Beyond the traditional vector control and the need the strengthening integrated vector management in Latin America

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According to the World Health Organization (WHO), vector-borne diseases (VBDs) cause more than 700,000 deaths annually, representing 17% of all infectious diseases around the world.[1] In Latin American countries, the burden associated with neglected tropical diseases and other infectious diseases of poverty is on the rise.[2]

VBDs contribute significantly to the global morbidity burden, affecting unevenly poor communities, particularly in developing countries. In the Americas, there is a high burden of these diseases, several of which present as endemic and epidemically in different geographical areas. They cause school absenteeism, worsen poverty, increase health costs, and overload health systems while undermining general economic productivity.[3,4]

The main VBDs affecting the populations of the Americas are dengue, Zika, chikungunya, malaria, leishmaniasis (cutaneous, mucocutaneous, and visceral), Chagas disease, onchocerciasis, lymphatic filariasis, and, to a lesser extent, yellow fever, and West Nile Virus.

The Pan American Health Organization (PAHO) estimates that 145 million people in 21 countries of the region live in areas at risk of malaria. In the last three decades, dengue in the region has been characterized by recurring epidemic cycles of 3–5 years, and cases have been on the rise since the year 2000.

Chagas disease is another parasitic infection acquired principally through its vector. Nearly 6 million people of the Region of the Americas, particularly families that live in substandard housing and some indigenous communities, are still chronic sufferers of this disease. Congenital Chagas transmission is a source of disease burden in Latin America. Food and beverages contaminated with Chagas disease vectors' feces continue to cause local outbreaks of acute disease. Leishmaniasis, another parasitic VBD, with an increasing incidence, constitutes a significant health problem in the region. PAHO reports approximately 55,000 and 3,500 annual cases of cutaneous and mucocutaneous, and visceral leishmaniasis, respectively. Leishmaniasis is more prevalent in vulnerable rural and peri-urban communities.

Historically, initiatives led by PAHO and countries have promoted vector control strategies. In the 1950s, with the availability of insecticides such as dichloro-diphenyltrichloroethane (DDT) and synthetic drugs, campaigns to eliminate *Ae. aegypti* and malaria met with different results.[5,6] However, various factors, such as the lack of community participation, the decline of international economic support, and insecticide resistance, have caused malaria elimination campaigns to fail in several countries.[7,8]

Between 1950 and 1970, vector control efforts succeeded in eliminating *Ae. aegypti* and, at least initially, preventing the re-urbanization of yellow fever in most countries of the Americas, although these results were not sustained over time.[9] The initial success was unfortunately followed by inaction and neglect.

Starting in the 1970s and 1980s, the effectiveness of these programs declined due to various economic, administrative, operational, and even biological issues (including insecticide resistance beginning to emerge, as the behavior of vector species began to change). All this caused a weakening of institutional action in different countries in the Region.

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We have seen the replacement of locally tailored approaches based on an understanding of the epidemiology, ecological, environmental, economic, and social determinants of VBDs by insecticide-only delivery approaches.[10]

In the year 2017, the WHO published a document entitled *Global response for vector control 2017–2030*,[11] and PAHO printed a document entitled *Action plan in entomology and vector control*,[12] both of which were oriented to strengthen vector control programs in the region.

A more mobile population, and migration caused by political and economic instability, facilitate the spread of VBDs. New diseases are introduced into areas where vector populations are not controlled, while massive influxes of susceptible people are coming to unplanned urban and deforested areas. Strengthening current control programs is therefore fundamental to protect against these risks.

In the 1990s, a strategy of "Integrated and Selective Vector Management" was attempted.[7] This was based on a combination of control measures aimed at specific disease vectors, but could not be consolidated due to different factors related to program structures.

Aware of the limitations of exclusive reliance on chemical interventions, over the years the WHO has recommended the use of an integrated approach to vector control, involving both chemical and nonchemical methods, and environmental management.[13–16] The document *Global Strategic Framework for Integrated Vector Management* (IVM) in 2004 added a much-needed clarity to the IVM concept.[17] More recently, PAHO launched the document entitled *Handbook for integrated vector management in the Americas* to reinforce this approach and made it accessible to all-region vector control programs.[18]

IVM was proposed based on a more flexible, rational, and comprehensive approach, which simultaneously considered control of the main insect vectors in endemic places, different control methodologies and strategies, and intersectoral action. However, in most countries of the region, progress has been slow due to operational barriers that hinder the full incorporation of IVM into program routines.[18]

It is important to reinforce the concept that IVM also implies the simultaneous control of multiple diseases transmitted by different vector species in a given area, or one tool controlling several VBDs transmitted by the same vector.[19,20] This approach to vector control is more cost effective for national and local vector control programs; it is also important to highlight the need for a change in mindset from the traditional preoccupation with combining the use of only a few, as opposed to limited, vector control methods, such as long lasting insecticide nets and indoor residual spraying.

The IVM is a comprehensive strategy with key elements that include the integration of chemical and nonchemical methods of vector control and their further integration with other aspects of a country's health-care system, evidence-based decision making, intersectoral collaboration, advocacy, social mobilization, and capacity building.

The main challenges to sustain this application includes the inappropriate institutional arrangements in some countries, weak inter-sectoral coordinating mechanisms, the lack of personnel with technical expertise in epidemiology and entomology, and sustainable and suitable allocation of financial resources. This situation worsens, especially in unforeseen events such as the COVID 19 pandemic, when all efforts are shifted to contain these emergencies.

However, recent political advances can help to change this scenario. Recently, the countries of the Americas pledged to support the Plan of Action on Entomology and Vector Control 2018–2023,[1] which aims to strengthen regional and national capacity for the prevention and control of key vectors and reduce the transmission of VBDs.

The action plan is consistent with the Global Vector Control Response 2017–2030 from WHO,[2] and has five strategic lines of action (Multilevel Integration Dimension; Government and Community, Vector Control Programs and Systems, Tools and Interventions, Workforce and Training). These lines should be implemented through effective, locally adapted, and sustainable vector control and best practices, including IVM.

In conclusion, VBDs continue to affect a large proportion of the population in Latin America. A milestone for the region was the approval of the Action Plan on Entomology and Vector Control 2018–2023, and therefore its implementation should be a priority for the countries. IVM frameworks are the only way to address the multiple players and modifiers to achieve meaningful health outcomes. Research to identify interventions with more immediate impact should be prioritized.

Authors contribution

GPH: idea, writing and corrections;

GC: Writing and corrections;

JPE: Corrections;

GG: Corrections;

HB: Writing and corrections.

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