

# Management of insecticides for use in disease vector control:

Lessons from six countries in Asia and the Middle East

---



Dr Rajpal S. Yadav

Veterinary Public Health, Vector Control & Environment Unit

Department of Control of Neglected Tropical Diseases

WHO, Geneva, Switzerland

YadavRaj@who.int

van den Berg H, Velayudhan R, Yadav RS (2021). PLoS Negl Trop Dis, 15(4): e0009358. <https://doi.org/10.1371/journal.pntd.0009358>

## PLOS NEGLECTED TROPICAL DISEASES

---

RESEARCH ARTICLE

# Management of insecticides for use in disease vector control: Lessons from six countries in Asia and the Middle East

Henk van den Berg <sup>1</sup>, Raman Velayudhan<sup>2</sup>, Rajpal S. Yadav <sup>2\*</sup>

**1** Laboratory of Entomology, Wageningen University, Wageningen, the Netherlands, **2** Veterinary Public Health, Vector Control and Environment Unit, Department of Control of Neglected Tropical Diseases, World Health Organization, Geneva, Switzerland

\* [yadavraj@who.int](mailto:yadavraj@who.int)

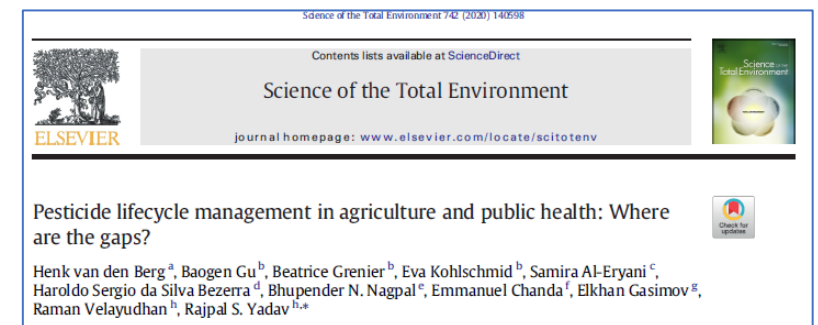


## Abstract

Interventions to control the vectors of human diseases, notably malaria, leishmaniasis and dengue, have relied mainly on the action of chemical insecticides. However, concerns have

# Background

- Vector control interventions have demonstrated their critical importance for the control and elimination of most vector-borne diseases
- Insecticides are the mainstay for controlling the vectors of malaria, dengue and visceral leishmaniasis
- Proper management of insecticides is critical to reduce risks to human health and the environment, and to delay insecticide resistance
- A recent global survey reported shortcomings in pesticide regulatory, pesticide procurement, application methods, safety measures, pesticide storage, chemical waste disposal, insecticide resistance management
- An in-depth assessment is needed to provide insight into the context of pesticide management (technical, organizational and institutional aspects).



Science of the Total Environment 742 (2020) 140598

Contents lists available at ScienceDirect

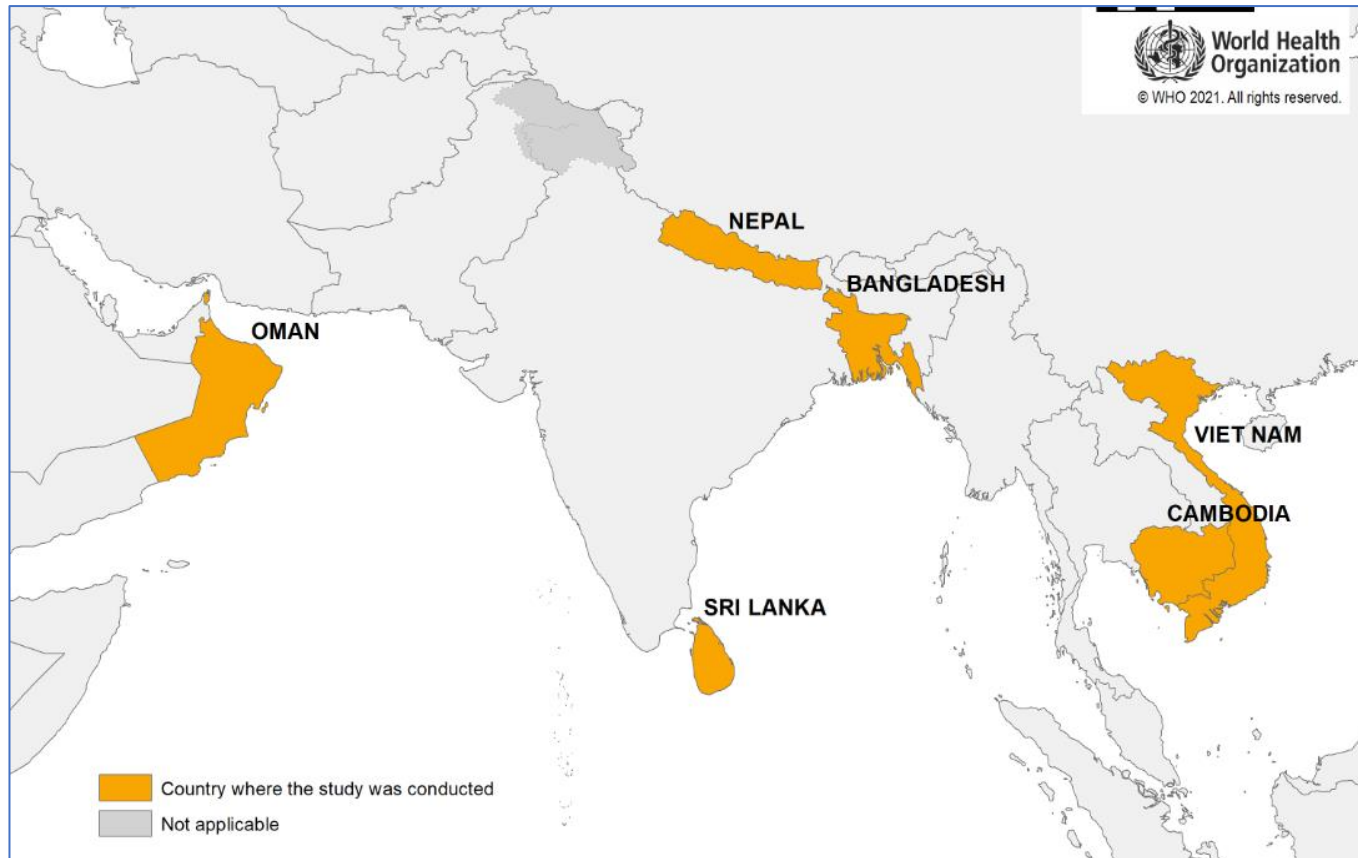
Science of the Total Environment

journal homepage: [www.elsevier.com/locate/scitotenv](http://www.elsevier.com/locate/scitotenv)

Pesticide lifecycle management in agriculture and public health: Where are the gaps?

Henk van den Berg<sup>a</sup>, Baogen Gu<sup>b</sup>, Beatrice Grenier<sup>b</sup>, Eva Kohlschmid<sup>b</sup>, Samira Al-Eryani<sup>c</sup>, Haroldo Sergio da Silva Bezerra<sup>d</sup>, Bhupender N. Nagpal<sup>e</sup>, Emmanuel Chanda<sup>f</sup>, Elkhan Gasimov<sup>g</sup>, Raman Velayudhan<sup>h</sup>, Rajpal S. Yadav<sup>h,\*</sup>

- A qualitative situation analysis of insecticide management was conducted in Aug-Dec 2019
- Using 15 quality insecticide management indicators in 31 countries in Asia and the Middle East (2017-18 survey), 6 countries with poorer than average pest. management conditions (40% vs. 52%) were selected
- Meetings with key stakeholders in each country



Country	Vector-borne disease or pest targeted	Cases <sup>a</sup>
Bangladesh	Malaria	10500
	Visceral leishmaniasis	144
	Dengue	90000
	Nuisance mosquitoes	n/a
Cambodia	Malaria	25502
	Dengue	67436
Nepal	Malaria	1065
	Visceral leishmaniasis	169
	Dengue	14000
Sri Lanka	Malaria	1
	Dengue	99120
Oman	Malaria	0
	Dengue	59
	Nuisance mosquitoes	n/a
Vietnam	Malaria	5000
	Dengue, chikungunya	250000

# Key results – vector control programs

- Vector control programs (Mal/Den/VL) using different interventions
- Centralized and decentralized programs with varying capacity
- Critical shortcomings in the practices of procurement, application, safety measures, storage and disposal of vector control insecticides
- This has implications for efficiency, effectiveness, safety of vector control and, thus, for the control and elimination of vector-borne diseases
- Comparison between malaria programs and dengue programs provided lessons
- Central-level norms, guidelines and strategies were vital to the quality and safety of insecticide use – these offered direction and control in most malaria programs, but were largely lacking from decentralized dengue programs

# Key results – coordination between VC programs

- Dengue programs were operated in a decentralized manner and, consequently
  - lacked coordination through guidelines and standards on best practices
  - had variable practices of procurement, application, safety, disposal, which compromised quality and safety of operations
  - they were better at involving communities/sectors, & securing local financing
- Coordination/collaboration between vector control programs (MAL, DEN, VL) was weak. Entomological capacity concentrated in malaria programs at central level is not benefiting dengue and leishmaniasis.

# Key results - coordination

- Non-health sectors have a potential role in vector control, for example, in pesticide management, drainage or irrigation management, waste management or community mobilization
- Potential synergies in sharing entomology labs, expertise and resources not utilized. This compromises the sustainability of entomological capacity
- Lack of inter-program coordination on insecticide resistance management (except in Sri Lanka)
- Institutional mechanisms (e.g., integrated vector management committee) for multi-sectoral action weak or lacking.

# Key results - capacity

- A critical shortage of entomological capacity, especially in most dengue and visceral leishmaniasis programs – possibilities for tertiary education on medical entomology were absent or limited
- Different stages of management of insecticide resistance in malaria vectors
- Lack of routine IR monitoring in dengue and VL programs under-valued importance of IRM in five countries (except SL)
- Nuisance mosquitoes were a main target for routine insecticidal application by municipalities in Bangladesh and Oman
- Pesticide regulatory control
  - legislation was in place, but compliance monitoring & enforcement was weak
  - pesticide quality control was a major challenge – did not test full physical-chemical properties and relevant impurities of pesticides
  - national pesticide procurement guideline were absent in most countries
  - centralized procurement for malaria & VL; for dengue decentralized and disorganized

Thanks!



# Key recommendations

- To improve the vector control insecticide management, begin by bottom-up situation analysis of organizational/institutional aspects, using a cross-disease approach, and develop appropriate solutions across programs.
- Further international support is needed to assist countries in situation analysis, action planning and development of national guidelines on vector control insecticides and resistance monitoring.
- Need to harmonize with central standards:
  - application methods and safety measures
  - insecticide storage and disposal practices at local levels