in real time. Efforts against dengue must be combined with malaria programs to save money and resources.



Source: Coachella Valley Mosquito and Vector Control District, 2025

9.5 Enhance Community Engagement and Education

Dengue control must move beyond reactive

awareness campaigns. It is important to create a group of trained volunteers who will regularly visit households in search of mosquito-breeding conditions and promote

clean-up actions lead by residents. At the same time, a series of corresponding vigilance efforts must be carried out continuously, using social media, mobile apps, as well as educational institutions, to provide households with the necessary knowledge in order to protect themselves and their families. In addition, digital tools, like the Punjab Information Technology Board (PITB) Dengue Dashboard, which helped to overcome the outbreak in Lahore, should be scaled to cover a greater area of the country and support the integration of data in real-time and the coordination of the response to the disease.

9.6 Role of Local Governments

Local governments can play an important role in dengue control efforts. The common interventions involve targeted community sensitization, proper waste-management infrastructures as well as ensuring environmentally-sustainable city planning in a bid to reduce breeding grounds of the mosquitos. Adopting the early-warning systems via local health facilities will enhance the real time surveillance of outbreaks and the strategic application of the vector- control strategies namely fumigation and larviciding on the high-risk districts. Routine inspections of public and household premises in search of stagnant water, as well as orderly collaboration with the health departments surrounding the observation and subsequent interpretation of epidemiological information continue to make the dengue-prevention and response capacity ever stronger. A long-term collaboration between local governments and the community is the key to disseminating these measures (Farid, 2023).

9.7 Integrate Vaccination Strategies

Vaccines are the most effective tool to control infectious diseases. Pakistan should also add dengue vaccination to its national immunization plan. Following WHO advice, the new Q- denga® (TAK-003) vaccine can be given in areas where dengue is widespread, targeting children aged 6 to 16 years. It should be given in two doses, three months apart. Pilot programs can first test how well vaccination works before expanding it across the country. Pakistan has neither vaccine development program nor any international vaccine get authorization yet.

9.8 Secure Sustainable Financing and Legislative Support

To keep dengue control efforts running smoothly, Pakistan must secure continuous funding. Dengue programs should be linked with other public health programs to share costs. A special public health fund can be created and managed by the NDCA. New laws must be passed to enforce environmental cleanliness, like proper waste management and safe water storage, with fines for those who don't follow them.

9.9 Promote Research, Monitoring, and Evaluation

Pakistan must invest in carrying out some research on the best and cost effective dengue prevention and control measures. Such studies include development of vaccines, mosquito-control measures and local-community efforts. The NDCA should develop a dedicated Monitoring and Evaluation (M&E) unit responsible to review the progression of the programs once a year and to publish full reports. Such institutional framework will result in improving the transparency of the intervention as well as the ability to improve current practice. Building on these strategies, Pakistan can work out a comprehensive National Dengue Control Policy that will reduce the burden of diseases and enhance the long term public health situation.

10 Conclusion

Dengue remains a major and escalating threat to the population in Pakistan. Although some control measures are occasionally implemented, the national response is severely reactive, fragmented, seasonal with over-dependence on post-outbreak fumigation and the lack of sufficient surveillance. Such efforts have always been unsuccessful in curbing the recurring epidemics especially when seen in the light of rapid urbanization, improper management of water and its impact on climate disturbances like floods. This study underscores the need for an evidence-based National Dengue Control Policy which should be based on proactive and coordinated measures. The policy needs to be formulated by putting in place a legally enforced National Dengue Control Authority with streamline real-time surveillance, continuous Integrated

Vector Management (IVM), community led awareness, source reduction, and introduction of targeted vaccination a compulsory policy framework. Also, it will be important to have access to sustainable financial resources, implement supportive laws, and develop a

strong monitoring and evaluation system to have long-lasting changes. The Pakistani government can only mitigate the ever-increasing dengue burden and protect civil health through a multi-sectoral and coordinated response.

Conflict of Interest

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