

Indian Society for Malaria and Other Communicable Diseases

**Learning Module on Vector Surveillance,
Biology and Management Strategy for Vector
Borne Diseases**

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Preface

Vector Borne Diseases (VBDs) have been always a public health challenge in the country due to the ongoing threat of emerging and re-emerging diseases. This has been possible due to the continued environmental and climatic changes at the macro and micro level, thereby helping the vectors and pathogen to establish strong linkages leading to disease transmission. Besides the disease prevention, surveillance, diagnosis and treatment as a part of the control strategy, the proper understanding of the vectors of a particular VBD is critical to planning and implementing the control strategy.

There are different vector species playing a role in the transmission of malaria, filaria, dengue, Chikungunya, JE, Kala-azar spread over different eco-epidemiological settings. Entomological surveillance and vector control are the strong pillars of the strategic components of any VBDs. The biology of the vectors is also changing due to different ecological and human factors in terms of breeding, resting, feeding and dispersal. There are some challenges faced in the field with the continued reporting of insecticide resistance to the larval as well as adult vectors of malaria, filaria, dengue, JE and Kala-azar.

Zoonotic diseases are a huge challenge in India leading to increased morbidity and mortality in humans and potential threats to health security. The worldwide occurrence of a significant number of outbreaks of emerging and re-emerging infections, like Scrub Typhus, Crimean Congo Haemorrhagic Fever and Kyasanur Forest Disease over the past few years is a matter of concern for India. As these diseases are spread from animals, prevention and control strategies need to be multi-sectoral and require the coordinated and combined efforts of Zoonosis, Veterinary, Environment and Forest, Agriculture and Health Sectors.

An attempt has been made by the Indian Society for Malaria and Other Communicable Diseases to bring out this manual of “Vector Surveillance, Biology and Vector Management Strategy for Vector Borne Diseases”. This training module will be useful in providing necessary technical information and hands-on training for Public health Entomologists in the country dealing with vector-borne diseases. This manual may also be used in the form of valuable resource material for training programmers and self-learning by the district/zonal/state entomologists in the country.

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Abbreviations

VBD	Vector Borne Diseases
DEN	Dengue
CHK	Chikungunya
GTS	Global Technical Strategy
JE	Japanese Encephalitis
VL	Visceral Leishmaniasis
KFD	Kyasanur Forest Disease
CCHF	Crimean-Congo Hemorrhagic Fever
CL	Cutaneous leishmaniasis
WN	West Nile
WNV	West Nile Virus
JEV	Japanese encephalitis virus
LF	Lymphatic Filariasis
MDA	Mass drug administration
IDA	Integrated drug administration (Triple drug therapy)
HMIS	Health Management Information System
Pv	Plasmodium vivax
Pf	Plasmodium falciparum
NCVBDC	National Centre for Vector Borne Disease Centre
WHO	World Health Organization
PMHD	Per man hour density
IRS	Indoor residual Spray
CDC	Center for Disease Control
LSM	Larval Source Management
WHO GVCR	WHO - Global Vector Control Response
TAS	Transmission Assessment Survey
DEC	Diethyl Carbamazine
DDT	Di-chloro-diphenyl-trichloroethane
DF	Dengue Fever
DSS	Dengue Shock Syndrome
DHF	Dengue Haemorrhagic Fever
HI	House Index
CI	Container Index
BI	Breteau Index
PI	Pupal Index
XS	Xeno-surveillance

MX	Molecular Xenomonitoring
ELISA	Enzyme-linked immunosorbent assay
KFDV	KFD Virus
FAO	Food and Agriculture Organization
MLO	Mosquito Larvicidal Oil
EC	Emulsified Concentrate
WP	Wettable Powder
AS	Aqueous Suspension
IGR	Insect Growth Regulator
IRS	Indoor Residual Spray
ULV	Ultra Low Volume
ITN	Insecticide Treated Net
LLIN	Long-Lasting Insecticidal Net
NPHCC	National Programme for Human Health and Climate Change
MIS	Management Information System
VCP	Vulnerable Communities plan
WCO	WHO Country Office

Glossary

Surveillance (control program): Ongoing, systematic collection, analysis, and interpretation of disease-specific data for use in planning, implementing, and evaluating public health practice. Surveillance can be carried out at different levels of the health care system (e.g., health facility-based, community-based), using different detection systems (e.g., case-based, active, passive), and sampling strategies (e.g., sentinel sites, surveys).

Transmission Intensity: The frequency with which people living in an area are bitten by anopheline mosquitoes carrying human malaria sporozoites. It is often expressed as the annual entomological inoculation rate (EIR), which is the average number of inoculations with malaria parasites estimated to be received by one person by time period. Due to the difficulty in measuring EIR, parasite rate in young children is often used as a proxy for transmission intensity.

Transmission Season: Period of the year during which mosquito-borne transmission of malaria infection usually takes place.

Vector Control: Measures of any kind against malaria-transmitting mosquitoes are intended to limit their ability to transmit the disease.

Vector Efficiency: An imprecise way of ranking vector species or populations as relatively more or less important in transmission. It is less calculable than vectorial capacity.

Vectorial Capacity: Number of new infections that the population of a given vector would induce per case per day at a given place and time, assuming the population is and remains fully susceptible. Factors affecting vectorial capacity include (i) density of female anophelines relative to humans; (ii) their longevity, frequency of feeding and propensity to bite humans; and (iii) length of the parasite extrinsic cycle.

Vulnerability: The frequency of influx of infected individuals or groups and/or infective anophelines into an area. Also referred to as importation risk.

Receptivity: Receptivity is a function of the presence of competent Anopheles vectors, a suitable climate and a susceptible human population, and is generally based on a combination of the indicators listed above. Various methods are used to assess receptivity; these are being reviewed by WHO to provide improved guidance on this topic.

Entomological Inoculation Rate: It is the number of infectious bites by adult female vectors per person per unit time, usually per year. Calculated as: human biting rate x sporozoite rate from human landing catches or vector density x human biting rate x sporozoite rate based on CDC light trap collection. Reported per year, season, month or night. Yearly or seasonal EIRs are best calculated by adding monthly EIRs in order to account for strong seasonality in transmission.

Sporozoite Rate: Proportion of adult female vectors with sporozoites in their salivary glands

Occurrence: Adult female vectors present or absent.

Density: Number of adult female vectors collected, usually per sampling method and unit time.

Human Biting Rate: Number of adult female vectors that attempt to feed or are freshly blood-fed, per person per unit time.

Human blood index (host preference): Number of female Anopheles vectors that feed on human blood/total number of Anopheles vectors from which the blood meal was identified.

Resistance Frequency: Proportion of adult female vectors alive after exposure to insecticide.

Resistance Status: Classification of adult female vector populations as confirmed resistant, possibly resistant or susceptible.

Resistance Intensity: Classification of adult female vector populations as having high, moderate or low resistance.

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