TRAINING MODULE

FOR

MALARIA TECHNICAL SUPERVISOR

2012

Directorate of National Vector Borne Diseases Control Programme
Directorate General of Health Services
Ministry of Health and Family Welfare
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PREFACE

Malaria has been brought down in large areas of the country; however, it is still a major cause of morbidity and mortality in country especially in Eastern and Northeast states of the country. Additional inputs are being provided in terms of commodities and drugs for containment of malaria in the high-endemic areas of the country with the support from Global Fund and the World Bank. Malaria technical supervisors are being provided for improving the grass-root level implementation and supervision of malaria control activities in these high endemic areas with the externally funded project areas.

The role of Malaria Technical Supervisors is of immense importance as MTSs will work within the system while having a sharp understanding of the decision making and review process while working. The module has been developed with these considerations in mind which will help the MTS to understand the system as well as the interventions at various levels of healthcare systems and the mechanism of supervision and monitoring of these interventions.

A large number of officers of the Directorate of NVBDCP, WHO, World Bank, states and institutions have contributed immensely by giving their valuable inputs and suggestions. I am thankful to all those who have put in untiring efforts to make this publication possible.

This module was initially prepared in 2008 with the support from the World Bank assisted project. It is revised in 2012 to include the newer interventions and specific activities added under the projects and programme.

It is expected that this module will be of practical use to all those who are engaged in malaria control activities. Any suggestions / views / comments to improve the module are most welcomed and the same will be incorporated in its future editions.

Dr. A. C. Dhariwal

Director, NVBDCP

HOW TO USE THIS MODULE

This training module has been developed by the Directorate of National Vector Borne Disease Control Programme in consultations with experts from World Bank, WHO, State, NIMR, RMRC, Consultant M&E for the training of Malaria Technical Supervisors, who are appointed under GFATM/ World Bank assisted projects to strengthen the surveillance and supervision activities in the project areas. It has been revised based on the current programme and project interventions

Duration: The training will be for a 10 days period.

Training Methodology: It will include lecture, demonstration, role play, field work, practical as methodology for training, with the use of audio visual and problem solving practical exercises.

Trainers: The trainers will be the faculties from RMRC, NVBDCP, State Programme Manager, Training, M& E Consultants and other consultants at NVBDCP and state level.

Venue: The venue will be at RMRC, Dibrugarh for North Eastern States and at RMRC, Bhubaneswar for Orissa, West Bengal, Jharkhand, Chattisgarh and Madhya Pradesh and State .

Certificate: Training will be certified by the Head of the Institute where the training has been given

Objectives of the Training: At the end of the training the trainee (MTS) will be

- Having preliminary knowledge about
  - the malaria disease and treatment
  - Vectors.
  - Vector Control measures
  - IRS
  - ITN/LLIN
  - Healthcare systems
- Able to use the monitoring formats and interpretation of various indicators
- Able to do data collection using LQAS survey method
- Having knowledge about areas of supervision at the field level and PHC levels with the goals to be achieved.

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Abbreviations and Acronyms

ABER	Annual Blood Examination Rate
ACD	Active Case Detection
ACT	Artemisinin-based combination therapy
API	Annual Parasite Incidence
BCC	Behavior Change Communication
CHC	Community Health Center
DBS	Domestic Budget Support
DDT	Dichloro Diphenyl Trichloroethane
DPIP	District Program Implementation Plan
EAP	Externally Assisted Projects
EMCP	Enhanced Malaria Control Programme
EMP	Environment Management Plan
FTD	Fever Treatment Depot
GOI	Government of India
GTZ	Gesellschaft fur Technische Zusammenarbeit (Germany)
ICMR	Indian Council of Medical Research
IEC	Information, Education and Communication
IDA	International Development Association
IDR	In-Depth Review
IMNCI	Integrated Management of Newborn & Childhood Illnesses
IRS	Indoor Residual Spraying
ITN	Insecticide Treated (bed) Nets
JMM	Joint Monitoring Mission
LLIN	Long lasting insecticidal nets
LQAS	Lot Quality Assurance Sampling
MDGs	Millennium Development Goals
M & E	Monitoring and Evaluation
MIES	Monitoring Information and Evaluation System
MIS	Malaria Indicator Survey
MOHFW	Ministry of Health and Family Welfare
MOU	Memorandum of Understanding
MPO	Modified Plan of Operation
MTR	Mid-term review
MRC	Malaria Research Centre
NFHS	National Family Health Survey
NGO	Non-Governmental Organization
NIMR	National Institute of Malaria Research
NHSRC	National Health Systems Resource Center
NMCP	National Malaria Control Programme
NMEP	National Malaria Eradication Programme
NPIP	National project implementation Plan
NRHM	National Rural Health Mission
NVBDCP	National Vector Borne Disease Control Programme
PCD	Passive Case Detection
PDO	Project Development Objectives
PBF	Performance Based Financing
Pf	*Plasmodium falciparum*
PHC	Primary Health Center
PIP	Program Implementation Plan
PPP	Public Private Partnerships

PRI	Panchayat Raj Institutions
Pv	*Plasmodium vivax*
RCH	Reproductive and Child Health
RDK	Rapid Diagnostic Kit
RPRG	Regional Programme Review Group
SOP	Standard operating procedures
SP	Sulphadoxine-Pyrimethamine
SA	Social Assessment
SOE	Statement of Expenses
SPAR	State Procurement Assessment Report
SPIPs	State Program Implementation Plans
TA	Technical Assistance
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VBD	Vector-borne disease
VCP	Vulnerable Community Plan
VCRC	Vector Control Research Centre
VGHP	Vulnerable Group Health Plan
WB	World Bank
WHO	World Health Organization

Learning Unit 1. Health System in India

1.1 Rural Health Care System

The health care infrastructure in rural areas has been developed as a three-tier system, i.e., Sub-centre, Primary Health Centre and Community Health Centre.

1.1.1 Sub-Centre

The Sub-Centre is the most peripheral and first contact point between the primary health care system and the community. Each sub-centre is staffed by one Multipurpose Health Worker – Female (MPHW-F)/ Auxiliary Nurse Midwife (ANM) and one Multipurpose Health Worker - Male (MPHW-M).

1.1.2 Primary Health Centre (PHC)

The PHC is the first contact point between village community and the Medical Officer. The PHCs provide integrated curative and preventive health care to the rural population with emphasis on preventive and promotive aspects of health care. The PHC is staffed by a Medical Officer supported by 14 paramedical and other staff. The staff is as follows:

Table: Staff at the PHC

S. No	Staff	Number
1.	Medical Officer	1
2.	Pharmacist	1
3.	Nurse Mid-wife (Staff Nurse)	1
4.	Health Worker (Female)/ANM	1
5.	Health educator	1
6.	Health Assistant (Male)	1
7.	Health Assistant (Female)/LHV	1
8.	Upper Division Clerk	1
9.	Lower Division Clerk	1
10.	Laboratory Technician	1
11.	Driver	1
12.	Class IV	4
	Total	**15**

1.1.3 Community Health Centre (CHC)

The CHC serves as a referral centre for 4 PHCs and also provides facilities for obstetric care and specialist consultations. It has 30 beds, one operation theatre, X-ray, Labour room and laboratory facilities. The staffing is as follows:

Table: Staff at the CHC

S. No	Staff	Number
1.	Medical Officer*	4
2.	Nurse Mid-wife (Staff Nurse)	7
3.	Dresser	1
4.	Pharmacist/Compounder	1
5.	Lab Technician	1
6.	Radiographer	1
7.	Ward boys	2
8.	Dhobi	1
9.	Sweepers	3
10.	Mali	1
11.	Chowkidar	1
12.	Aya	1
13.	Peon	1
	Total	**25**

* Either qualified or specially trained to work as surgeon, obstetrician, physician and paediatrician. One of the existing medical officers similarly should be either qualified or specially trained in public health.

1.1.4 Norms and Achievements

The population norms for each level of infrastructure are as follows:

Centre	Population Norms	
	Plain Area	Hilly/Tribal/Difficult Area
Sub-Center	5000	3000
Primary Health Centre	30,000	20,000
Community Health Centre	120,000	80,000

The achievements as on 2010 are given below:

Centre	No. functioning as on Mar 07	Average area (sq.km) covered	Average radial distance (km) covered	Average No. of villages covered
Sub-centre	147,069	21.20	2.60	4
PHC	23,673	131.72	6.47	27
CHC	4,535	687.61	14.79	141

1.1.5 Staff Position. The position of some of the staff in the health care establishments as on March 2010 is given below:

Table: Staff position at PHCs and SCs

Staff	Sanctioned (S)	In position (P)	Vacant (S-P)
Doctors at PHC	29639	25870	6148
HA (M) at PHCs	22739	16565	6912
HA (F) /LHV at PHCs	20860	17034	5070
LTs at PHCs & CHCs	17858	15094	5183
HW (M) at SCs	76074	52774	25853
HW (F) at SCs/PHCs	161794	191457	10214

1.1.6 Strengthening of Rural Health Infrastructure under the National Rural Health Mission (NRHM)

The NRHM was operationalized from April 2005 throughout the country, with special focus on 18 states which includes 8 Empowered Action Group (EAG) states (Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Uttaranchal, Orissa and Rajasthan) and 8 North Eastern States (Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura), Himachal Pradesh and Jammu & Kashmir.

The main aim of NRHM is to provide accessible, affordable, accountable, effective and reliable primary health care, especially to poor and vulnerable sections of the population. It aims to achieve this aim through creation of a cadre of Accredited Social Health Activists (ASHAs), improved hospital care, decentralization of programme to district level to improve intra- and inter-sectoral convergence and effective utilization of resources. The mission further seeks to build greater ownership of the programme among the community through involvement of Panchayati Raj institutions, NGOs and other stakeholders at National, State, District and Sub-district levels.

1.1.6.1 ASHAs. The details regarding ASHA are as follows:

Every village/large habitat will have a female Accredited Social Health Activist (ASHA) chosen by and accountable to the panchayat, to act as the interface between the community and the public health system.

ASHA acts as a bridge between the ANM and the village and be accountable to the Panchayat.

She is an honorary volunteer, receiving performance-based compensation for promoting universal immunization, referral and escort services for RCH, construction of household toilets, and other healthcare delivery programmes. The role of ASHAs in NVBDCP is given below:

She is trained on pedagogy of public health developed and mentored through a Standing Mentoring Group at National level incorporating best practices and implemented through active involvement of community health resource organizations.

She will facilitate preparation and implementation of the Village Health Plan along with Anganwadi worker, ANM, functionaries of other Departments, and Self-Help Group members, under the leadership of the Village Health Committee of the Panchayat.

ASHAs are being promoted all over the country, with special emphasis on the 18 high focus States. The Government of India bears the cost of training, incentives and medical kits. The remaining components will be funded under Financial Envelope given to the States under the programme.

She is given a Drug Kit containing generic AYUSH and allopathic formulations for common ailments. The drug kit is being replenished from time to time. Under the VBD control programme, ASHAs are actively involved in diagnosis and treatment of malaria and kala-azar cases. They are provided incentives for the diagnosis and treatment

Induction training of ASHA is of 23 days in all, spread over 12 months. On the job training would continue throughout the year. Prototype training material has been developed at the National level and modified at State level. Cascade model of training is done through Training of Trainers including contract plus distance learning model. Training involves partnership with NGOs/ICDS Training Centres and State Health Institutes.

1.2 Urban Health Care System

Nearly 30 per cent of India's population lives in the urban areas. The urban migration of population from rural areas has resulted in rapid growth of slums. The population of slums faces health hazards due to over-crowding, poor sanitation, lack of access to safe drinking water and environmental pollution. Studies have shown that health indices of urban slum dwellers in some areas are worse than those of rural population.

Majority of the hospitals and beds, doctors and paramedical staff in the country are in urban areas. There are Urban Health Centres, Health Posts and dispensaries in many urban areas. However, there are no well structured geographically delineated primary and secondary health care facilities in most of the cities and towns. Moreover, there is over-crowding in most of the available centres. Inappropriate use of diagnostic and therapeutic facilities is also resulting in escalating cost of health care without commensurate health benefits.

Realizing that the available infrastructure is insufficient to meet the health care needs of the growing urban population, the municipalities, state governments and

the central government have tried to build up the urban health care facilities. Funds provided by corporations/municipalities, state government, central government and externally assisted projects are taken up to achieve the goal of providing comprehensive and affordable health care in urban areas.

1.2.1 Urban Malaria Scheme

Due to serious hazards to the National Malaria Eradication programme due to urban malaria problem, it was realized that urban areas with 40,000 population and above having *A. stephensi* problem should be brought under the purview of NMEP for implementing anti-larval operations as a complementary to the programme in rural areas. The Urban Malaria Scheme (UMS) came into existence in 1971 covering 23 towns initially and now the scheme is in operation in 131 towns.

The main objective is to control malaria by reducing the vector population in the urban areas through recurrent anti-larval measures, since indoor residual insecticidal spray is not acceptable to the urban population.

The norms for establishment of UMS are as follows:

- The towns should have a minimum population of 40,000
- The API should be 2 or above
- The towns should promulgate and strictly implement the civil bye-laws to prevent/ eliminate domestic and peri-domestic breeding places.

1.2.1.1 Control strategy. The components of UMS strategy are as follows:

- Source Reduction
- Anti-larval measures
    - ✓ Chemical methods
    - ✓ Biocides
    - ✓ Biological control
    - ✓ Aerosol space spray
    - ✓ Anti-parasitic measures

Learning Unit 2. Introduction to malaria and Life Cycle of Malarial Parasite

2.1 What is Malaria?

Malaria is a disease transmitted by the female anopheles mosquito. The parasite which causes malaria is the plasmodium (a unicellular organism). Malaria is a global health problem; worldwide 300-500 million people develop malaria every year. In India the number of recorded cases is about 1.5 million per year, but it is estimated that the real number may be much higher. About thousand deaths due to malaria are reported every year by NVBDCP, but as many hospitals do not report malaria cases to the programme, the real number is thought to be much higher.

2.2 Malaria Control programme in India

Malaria has been a problem in India for centuries. Details of this disease can be found in the ancient Indian Medical Literature like the *"Charaka Samhita".* In the 1930s there was no aspect of life in the country that was not affected by malaria. The annual incidence of malaria was estimated at around 75 million cases in 1953, with about 8 lakh deaths. To combat this menace, the Govt. of India launched the National Malaria Control Programme (NMCP) in April 1953. The programme was highly successful and within 5 years, the incidence dropped to 2 million cases. Encouraged by this, the programme was changed to a more ambitious National Malaria Eradication Programme (NMEP) in 1958. By 1961 the incidence dropped to a mere 50,000 cases a year. But since then the programme suffered repeated setbacks due to technical, operational and administrative problems, and cases started rising again. In the late 1960's malaria cases in urban areas started to increase and surges of malaria in rural areas were also widespread. As a result in 1976, 6.47 million cases were recorded by the malaria control programme, the highest since resurgence began. In the year 1995 Malaria Action Programme (MAP) was taken up in high risk areas. The National Malaria Eradication programme was renamed as National Anti Malaria Programme (NAMP) in 1999 covering the concept of effective control. In 2004 the programme was integrated with other vector borne diseases control and was named as the National Vector Borne Disease Control Programme (NVBDCP).

The reported malaria incidence is now about 1.5 million cases per year. Over the last few decades, the proportion of falciparum malaria has increased; and the drug resistance of *P.falciparum* and insecticide resistance of vectors threaten to cause setbacks. Malaria therefore remains one of the most important public health problems of India, despite continuous efforts at its control.

The Strategy of malaria control in India is three pronged comprising of Early Diagnosis and Prompt Treatment (EDPT), Integrated Vector Management (IVM) and Supportive interventions like Training for capacity building, Behaviour

Change Communication (BCC), inter-sectoral coordination, Public Private Partnerships (PPP), community participation and legislation.

2.3 Types of Malarial Parasite

In India two types of plasmodia are responsible for most human malaria.–They are *Plasmodium vivax* (*P. vivax*, PV) and *Plasmodium falciparum* (*P. falciparum*, PF). There are two other plasmodia (*Plasmodium malariae* and *Plasmodium ovale*) that cause malaria in humans, but they are rare and of practicably no public health importance in India. *P.falciparum* is the variety which is responsible for almost all the deaths due to malaria. *P. vivax* causes debilitating illness, but *vivax* malaria is rarely fatal, unless accompanied by some other problem like malnutrition. In many states of India, particularly the North Eastern states, Orissa and Chhattisgarh, a very high proportion of malaria cases are due to *P. falciparum*.

2.4 Life Cycle of the Malarial Parasite

The malarial parasite undergoes 2 cycles of development – the human cycle (asexual cycle) and the mosquito cycle (sexual cycle). Man is the intermediate host and mosquito the definitive host.

2.4.1 Asexual cycle in human being

The asexual cycle begins when an infected anopheles mosquito bites a person and injects sporozoites. There are 3 phases in the human cycle.

2.4.1.1 Hepatic Phase

The sporozoites disappear within 60 minutes from the peripheral circulation. Many of them are destroyed by phagocytes, but some reach the liver cells. After 1-2 weeks of development (depending upon the species), they become hepatic schizonts, which eventually burst releasing a shower of merozoites. The number of merozoites produced from a single sporozoite varies – as many as 40,000 in P. falciparum, whereas only 200 – 15,000 in other species. In P. falciparum, the intra-hepatic schizonts rupture almost simultaneously and there is no persistent tissue phase (exo-erythrocytic phase). In other species, the hepatic forms may remain dormant (hypnozoites) for long periods, liberating merozoites at various intervals, causing relapses of malaria.

2.4.1.2 Erythrocytic Phase

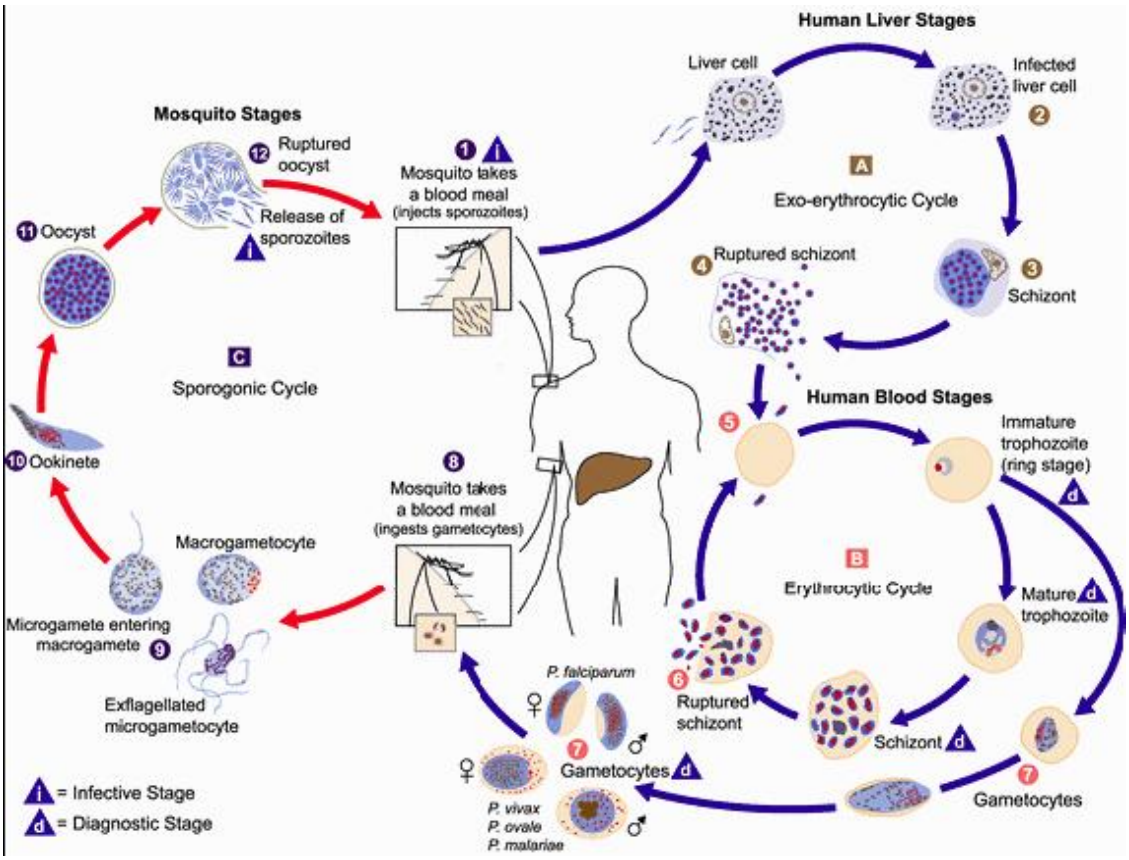
Many of the merozoites released from the liver cells are quickly destroyed, but a significant number attach themselves to specific receptor sites on the RBCs, penetrate them and pass through various stages of trophozoite and schizont. The erythrocytic phase ends with the liberation of merozoites, which infect fresh RBCs. The clinical feature of fever with chills coincides generally with the rupture

of RBCs. The cycle is repeated over and over again until the condition worsens or when it may be slowed down by the immune response of the host. The duration of each erythrocytic cycle varies between species – 48 hours for *P. falciparum, P.vivax* and *P. ovale*; and 72 hours for *P. malariae*.

2.4.1.3 Gametogony

Some of the erythrocytic forms of plasmodia do not divide further but develop into male and female gametocytes. Not all **infected** persons are **infectious** (can infect *anopheline* mosquitoes). The blood of the person has to have mature male and female gametocytes and the density should be minimum 12/ cumm of blood to be infective. These gametocytes take over a week to appear in the blood. Gametocytes do not cause any symptoms in humans. Most drugs like chloroquine kill the asexual forms that cause the fever but leave intact the sexual forms that are infective especially in case of *P falciparum*. Thus an apparently normal person may harbour the disease and contribute to its spread.

Figure 1. Life Cycle of *Plasmodium* species in man and the mosquito



2.5 Spread of malaria

The plasmodia spread from person to person by the bite of mosquitoes. This process is called the **transmission** of the disease, and the mosquitoes are the **vectors** of malaria. However, not all mosquitoes can act as malaria vectors. It is only mosquitoes belonging to the genus *Anopheles* - and that too the female of the species which can carry the parasite and infect. Male *Anopheles* mosquitoes only feed on plant juices and nectar and cannot transmit malaria.

2.5.1 Sexual Cycle in Mosquito

The mosquito cycle (sporogony) begins when gametocytes are ingested by the vector mosquito while feeding on an infected person. The male gametocytes, after reaching the stomach of the mosquito and develop into 4-8 filaments called "microgametes". The female gametocyte undergoes maturation to become a "macrogamete". The microgametes get attracted to the macrogamete, and one of the microgametes fertilizes the macrogamete. The resulting zygote is at first motionless, but within 18-24 hours, becomes a motile ookinete, which penetrates the stomach wall of the mosquito and develops into an oocyst on the outer surface of the stomach. The oocyst further develops into numerous sporozoites, when the oocyst ruptures and releases the sporozoites into the body cavity of the mosquito. Many of the sporozoites migrate to the salivary glands and the mosquito becomes infective to man. The period required for the development of the parasite from the gametocyte stage to sporozoite stage is about 10-20 days depending on atmospheric temperature and humidity. This period is known as the "extrinsic incubation period". The sporozoites (the infective stage of *Plasmodium*) are injected with saliva when the mosquito next feeds.

In falciparum malaria, there may be involvement of the brain and coma in addition to life threatening complications including kidney or liver failure. With early and effective treatment, the case fatality rates in *P.falciparum* malaria can be brought down from above 5% to close to zero. Malaria cases can be classified according to the parasite species causing them and according to the severity of the disease, as either uncomplicated or severe malaria. It should be understood that severe vivax malaria is very rare.

2.6 Immunity to malaria

Repeated infections with malaria parasites lead to the acquisition of antibodies directed against various antigens of various stages of malaria parasites as well as cell-mediated immunity. The immunity is to a large extent, but not completely, specific to the species of malaria parasite. It is also to some extent strain-specific, meaning that a person, who has been exposed to malaria in a certain part of the world (or part of a large country like India) will have a higher degree of immunity to local malaria parasites than to those from a distant location. There is no perfect immunity to malaria: nobody acquires such a high level of protective antibodies that he or she can be certain not to contract malaria. Also, in contrast

to many other communicable diseases, the immunity to malaria is time-limited: the person who has acquired a certain degree of immunity through repeated malaria attacks will lose that immunity in a few years, if the exposure is not maintained. For this reason, sometimes the terms semi-immunity or premunition are preferred to immunity.

Typically in areas with very intense transmission, persons who are heavily exposed, acquire some immunity in childhood. Then as adults, they get ill relatively rarely and when they do, the disease is mild and of short duration. It seems that in old age, immunity is lost again, but it is not clear whether this is a result of ageing processes or of old people being less exposed to malaria or both. Typically, people with a certain degree of immunity still harbour parasites: They are **asymptomatic carriers**. It can be difficult to detect such cases and this can have implications for malaria control. If a certain population is heavily exposed to malaria, so that some people have some immunity to the disease and exposure is reduced for some years as a result of control measures, the immunity will largely be lost. If control is then relaxed, malaria may return with occurrence of large number of cases. For this reason, sustainability is important in malaria control.

Scientific work to develop a **malaria vaccine** has taken place for decades. One or two vaccines may well be marketed within the coming 5 years, but they are likely to have only a limited degree of effectiveness and would, at best, only be a supplement to other malaria control tools.

Malaria is a serious disease, which has affected human populations for many thousands of years. It has therefore exerted a selective pressure, favouring certain genotypes in humans with some innate (in contrast to acquired, as described above) immunity to malaria. Among these conditions are sickle cell disease, thalassaemia and glucose-6-phosphate dehydrogenase deficiency, all of which are common in India, especially in populations which are or have in the past been heavily exposed to malaria.

2.7 Malaria Control

Malaria control comprises all activities undertaken to reduce the burden of malaria in a given population. It includes the diagnosis and treatment of malaria cases and prevention. Surveillance of the disease, prevention and control of epidemics and field studies to regularly assess the malaria situation and its determinants are essential components in a malaria control programme. The main methods of prevention aim to reduce the risk of humans being bitten by infected anopheline mosquitoes. The aim of malaria control is to reduce morbidity and mortality of malaria to the lowest possible levels locally. In some cases, the aim may be elimination, i.e. the interruption of transmission, where no new cases occur.

2.8.1 Diagnosis and treatment

Uncomplicated malaria can become severe malaria within 1-2 days (shorter for young children) of onset of symptoms. Early and effective treatment will halt the progression of the disease, thereby preventing deaths from occurring. This could be achieved by treating everybody with a fever as malaria, and this was in fact done until recently as "presumptive treatment". Nowadays, because of drug resistance, it is necessary to use more expensive and differentiated treatment regimens. The strategy of presumptive treatment has therefore been replaced by early diagnosis (through RDTs or microscopy) followed by prompt, effective treatment. Early effective treatment benefits not only the individual patient, but also has the following advantages:

a) Lowering the infectivity of infected persons to the mosquito vector will contribute to reducing malaria transmission, and eventually the incidence of malaria.

b) Early diagnosis is important because in the early stages the infected persons have only asexual forms of plasmodia in the blood, which are not infective to mosquitoes. It takes about 4 - 5 days after the person has developed fever to develop the sexual forms of *P. vivax* in the blood; for *P. falciparum* it takes 8 -10 days. If the blood is cleared of the parasites during this time, then the transmission from that person is prevented.

c) In low transmission areas, where most infective people are symptomatic, treating all cases within the first week could cut transmission dramatically. In high transmission areas, where there are many asymptomatic carriers, case management alone has relatively little role in transmission control.

d) Most antimalarial medicines have no significant action on the gametocytes, whereas primaquine can effectively destroy them. Artemisinin derivatives have some effect on gametocytes, but it is not as constant as that of primaquine. Therefore, primaquine is included in the treatment of falciparum malaria, because some patients only report after they have developed gametocytes.

2.8.2 Measures directed against the transmission by mosquitoes

2.8.2.1 Transmission dynamics

It is important to have a basic knowledge of the transmission dynamics to understand malaria control. The intensity of malaria transmission in an area is the rate at which people are inoculated with malarial parasites by mosquitoes. It is expressed as the annual Entomological Inoculation Rate (EIR) i.e. the average number of infectious bites by malaria-infective mosquitoes delivered to an individual human resident in that area per year. Annual EIRs range from 500 to 1000 in certain parts of Africa to about 10 to 100 in places where there are

seasonal peaks. At levels of about 0.01 or less, malaria transmission is barely and rarely sustained.

The EIR can go down, if:

a) There are fewer people, who have gametocytes in their blood; so that the probability of a mosquito becoming infected upon biting a human being is reduced.

b) Total population of mosquitoes has decreased.

c) People have taken measures to avoid mosquito bites.

d) More animals are available as sources of blood meals, provided the vectors are zoophilic.

e) Average life-span of vectors has been reduced, so that only a few of those infected become infective for human beings.

Field studies and mathematical models have shown that in most situations the most effective vector control methods are the ones, which include reduction of life-span of vectors. The explanation is that the average life-span of a female *anopheline* is only a little longer than the extrinsic incubation period. Thus, a 20% reduction of the average life-span of female *anopheline*s may lead to a situation, where no or very little transmission takes place. In contrast, even if the density of *anopheline*s is reduced by, for example 80%, the remaining 20% will be able to maintain some transmission. In practice, methods which reduce the life-span of *anopheline*s may also reduce their density and the frequency with which they bite humans.

2.8.3 Behaviour Change Communication (BCC)

The NVBDCP envisages strong community participation and behavior change components in the malaria control program to meet the challenges in malaria control. Three interventions of proven value are now being introduced at a large scale into the program, each of which has benefits tangible even to the lay person, and thus having high likelihood of acceptability and utilization:

2.8.3.1 Diagnosis. In the place of slide tests which involved delay in getting results, rapid diagnostic tests (RDT) (Monovalent for *P. falciparum* and bivalent for both *Pv* and *Pf*) are now available. These tests can be conducted at the most peripheral levels by any one with simple training.

2.8.3.2 Treatment. In place of Chloroquine which was associated with treatment failure due to drug resistance, ACT is now available which is nearly 100% effective and is not associated with any major side effects. For all *Pf* cases SP-ACT is the first line of treatment in the whole country.

2.8.3.3 Bed nets. In place of Insecticide impregnated Bednets which required periodic re-impregnation, now Long Lasting bed nets are available from the year 2009, which do not require re-impregnation and are remaining effective even after 20-25 washes and lasting for 3-5 years.

A fourth component of the program having high acceptance potential is the establishment of trained ASHAs at village level, known as ASHAs. The malaria control program offers considerable scope for communities to participate in and own the program.

2.9 Vulnerable groups

Certain groups are particularly vulnerable to malaria:

Pregnancy increases vulnerability of women to severe malaria, by lowering immunity. Malaria can cause abortion, stillbirth, low birth weight and severe anaemia in pregnant woman. Early and complete treatment of malaria is therefore of the greatest importance in pregnant women.

Young children are at highest risk in those populations, which are exposed to very intense transmission, where older people develop immunity. Even in areas with less intense transmission, severe disease may develop particularly rapidly in young children. Diagnosis may be difficult, as young children can have fever from a number of different causes.

People who do not live in malaria-endemic areas have no immunity. The problem of immigrants may be a lack of knowledge of malaria and about where to go for treatment if they fall ill. Travellers, tourists and immigrants need information on protective measures against malaria in various locations and situations.

2.10 Malaria and gender

Women are more likely to delay visits to qualified health care providers and more likely to visit traditional healers for their sickness and for their children because of their lesser control over resources and decision-making process in the household. There may be a gender bias towards the male child, who gets preferential attention in getting health care. Studies have shown that women in many situations do not have control over decision making about accessing quality health care. Malaria in pregnant women is associated with more serious complications.

When men have malaria the household becomes severely affected economically. Women's work days become longer and the work load becomes heavier as they have to take care of the ill apart from their routine activities. There may also be times when they have to go for work to compensate for the wage loss of the male

members. In households without any male earning member, the economic consequence can be very severe on the entire family.

There is a need to promote women's active participation in leadership and decision-making. It is critical that people at every level come together to create awareness of the magnitude of the problem and on the way gender inequalities lead to a greater impact on women and the girl child in case of sickness due to malaria.

Learning Unit 3. Malaria Entomology

3.1 Malaria entomology is the study of biology and ecology of the mosquitoes that transmit malaria. There are more than 4000 species of mosquitoes in the world of which about 424 belong to *Anopheline* group, and about 70 are considered to be the main vectors of malaria. In India there are about 53 species of *anopheline* mosquitoes and of these nine are vectors for malaria; only six of them being important primary vectors. The other three can contribute to spread of malaria but by themselves cannot initiate or sustain transmission (secondary vectors).

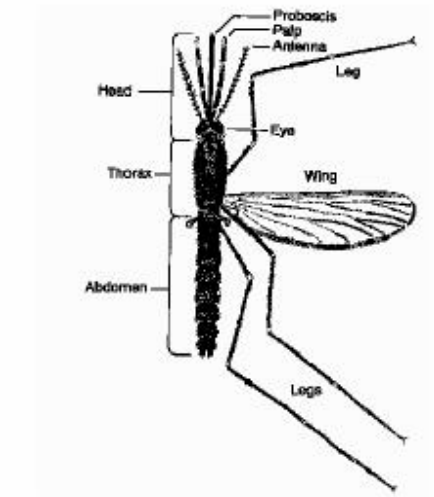
3.2 Distinguishing mosquitoes from other insects

Mosquitoes belong to the **class Insecta –** having the following characteristics:

- the body is divided into three sections—head, thorax and abdomen
- the head has one pair of antenna, and a pair of compound eyes
- the thorax has three pairs of legs

The main parts of the adult mosquito are shown in Figure 3.1 below. Four characteristics can be used to describe adult mosquitoes: only one pair of wings; a long proboscis; the body is covered with scales; and wings have **veins** that show a defined pattern

Figure 3.1 Main parts of the adult mosquito



3.3 Distinguishing anophelines from culicines

Distinguishing characteristics of *anophelines* and *culicine*s are illustrated in Figs. 2.2 and 2.3.

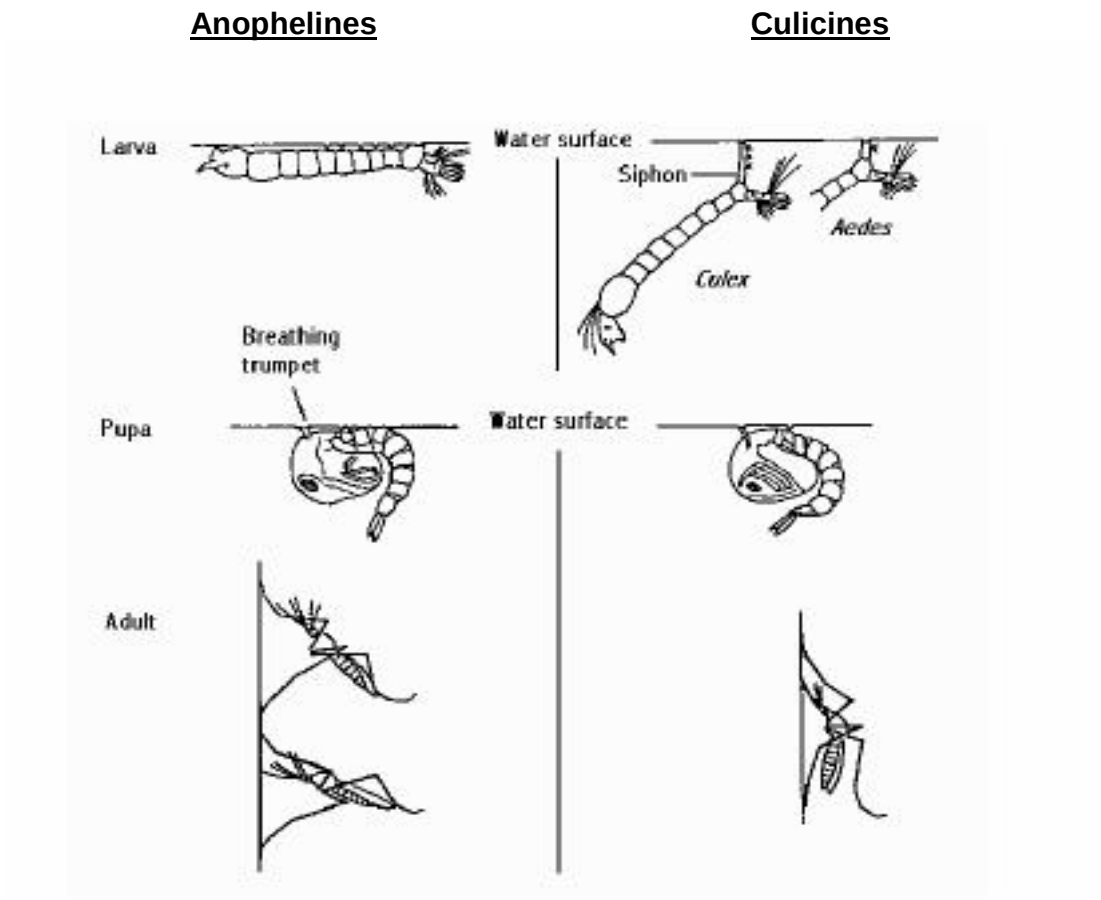


Figure 2.2 Comparison between anopheline and culicine mosquitoes

3.3.1 Eggs

Culicine eggs clump together in a **"raft"** (*Culex*) or float separately (*Aedes*); anopheline eggs float separately and each of them has **"floats"**.

3.3.2 Larvae

The **culicine** larva has a breathing tube (**siphon**) which it also uses to hang down from the water surface, whereas the **anopheline** larva has **no siphon** and rests parallel to and immediately below the surface.

3.3.3 Pupae

Pupae of both anophelines and culicines are comma-shaped and hang just below the water surface. They swim when disturbed. The breathing trumpet of the anopheline pupa is short and has a wide opening, whereas that of the culicine pupa is long and slender with a narrow opening. However, it is difficult to distinguish anopheline from culicine pupae in the field.

3.3.4 Adults

Live adult anopheline and culicine mosquitoes, can easily be distinguished by observing their resting postures. Anophelines rest at an angle between 50^{o} and 90^{o} to the surface whereas culicines rest more or less parallel to the surface. Anopheline mosquitoes can also be distinguished from culicines by the length and shape of the palps. The differences (Fig. 2.3) are:

- In female anophelines, palps are as long as proboscis; in female culicines, palps are very much shorter than proboscis.
- In male anophelines, palps are as long as proboscis and club-shaped at tip; in male culicines, palps are longer than proboscis, with tapered tips.

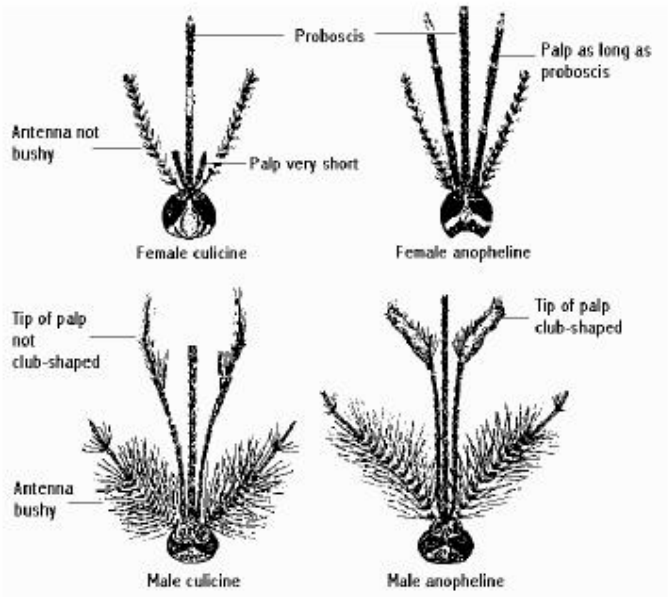


Figure 2.3 Heads of male and female anopheline and culicine mosquitoes

3.4 Distinguishing female *Anopheles* from males

It is important to distinguish females from males because only the female *Anopheles* takes blood meals and transmits malaria; on the antennae of the female the hairs are few in number and short (Fig. 2.3). The male has very long hairs on the antennae, which consequently have a bushy appearance.

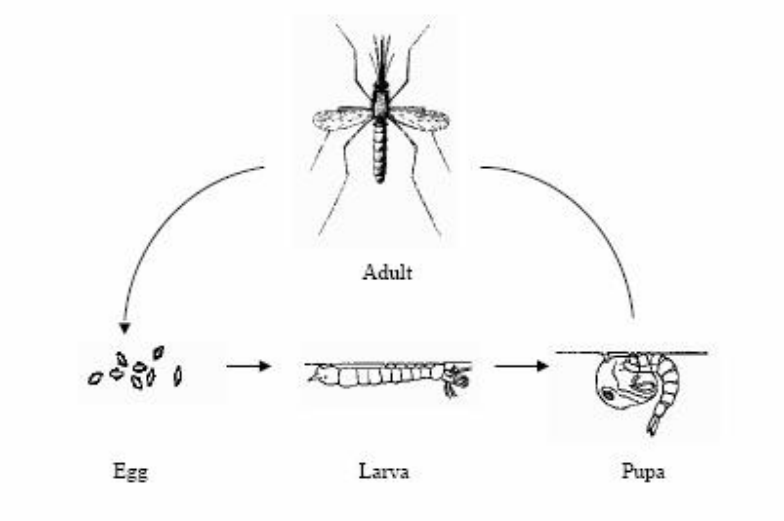
3.5 Life cycle of anopheline mosquitoes

All mosquitoes have four different stages in their life cycle: the **egg**, **larva**, **pupa** and **adult**.

3.5.1. Eggs

A female anopheline mosquito normally mates only once in her lifetime. She usually requires a blood meal after mating for development of eggs. Blood meals are generally taken every 2-3 days before the next batch of eggs is laid. About 100-150 eggs are laid on the water surface during oviposition. Oviposition sites vary from small hoof prints and rain pools to streams, swamps, canals, rivers, ponds, lakes and rice fields. The average lifespan of female anopheline mosquitoes is about 3-4 weeks.

Figure 3.3 Life cycle of an *Anopheles* mosquito



3.5.2 Larva

A larva hatches from the egg after about 1-2 days. The anopheles larva floats parallel under the water surface, since it needs to breathe air. It feeds by taking up food from the water. When disturbed, the larva quickly swims towards the bottom but soon needs to return to the surface to breathe. There are four larval stages or **instars**. The total time spent in the larval stage is generally 8-10 days at normal tropical water temperatures. At lower temperatures, the aquatic stages take longer to develop.

3.5.3 Pupa

The pupa is shaped like a comma and it's a non feeding stage. It stays under the surface and swims down when disturbed. The pupal stage lasts for two to three days after which the skin of the pupa splits. Then the adult mosquito emerges and rests temporarily on the water's surface until it is able to fly.

3.5.4 Adult

Mating takes place soon after the adult emerges from the pupa. The first batch of eggs develops after one or two blood meals, while successive batches usually require only one blood meal. The feeding and resting habits of mosquitoes are of great importance in control programmes and for this reason they must be well understood. Most anopheline mosquitoes bite at night. Some bite shortly after sunset while others bite later, around midnight or the early morning. Some mosquitoes enter houses to bite and are described as being **endophagic**; others bite mostly outside and are called **exophagic**.

After the mosquito takes a blood meal she usually rests for a short period. Mosquitoes that enter a house usually rest on a wall, under furniture or on clothes hanging in the house after they bite and are said to be **endophilic**. Mosquitoes that bite outside usually rest on plants, in tree holes, on the ground or in other cool dark places and are called **exophilic**.

Host preferences are different for different species of mosquitoes. Some mosquitoes prefer to take blood from humans rather than animals and are described as being **anthropophagic / anthropophilic** while others only take animal blood and are known as **zoophagic/zoophilic**. Clearly, those who prefer to take human blood are the most dangerous as they are more likely to transmit malaria from person to person.

3.6 Malaria vectors of India

The important malaria vectors in India are:

a. *Anopheles culicifacies*: The most common vector in India, especially in rural areas and is widely distributed in India. Occurs sporadically in N.E. India. Not reported in Andaman & Nicobar Islands and Lakshadweep.

b. *Anopheles fluviatilis*: Important vector in hilly and forested areas. Widely distributed in the foothill areas including both peninsular and North East India

c. *Anopheles stephensi*: Distributed throughout India except at higher altitudes. Found only sporadically in the North East. Almost all urban malaria is due to this species.

d. *Anopheles sundaicus*: Typical of seashores; low importance except on islands. Responsible for malaria transmission in Andaman & Nicobar islands only.

e. *Anopheles minimus*: Of great importance in the north east India, breeding in slow- moving streams with grassy margins, mainly in foothills.

f. *Anopheles dirus*: Vector in forested and forest fringe area in the north-east. Highly exophilic and exophagic and difficult to). Breed in small, transient, partly shaded pools in forest areas (eg. Elephant footprints)

g. *Anopheles annularis*: Mainly a secondary vector, which is common in central India and Orissa.

h. *Anopheles philippinensis*: It is incriminated as a vector in deltaic West Bengal and N.E. India. Breeds mainly in paddy fields.

i. *Anopheles varuna*: Secondary vector in Andhra Pradesh, Jharkhand and Orissa.

3.7 Bionomics of important vector species. The behaviour of the four important vector species is given below:

Vector Bionomics

	An. culicifacies	***An. stephensi***	***An. fluviatilis***	***An. minimus***	***An. dirus***
Site of breeding	Water in paddy fields, wells, irrigation wells, step wells, ponds, cattle water storages, cattle foot prints	Clean water in water tanks, water logged in trenches, large clean water puddles, upturned cans, etc	Rock pools, hilly streams, ponds	Shaded slow flowing streams with grassy margins, swamps, ditches, channels	small, transient, partly shaded pools in forest areas (eg. Elephant footprints)
Zoophilic/ anthropophilic	Zoophilic; Occasionally anthropophilic	Zoophilic/ Anthropophilic according to availability	Anthropophilic	Highly anthropophilic	Highly anthripophilic
Seasonality	Peaks during monsoon months	Rainy months	Peaks in late monsoons and early winter months	Perennial	Rainy months
Peak Time of biting	Varies – (1900 to 0400)	Varies- (2200 to midnight)	Late night (2300 to 0300)	1800 to 1900 (Outdoors); Midnight to 0200 (Indoors)	2100 – 03:00 Hrs
Preferred place of	Endophagic	Endophagic	Endophagic &	Endophagic & Exophagic	Primarily

	An. culicifacies	***An. stephensi***	***An. fluviatilis***	***An. minimus***	***An. dirus***
biting			exophagic		Exophagic & Endophagic as well
Resting behaviour	Endophilic	Endophilic	Endophilic/ Exophilic	Endophilic/ Exophilic	Exclusively Exophilic
Biological efficiency as vector	Low	Low	High	High	High

Learning Unit 4. Case detection

4.1. Objectives of Malaria Case Management

The objectives of malaria case management are:

- To give prompt and complete treatment of all suspected/ confirmed cases
- To prevent progression of mild malarial disease to severe or complicated disease
- To prevent deaths from severe and complicated malaria
- To reduce or prevent transmission of malaria
- To minimize risk of spread of drug resistant parasites by use of effective drugs in appropriate dosage by everyone.
- To shorten the duration of symptoms
- To prevent relapses of *vivax* malaria

For malaria control, the main thrust of the National Vector Borne Diseases Control programme (NVBDCP) is on early diagnosis and prompt, complete and effective treatment. Malaria diagnosis is carried out by microscopic examination of blood films collected by active and passive agencies. Health agencies and volunteers treating fever cases in inaccessible areas are being provided with Rapid Diagnostic Test (RDT) kits for diagnosis of *Pf* cases so as to provide full radical treatment to the confirmed *Pf* cases. It is stressed that all fever cases should be suspected of malaria after ruling out other common causes and should be investigated for confirmation of malaria by Microscopy or Rapid Diagnostic Kit (RDK) so as to ensure treatment with full therapeutic dose with appropriate drug to all confirmed cases. Presumptive treatment of malaria with a single dose of chloroquine has been stopped. The malaria case management is very important for preventing serious cases and death due to malaria. So, everyone including the private healthcare providers should follow the common National Guidelines for treatment of malaria as per the Drug Policy 2010.

4.2 Recognition of malaria

The symptoms characteristic of malaria include flulike illness with fever, chills, muscle aches, and headache. Cycles of chills, fever, and sweating that repeat every one, two, or three days are typical. There can sometimes be nausea, vomiting, diarrhea, coughing, and yellowing (jaundice) of the skin and whites of the eyes due to destruction of red blood cells and liver cells. Fever which is the cardinal symptom in malaria is usually irregular or intermittent. Many cases have chills and rigors, but the pattern described in classical texts with paroxysms every second day is unusual, except in protracted cases. Prodromes with headache and lassitude lasting one to two days are common. Vomiting is particularly common in children. The symptoms of malaria are uncharacteristic and especially in the early stages they are indistinguishable from for example arboviral fevers and typhoid fever.

Person affected with severe *Pf* malaria can develop bleeding problems, shock, liver or kidney failure, central nervous system problems, coma, and can die from the infection or its complications. Cerebral malaria (coma, or altered mental status or seizures) can occur with severe P. falciparum infection. The patient may die, if not treated quickly; even with treatment about 15%-20% die.

Clinical symptoms associated with history of travel to areas that have identified malarial risk suggest malaria as a probable diagnosis, so recognition of travel history is essential. Unfortunately, many diseases can mimic symptoms of malaria (for example, yellow fever, dengue fever, typhoid fever, cholera, filariasis, and even measles and tuberculosis). Consequently, physicians need to order the correct special tests to diagnose malaria, especially in areas where malaria is seldom seen. Without the travel history, it is likely that other tests will be ordered initially. In addition, the long incubation periods may tend to allow people to forget the initial exposure to infected mosquitoes.

Suspected Case: A patient should be suspected as a case of malaria if he comes with fever (in endemic area during transmission season, or who has recently visited an endemic area), without any other 'obvious cause' of fever like cough and other signs of respiratory infection, running nose and other signs of cold, diarrhea, pelvic inflammation indicated by severe low back ache, with or without vaginal discharge and urinary symptoms, skin rash suggestive of eruptive illness, burning micturition, skin infections e.g. boils, abscess, infected wounds, painful swelling of joints and ear discharge

People living in Pf predominant areas should be aware that any febrile disease might be malaria and that malaria can rapidly become a very dangerous disease if not treated timely. They also need to be informed about where they can get quality care for malaria. This is particularly important for migrants to endemic areas (for example temporary labour), who may be ignorant both of what malaria is and where treatment is available.

4.3 Diagnosis of malaria

A patient with fever in endemic area during the transmission season or who has visited an endemic area without any other obvious cause of fever is considered as a case of suspected malaria. In practice, the ascertainment of an "obvious cause" can only be expected from well-trained and experienced healthcare provider. All healthcare providers working in a high-risk area should consider any fever case, in the absence of specified symptoms, as suspected malaria. All suspected malaria cases should be investigated immediately by microscopy and/or Rapid Diagnostic Test (RDT). Delay in confirming a malaria diagnosis can have grave consequences. Anti-malarial treatment should be given only after confirmation of positive diagnosis based on the species. All efforts should be made to make microscopy services available to the patient within 24 hours. If a microscopy result cannot be made available within 24 hours in *Pf* predominant areas, RDT should be used for diagnosis, which is simple and can be done by

any healthcare providers in their clinic. If the RDT is found negative, then the slide is to be sent for microscopy. If it is positive, the patient is treated for *falciparum* malaria. Mixed infection cannot be ruled out in such cases, but the risk is low. The Artimisinin-based Combination Therapy (ACT) treatment given for *P.falciparum* is also effective for the blood stages of *P.vivax*. If the patient should have a *P.vivax* relapse later, he or she is expected to return and then be diagnosed and treated with primaquine. In areas, where the risk of *falciparum* malaria is very low, it is not cost-effective to do RDT in every patient with fever. To meet this challenge, the country programme is recently planning to introduce bivalent RDT which will not only be useful to detect both *Pv* and *Pf* cases at the field level, but also reduce the load of microscopy service. If such tests are available in private set up in any area, the treatment provider should use that service for confirmation of diagnosis and the species-specific treatment should be provided for malaria on confirmation only.

In case the blood examination report is not readily available, all cases of suspected malaria should be given complete three day course of Chloroquine and subsequent treatment should be given as per the microscopic examination result. The revised drug policy 2010 should be followed for treatment of *Pv* or *Pf* malaria.

4.4 Blood tests to detect malaria

There are two kinds of blood tests for detecting malaria:

4.4.1 Rapid Diagnosis Test (RDT)

One drop of blood is taken from a finger and immediately placed on a test strip. A few drops of a solution are added, and a few minutes later, a red line appears on the strip. If two red lines appear, the test is positive for falciparum malaria.

Existing monovalent RDT can detect only falciparum malaria, the dangerous form. The advantage of this method is that it is easy to learn, there is no need for a laboratory, and it takes only 15 minutes to get the result and patients can be treated early. The Rapid Diagnostic Test (RDT) is thus very useful for detecting the dangerous form of malaria (P.f) early and saving lives. It is expensive, but is supplied by the Government of India free of cost.

Bivalent RDTs have recently been introduced in the Programme and skill based training is essential for diagnosis of *P.vivax* and *Pf* malaria.The bivalent kits are used for detection of both falciparum and *vivax* malaria. The bivalent rapid diagnostic tests are available both as card and dip-strips. Detailed instructions are available in the RDT kits. However, on the job training shall be provided with practical demonstration as and when the kits are available to the fieldworkers.

4.4.2 Slide test

A few drops of blood are taken from a finger and spread on a glass slide. The glass slide is then examined by a trained laboratory technician under a microscope. If the technician sees Plasmodium organisms in the smears, the slide test is reported positive.

If the slide is made by a health worker at home in the village, it has to be sent to the laboratory, and it may take few days for the report to get back to the patient. This method has the advantage that it can detect all types of malaria.

4.4.3 Which of the tests is to be used?

ASHAs that live very close to the laboratory will need to do only the slide test, because it will be possible for them to get the test result from the laboratory on the same day or, at the most, the next day. Those ASHAs who live far from the laboratory should do both the tests, RDT and slide, from a single finger prick. The RDT should be read in 15 minutes.

If the RDT is positive, specific treatment for both *vivax* and *falciparum* malaria is given as per identified species and there is no need for sending the slide to the laboratory. However, in case of suspicion of malaria despite RDT negative, the slide should be prepared and send for confirmation and treated accordingly. In case of mixed infections three day treatment for Pf malaria should be given, followed by 14 days radical treatment with Primaquine.

4.5 Drawing blood from a finger prick

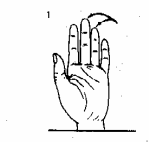
To do the blood test, the blood is drawn from a finger prick.

4.5.1 Requirements to draw blood

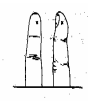
1. Spirit swab
2. Cotton
3. Lancet

4.6 Preparation of blood smear

For preparation of blood smears the items required are Clean glass slides, Disposable Lancet, Spirit or Cotton swab for cleaning the finger, Cotton, Clean piece of cotton cloth, Slide box for 25 slides, Lead pencil, Register and MF form. After the patient information has been recorded on the appropriate form, the blood films are made as per the following steps:

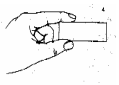


1. Select the second or third finger of the left hand and clean with spirit swab

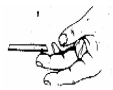


2. The site of the puncture is the side of the ball of the finger, not too close to the nail bed. This part of the finger should be pricked with a lancet, using one quick, firm movement.

3. Gently wipe the tip of the finger with cotton, and then allow the blood to flow out on its own. Allow the blood to come up automatically. Do not squeeze the finger.

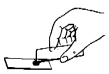


4. Hold the slide by its edges



5. The size of the blood drop is controlled better if the finger touches the slides from below

6. Touch the drop of blood with a clean slide, three drops are collected for preparing the thick smear



7. Spread the drop of blood with the corner of another slide to make a circle or a square about 1 cm

8. Bring the edge of the slide carrying the second drop of blood to the surface of the first slide, wait until the blood spreads along the whole edge

9. Holding it at an angle of about 45^{o} push it forward with rapid but not too brisk movement.

Write with a pencil the slide number on the thin film, Wait until the thick film is dry

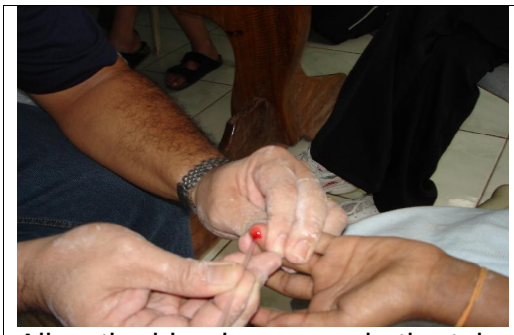
4.7 Rapid Diagnosis Test (RDT)

4.7.1 Requirements

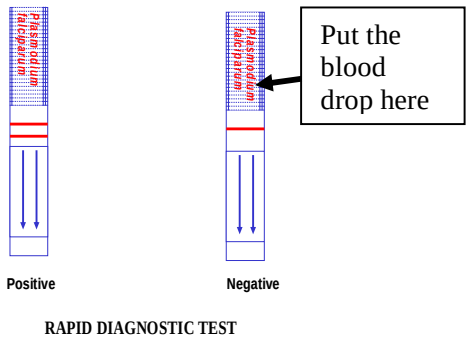
The Rapid Diagnosis Test (RDT) is done with the Rapid Diagnosis Test Kit (RDK). This kit is regularly supplied by the government through the nearest Primary Health Center. The kit contains the following materials:

1. Spirit swabs - one swab for one patient
2. Lancets - one lancet for one patient
3. Small glass tube (capillary tube) - one for each patient

4. Test strips - one strip for one patient
5. One multiple-well plastic plate - common for all tests
6. Test tube – one test tube for one patient
7. Buffer solution or reagent solution - a special liquid for doing the test, in a dropper bottle, common for all tests



Allow the blood come up in the tube



4.7.2 Procedure

1. Check that the test kit is within its expiry date. If not, do not use it.
2. Place your waste box close by.
3. Open a foil pouch and check that the powder inside it is still blue. If not, discard the test and use another test.
4. Remove the test strip and the small glass tube or loop from the foil pouch and place them on a clean dry surface.
5. Take out the bottle containing the liquid and the dropper.
6. Place a new test tube in the multiple-well plate.
7. After drawing blood from a finger as described, touch the tip of the small glass tube to the blood drop on the finger and let a small amount of blood come up in the tube or the loop.
8. Touch the tube or the loop to the test strip just below the arrow mark to place the blood there. If there is a paper where *Plasmodium falciparum* is written, remove it and place the blood on the strip in the place that was covered by the paper.
9. Put the used small glass tube in waste box.
10. Using the dropper, place 4 drops of liquid from the bottle into the new test tube that you had placed in the multiple-well plate.
11. Place the test strip containing blood in this test tube with the arrow pointing down, with the tip of the strip dipped in the liquid.
12. Wait for about 15 minutes. During this time, you can prepare the blood smear on a slide.
13. Observe the test strip after 15 minutes. You will find one of the following situations:

a. No red line appears on the test strip - this means that the test strip is not working. Discard it and repeat the test carefully with a new test strip, starting with the first step.

b. A single red line appears - this means that the patient does not have malaria. You do not need to send the slide to the laboratory to confirm malaria, unless there is strong suspicion.

c. Two red lines appear- this means that the patient has *vivax* malaria or falciparum malaria. Treat the patient for either *vivax* or *falciparum* malaria, depending on the species identifying line. There is no need to send the blood slide to the laboratory.

d. If three red line appear – this means that the patient has mixed infection i.e., both *Pf* and *Pv.* Treat this patient with ACT for three days along with primaquine 0.75 mg/Kg body weight followed by radical dose of primaquine at 0.25 mg/Kg body weight for 14 days.

14. After the test has been read, put the test strip and test tube into the waste box along with all used swabs and the used lancet.

Since the RDK may come from different companies at different times, there may be small differences in the contents and in the manner in which the test is done. The PHC staff will be able to clarify on this issue.

4.7.3 Storage of RDKs

The RDK should be stored in a cool, dry place indoors and should not be exposed to sunlight. The RDT may not give you correct results if it is exposed to sunlight or if it becomes wet. Therefore, it is very important to store the RDK carefully.

4.8 Safe Disposal of Materials used for Blood Tests

All the materials used in performing blood tests are unsafe for people to handle. Blood from patients can contain organisms that can cause disease. So, any materials that have been contaminated by blood, such as swabs, lancets, used and discarded slides, test strips and test tubes should be handled with care. They should be collected in a waste box having a lid. The box should be kept firmly closed and should be stored in a place out of reach of children. When the box is full, it should be buried in a deep hole in the ground away from wells and other sources of water. Or, the box can be given to the MPHW for disposal.

4.9 Protecting the Patient and Self while doing Blood Tests

If your hands are dirty when you do the blood test, dirt from your hands may contaminate the blood of the patient and cause harm to the patient. Hence, it is important that you take precautions while you do the test:

- Wash your hands thoroughly with soap and water before you draw blood. You will be taught how to wash your hands properly during your training.
- Always use a fresh lancet for each test. Do not reuse lancets.
- Do not touch the sharp tip of the lancet before or during the process of drawing blood. If the lancet gets accidentally contaminated before it can be used, discard the lancet and use another.
- After the blood has been taken for the tests, place a clean cotton swab on the prick site and ask the patient to apply firm pressure on the swab for a few minutes.

To protect yourself from the patient's blood, take the following precautions:

- Do not touch the blood with your bare fingers at any time. Handle the lancet, swabs, slides and RDT test strips with care.
- Take care to ensure that you do not prick yourself accidentally with a used lancet.
- After the blood test is over, again wash your hands thoroughly with soap and water. This is the best way to prevent any harm to you from the patient's blood.
- Dispose of all used materials in the waste box as described earlier, and handle the waste box carefully.

4.10 Quality Assurance (QA) /Quality Control (CQ) of Malaria Microscopy and RDT in India

Introduction

Under the National Vector Borne Disease Control Programme (NVBDCP) both microscopy and Rapid Diagnostic Tests (RDT) are used for diagnosis of malaria. Microscopic examination of blood smears stained with JSB stain (and /or Giemsa, Leishman), continues to be the method of choice-the "Gold Standard", for confirming the clinical diagnosis of malaria. It not only allows the differentiation of Plasmodium species but also provides an estimate of the parasite load i.e. number of parasites per micro liter of blood. With the advent and spread of antimalarial drug resistance, particularly of multi drug resistant P. falciparum, the need and the importance of accurate microscopic diagnosis has been felt more acutely.

RDTs (monovalent) have been introduced under NVBDCP in endemic areas which are inaccessible or where microscopic facilities are either poor or lacking

(due to operational reasons) and soon bivalent RDTs are going to be introduced. The detection of parasite's antigen is an evidence of a current or recent infection.

Like any diagnostic tests, various conditions of manufacture, transport, storage and the method of use may impair the accuracy of RDTs. Hence, irrespective of the technique employed, establishment and maintenance of a reliable diagnostic service depends on operational feasibility of the test, availability of adequate trained personnel, equipment and laboratory management systems at all levels. Quality Assurance and adequate monitoring of laboratory services at the peripheral level have been perceived as one of the important components under NVBDCP which needed to be strengthened.

Previous Status QA process of Microscopy

There has been a well established programme for cross verification of the laboratory results of microscopy under Dte. of NVBDCP, wherein all the blood smears found positive at the Primary Health Centres (PHC) or other peripheral laboratories are supposed to be cross-checked for parasite species and stage by the Regional Office of Health & Family Welfare (ROH&FW), Govt. of India and State Headquarter laboratories. The negative slides are also cross checked as well. All positives and 10% of all negative blood smears examined at PHC/ Malaria Clinic were cross-checked.

The PHC/ malaria clinic laboratory technician is supposed to collect all negative slides examined during the previous month with number ending with the code digit and dispatch to the concerned cross-checking laboratory by 10th of every month. All positive blood smears are cross checked in the Regional Office of Health & Family Welfare (ROH&FW), Govt. of India and State Headquarter laboratories. Depending on the workload, it is shared 50:50 between these laboratories. The negative slides are distributed between state/zonal and ROH&FW laboratories, at the ratio of 8.5: 1.5 between former and latter. Instructions are issued to the PHC/malaria clinic laboratory to preserve the rest of the slides, until the cross-checking results are received back.

The results of cross-checking were to be sent to the concerned laboratory by the 10th of the succeeding month. In case of high discrepancy rate i.e., 2% or above, the state programme officer and Regional Director of each ROH & FW was to take the needful remedial action like supervision of the concerned laboratory reporting high discrepancy rate.

Current Status of QAP for malaria RDTs

During the past one decade number of RDTs for malaria diagnosis have been developed, evaluated and validated for improved sensitivity and specificity. These RDTs are based on the principle of immunochromatography, require finger prick blood and detect malaria specific antigen. It can detect malaria parasite antigens in lysed blood by absorbent using monoclonal antibodies.

RDT being a recent entry into the programme, earlier there was no QA programme for this.

Need for strengthening the QAP

Over the years, the QA of malaria microscopy in the form of regular cross-checking of examined blood smears could not be sustained upto the desired extent due to various operational and technical reasons. One of the main reasons was/is vacant posts of laboratory technicians at each level that is at PHCs, malaria clinics, at State/Zone and ROH & FW. Besides, the quantity of the negative slides (10%) is too high.

Large nos of RDTs are procured every year for use for the remote and in-accessible endemic areas where microscopy is unavailable and the quantity is increasing every year. RDTs are mostly used by semi skilled persons in the peripheral areas. Sometimes, they may not be exactly following the guidelines for storage of the kits. Moreover, the climatic conditions like temperature may also play a vital role in deterioration of the RDT quality in the filed. Besides, sensitivity of malaria RDTs is dependent on several factors, including the rate of flow of blood upto the nitrocellulose strip, the adherence of antibody (Ab) to the strip, ability of the Ab to bind antigen (Ag) and the integrity of the Ab-dye conjugate. All these factors are subject to deterioration in adverse transport and storage conditions.

Moreover, published trials and experience in various countries have demonstrated a wide variability in the sensitivity of malaria RDTs, both within and between product trials. Sensitivity is particularly variable at lower parasite densities.

In view of the above as well as due to increasing trend of P. falciparum cases, emergence of newer foci of drug resistance and high mortality due to malaria, an urgent need was been felt to revitalize the QA component of the laboratory services provided by microscopy and also to develop, implement and establish a quality assurance programme for rapid diagnostic tests as an integrated part of malaria control under NVBDCP.

Current Quality Assurance under NVBDCP

As a first step to achieve this goal, the development of Standard Operating Procedures (SOPs) was felt imperative and two SOPs have been developed. For a sustainable and fool proof implementation of Quality Assurance Programme NVBDCP has networked the laboratories involving Apex Institutes, Medical Colleges, Regional and State Referral Laboratories, ROH&FW and ZMOs. NVBDCP will act as the Nodal Agency and has identified National Institute of Malaria Research (NIMR) as National Reference Laboratory for Quality Assurance for malaria diagnosis both by microscopy and RDT which are described in the third manual. Another user friendly hand book for use by the laboratory technicians including trouble shooting guidelines has also been

developed to ensure the quality diagnosis. Following SOPs and manuals have since been developed:

- Manual on Quality Assurance of Laboratory Diagnosis of Malaria by Microscopy - Guidelines for Standard Operating Procedures
- Manual on Quality Assurance of Laboratory Diagnosis of Malaria by Rapid Diagnostic Tests - Guidelines for Standard Operating Procedures
- Manual on Quality Assurance of Laboratory Diagnosis of Malaria : Networking of Laboratories
- Laboratory Diagnosis of Malaria: Operational Guidelines for Laboratory Technicians.

Results and feed back: The results of cross-checking were sent to the concerned laboratory by the 10th of the succeeding month.

- In case of high discrepancy rate i.e., 2% or above, the SPO &R.D. to take the needful remedial action like supervision of the concerned laboratory and re-orientation of the LT reporting high discrepancy rate.

Supervision of laboratories : A Sr LT from district/ zonal/ state lab use to visit PHC labs to inspect and conduct on the spot corrections in regard to laboratory procedure, equipment, records, returns, materials, etc to assist the technicians to improve their efficiencies.

Over the years, regular cross-checking of examined BS could not be sustained due to various operational and technical reasons. One of the main reasons:

- present status of Zonal Offices. ZMOs have been the technical body for all epidemiological & entomological activities in the States. Now in most States ZMOs either not existing or defunct
- Vacant posts of laboratory technicians at each level
- Besides, the quantity of the negative slides (10%) were too high.
- In view of all these technical and Operational problems, coupled with wide spread drug resistance in Pf and revised drug policy (use of ACT) QA was perceived as an important component requiring urgent strengthening
- ROH&FW issue the code by 10th day of each month to States /districts by email or telephone/fax
- District to forward the code on same day but not later than next day
- On 12th day slides dispatched from PHCs to DMOs

On 13th day DMOs must dispatch the slides to respective labs as networked (State cross cheching lab & ROHFW)

Results

- By 15th day of succeeding month
- DMO convey the results during the monthly review meetings and prepare the action plan if required to improve the quality under intimation to the State/ ROH&FW

LTs from each ROH&FWs visiting randomly PHC 2-3 laboratories (atleast 2 working days in a lab) in a month to

- confirm that the LTs are doing their jobs according to their training.

- assess whether they need re-orientation training/or their performance is satisfactory.
- make minor but necessary corrections to their work as per the local requirement.
- find whether the performance of LT is affected due to faulty equipment or poor quality of logistics supplied.
- See whether NVBDCP Operational Guidelines for LTs are followed properly.

- During visit the supervising LT cross check some examined slides & compare with PHC lab results as well as with his cross checking results.
- Observations made are reported to respective RDs along with the prescribed format.
- RD in turn convey the observations to SPO/DMO with suggested remedial measures, if any.
- RD/DMO compare the improvement after a regular interval (quality audit)
- Such visits provide opportunity to LTs to discuss with supervisors for difficulties they may be having that could be rectified locally or unable to convey his seniors.

New QAP for RDT

As mentioned under the NVBDCP, mainstay of malaria diagnosis has been microscopy. However, in recent years, for the remote and in-accessible areas where microscopy is unavailable, RDTs are being used. These are mostly used by semi skilled persons in the peripheral areas. Sometimes, they may not be exactly following the guidelines for storage of the kits. Moreover, the climatic conditions like temperature may also play a vital role in deterioration of the RDT quality in the filed.

NVBDCP guidelines are 95% sensitivity at 200 parasites/μl as a reasonable target for RDT performance. Therefore, it is important to determine the sensitivity & specificity under field conditions and to monitor any deterioration over the time. On the other hand for procurement of new RDTs for use in the programme it is of paramount importance to assess the post dispatch (post purchase) quality. Normally pre-purchase QA is mandatory for procurement of RDT under NVBDCP.

Post dispatch QA will be carried out after receiving the RDTs at the district by the DMO. Before dispatching the RDTs to the periphery, samples will be taken out randomly, and sent to the designated SRL/RRL. Thereafter randomly 7 RDTs will be collected at the interval of 3 months till the date of expiry.

Like microscopy the QA of RDT also includes both internal quality control and external quality assurance.

Lot/batch Testing of RDT kits using QC samples

The sensitivity of malaria RDTs is dependent on several factors and these factors are subject to deterioration in adverse transport and storage conditions. The rates of deterioration and their effect can vary between products. Hence, it is essential to assess the quality of the RDTs at periodical intervals with known low and high positive samples. This would be achieved by lot and batch testing of the procured kits.
From each RDT lot, 13 kits would be drawn and tested using positive (low and high parasitaemias) and negative controls for immediate QC. For long term quality assurance, 28 kits would be drawn in four lots depending on the expiry date of the kit (e.g. if expiry date is around one year, seven kits would be drawn every 3 months). For this, Manual for Quality Assurance of Malaria Diagnostic Tests by the NVBDCP would be strictly followed. The tests would be carried out at the in the designated laboratories. At the periphery, DMOs would collect and send 13 randomly selected kits to the linked SRLs for QA testing.

External Quality Assurance (EQA) of the RDTs used by health workers at periphery

The Once RDTs are supplied to the states; a sample would be drawn and tested for its quality from various levels. The District Malaria Officers would collect RDT samples from the periphery and send the same to SRL. Few kits would also undergo a temperature sensitivity test.

The District Malaria Officer would monitor the process of QA at peripheral levels i.e. at the lever of ASHA and health workers apart from PHCs/CHCs to determine any deterioration in the kit. Both immediate and long term QA will be performed with the RDT kits supplied to the periphery. It will be the responsibility of the DMO to pick up 2 samples of different sources to check the sensitivity and specificity of RDTs on quarterly basis by selecting the villages randomly.

The DMO would collect information on lot number and batch number of the consignment at the time of distribution. He would retain randomly 14 kits out of the entire lot to send seven of them to the SRL. After 3 months randomly he would select some PHCs, out of which from one sub center he would pick up one RDT. The process would be repeated to collect total seven RDTs from different sub centers after every three months. The next batch of seven RDTs would be collected from different centers at an interval of 3 months. The process of QA will be continued till the expiry period as mentioned on the kits by the manufacturer. (e.g. if expiry date is 12 months from the date of manufacturing and consignment is received after 3 months, than on receipt the 1st round of QA, thereafter 2nd, 3rd and 4th round should be carried out. The Vector Borne Diseases Consultants and Malaria Technical Supervisors will also be actively engaged in the QA programme.

ASHA and other end users of RDT shall be making blood smears of all samples whether RDT is positive for Pf or not. The negative smears are to be send for laboratory for confirmation of other than falciparum infection (Pv). After the tests used RDT (positive or negative) and the blood slide of the RDT positive should be marked and store for QA. The slides of all positive and 5% negative samples by RDT would also be collected and sent to the District Malaria Officer; who in turn would send them to designated laboratory SRL for cross check.

Bio-safety aspects

Bio-safety is a key component of total quality control programme. There is definitely a potential risk of infection to Health care workers (HCWs), who provide direct or indirect health care to people or handle samples (blood) and thus continuously come in contact with pathogenic organisms, they also handle infected waste and transport potentially infected specimens. Therefore all biosafety measures should be ensured as per guidelines and HCWs must take all precautionary measures to protect themselves from accidental injury, while handling the blood (standard work precautions) and patients must also be protected from infection. RDTs are biological component; it also needs special disposal. For this the guidelines for segregation and disposal of waste are to be followed.

Training

Training will be provided to the officials of the District State and ROH&FW involved malaria programme control and also to the identified laboratory personnel involved under QA network. Training will include both Internal Quality Control and External Quality Assurance Scheme including programme implementation, supervision and monitoring. Emphasis would be given on Good Clinical and Laboratory Practices, Hospital / Laboratory Waste Management, Universal Safety Precautions, and various aspects of Quality Assurance of Rapid Diagnostic Tests. For laboratory technicians special trainings for orientation on QA procedures and remedial trainings are designed. The NVBDCP manuals are followed and distributed for this purpose so as to maintain uniformity.

Roles and responsibilities

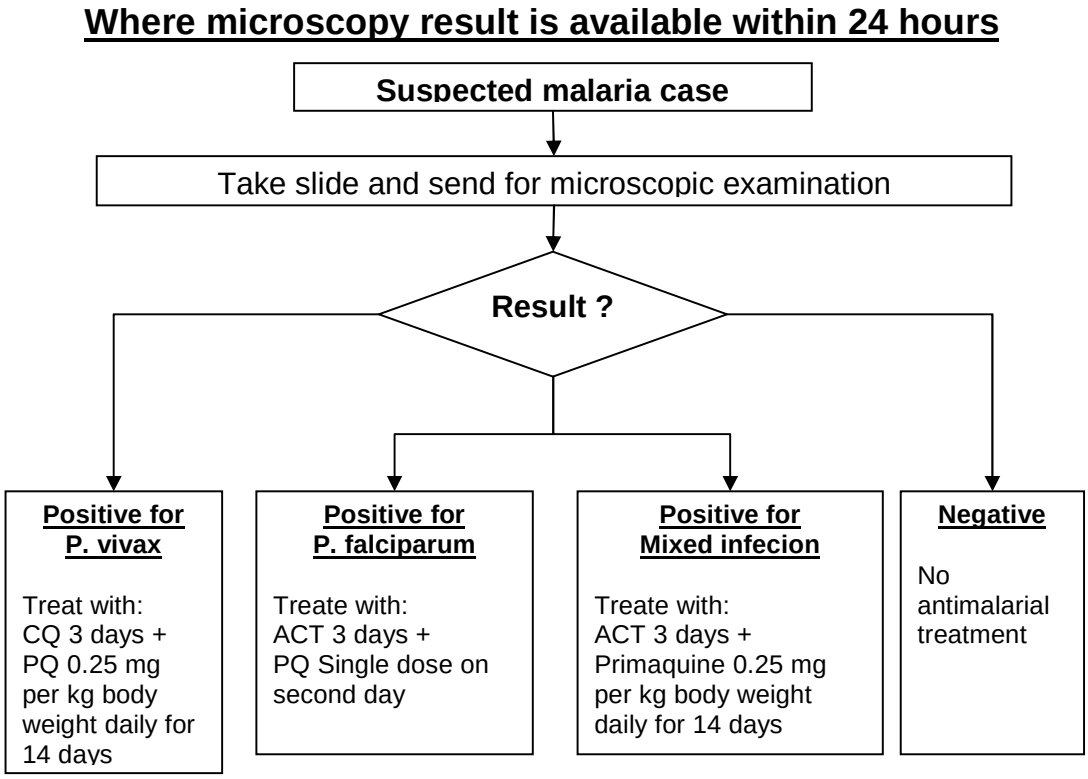
Directorate of NVBDCP is the nodal agency for the QA programme on laboratory diagnosis of malaria. It would be the focal point for national and international contacts regarding any issue related to the National malaria QA programme. Initially the QAP programme would implementing in the endemic areas by NIMR which will than be handed over to the States to carry out as an integral component of malaria control. The National Institute of Malaria Research (NIMR), Delhi, National Reference Laboratory would act as the National Reference Laboratory and provide technical support to the national QA programme, as per the criteria laid down by the Dte. of NVBDCP.

Learning Unit 5. Treatment and Chemoprophylaxis

5.1 Treatment

All fever cases diagnosed as malaria by either RDT or microscopy should be promptly given effective treatment. The medicine chosen will depend upon whether the patient has vivax malaria or falciparum malaria as diagnosed by the blood test.

Fig 5.1: Fever Diagnosis and Treatment Algorithm

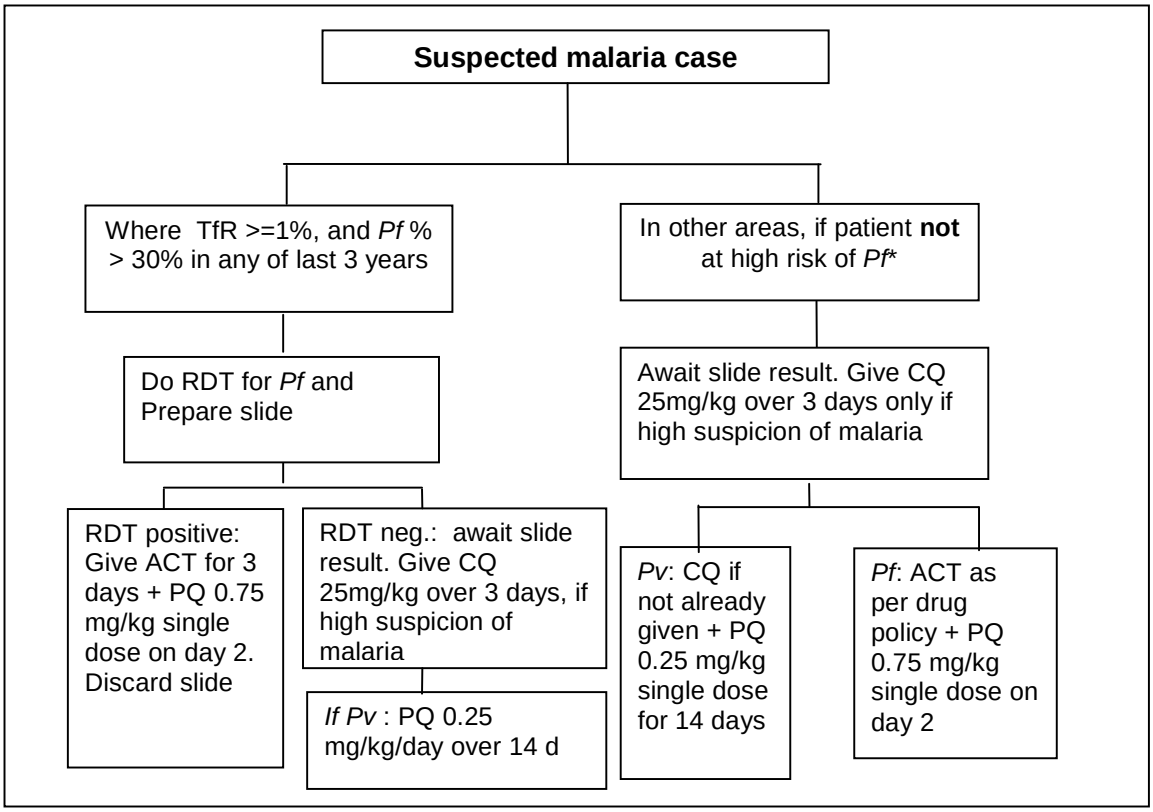


ACT - Artemisinin-based Combination Therapy (Artesunate + Sulfadoxine-Pyrimethamine)

CQ - Chloroquine

PQ - Primaquine

Where microscopy result is not available within 24 hours and monovalent RDT is used

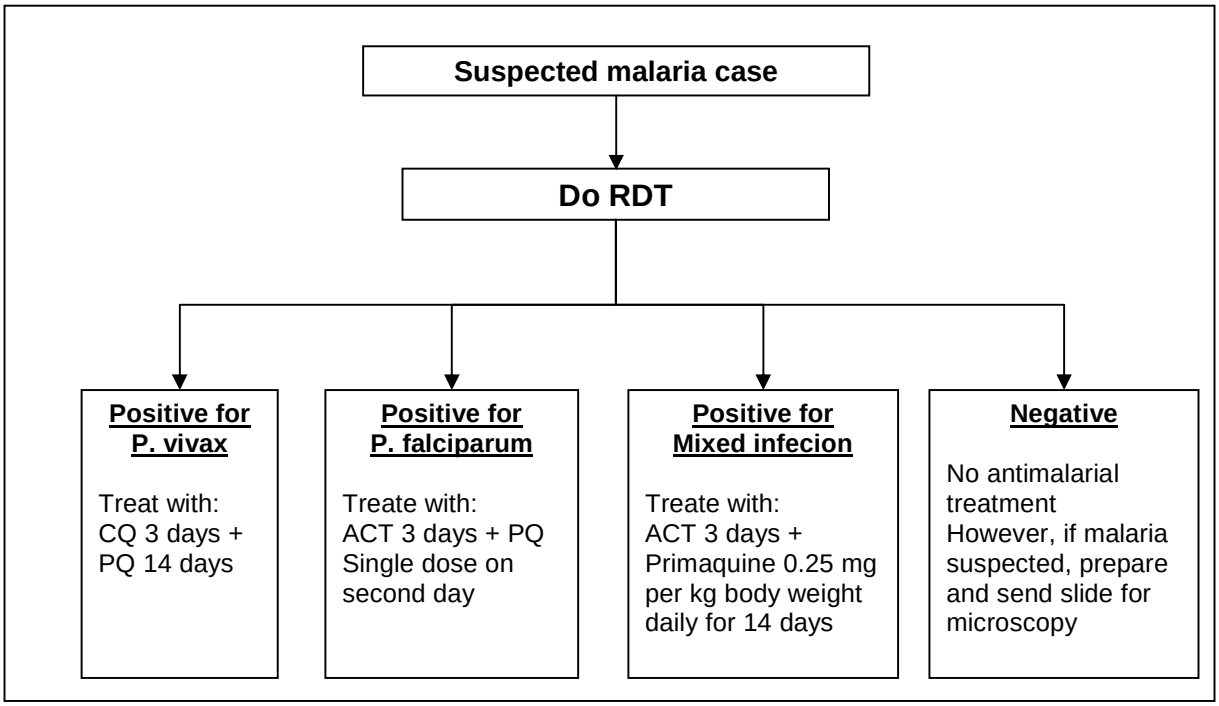


Note: if a patient has severe symptoms at any stage, then immediately refer to a nearest PHC or other health facility with indoor patient management or a registered medical doctor. Primaquine is not to be given to pregnant and infants

ACT= artemisinin-based combination therapy (artesunate + sulfadoxine-pyrimethamine); CQ= chloroquine; PQ=primaquine TfR= Test falciparum rate

Note: PQ is contra-indicated in pregnancy and in children under 1 years.

Where microscopy result is not available within 24 hours and Bivalent RDT is used



Drug schedule for treatment of *P vivax* malaria:

1. Chloroquine: 25 mg/kg body weight divided over three days i.e. 10mg/kg on day 1, 10mg/kg on day 2 and 5mg/kg on day 3.

2. Primaquine*: 0.25 mg/kg body weight daily for 14 days.
* Primaquine is contraindicated in infants, pregnant women and individuals with G_6PD deficiency. 14 day regimen of Primaquine should be given under supervision.

Treatment of uncomplicated *P.falciparum* cases:

1. Artemisinin based Combination Therapy (ACT)*
Artesunate 4 mg/kg body weight daily for 3 days Plus

Sulfadoxine (25 mg/kg body weight) – Pyrimethamine (1.25 mg/kg body weight) on first day. * ACT is not to be given in 1st trimester of pregnancy.

2. Primaquine*: 0.75 mg/kg body weight on day 2.

Treatment of uncomplicated *P.falciparum* cases in pregnancy:

1st Trimester : Quinine salt 10mg/kg 3 times daily for 7 days.

Quinine may induce hypoglycemia; pregnant women should not start taking quinine on an empty stomach and should eat regularly, while on quinine treatment.

2nd and 3rd trimester: ACT as per dosage given above.

Treatment of mixed infections (*P.vivax* + *P.falciparum)* cases:

All mixed infections should be treated with full course of ACT and Primaquine 0.25 mg per kg body weight daily for 14 days.

Teatment of *P. ovale* and *P. malariae* *:*

In India these species are very rarely found in few places. P. ovale should be treated as P. vivax and and P. malariae should be treated as P. falciparum.

Treatment of mixed infections:

All cases of mixed infection are to be treated as Pf as per the drug policy applicable in the area plus primaquine for 14 days

5.1.1 Treatment of Falciparum Malaria

Diagnosis of Falciparum malaria may be made by the use of RDT or microscopic examination of the blood smear. It is imperative to start the treatment for falciparum malaria immediately on diagnosis. The treatment for falciparum malaria is as follows:

Artesunate (AS), available as 50 mg tablets are given for three days, and Sulfadoxine-Pyrimethamine (S-P) tablets, containing 500 mg Sulfadoxine and 25 mg pyrimethamine are given for one day, as shown in the dosage chart below. All tablets for a day should be taken together, swallowed with water. In addition, Primaquine (PQ Large) tablets should be given on the second day.

Table 5.1 Dosage Chart for Treatment of falciparum Malaria

Age	Day 1		Day 2		Day 3
	AS Tablet	SP Tablet	PQ (7.5 mg)	AS Tablet	AS Tablet
Less than 1 yr	½	¼	0	½	½
1-4 years	1	1	1	1	1
5-8 years	2	1 ½	2	2	2
9-14 years	3	2	4	3	3
15 yrs or more*	4	3	6	4	4

Recently with the introduction of different coloured Blister Packs for different age group, treatment by the field level staff has been made easy. The colour code for different age group has been given as follows:

Dosage Chart for Treatment of falciparum Malaria

Age Group (Years)	1st day		2nd day		3rd day
	AS	SP	AS	PQ	AS
0-1 Pink Blister	1 (25 mg)	1 (25 mg)	1 (25 mg)	Nil	1 (25 mg)
1-4 Yellow Blister	1 (50 mg)	1 (500+25 mg each)	1 (50 mg)	1 (7.5 mg base)	1 (50 mg)
5-8 Green Blister	1 (100 mg)	1 (750+37.5 mg each)	1 (100 mg)	1 (7.5 mg base each)	1 (100 mg)
9-14 Red Blister	1 (150 mg)	2 (500+25 mg each)	1 (150mg)	4 (7.5 mg base each)	1 (150 mg)
15 & Above White Blister	1 (200 mg)	2 (750+37.5 mg each)	1 (200 mg)	6 (7.5 mg base each)	1 (200 mg)

Primaquine prevents transmission of falciparum malaria to others by its ability to kill gametocytes. PQ tablets should be taken after a meal; not on an empty stomach. Children less than the age of one year and pregnant women should not be given Primaquine. As pregnant women having falciparum malaria require different medicines, they should be directed to go to the nearest PHC or hospital immediately, without delay.

5.1.2 Treatment of Vivax Malaria

Table 5.2 Dosage Chart for Treatment of vivax Malaria

Age	Day 1		Day 2		Day 3		Days 4 to 14
	CQ	PQ (2.5 mg)	CQ	PQ (2.5 mg)	CQ	PQ (2.5 mg)	PQ (2.5 mg)
Less than 1 yr	½	0	½	0	¼	0	0
1-4 years	1	1	1	1	½	1	1
5-8 years	2	2	2	2	1	2	2
9-14 years	3	4	3	4	1½	4	4
15 yrs or more*	4	6	4	6	2	6	6
Pregnancy	4	0	4	0	2	0	0

5.1.3 Treatment of Mixed Infections

Table 5.3 Dosage Chart for Treatment of mixed (*vivax and falciparum*) Malaria

Age	Day 1			Day 2		Day 3		Days 4-14
	AS tablet	SP tablet	PQ (2.5 mg)	AS tablet	PQ (2.5 mg)	AS tablet	PQ (2.5 mg)	PQ (2.5 mg)
Less than 1 yr	½	¼	0	½	0	½	0	0
1-4 years	1	1	1	1	1	1	1	1
5-8 years	2	1 ½	2	2	2	2	2	2
9-14 years	3	2	4	3	4	3	4	4
15 yrs or more	4	3	6	4	6	4	6	6

5.1.4 Use of paracetamol

Paracetamol tablets are available as part of the ASHA kit also in the health facilities. Paracetamol usually brings down fever from any cause within half an hour. However, paracetamol does not cure the disease that is causing the fever. So, its effect does not last long. The fever remains low for about 4-6 hours, and then the fever can rise again. Paracetamol can be safely given at any age and even during pregnancy, in the dose shown in the dosage chart. In this dose, it can be given 3-4 times a day if needed. If the fever is not very high, and the patient is able to tolerate the fever, there is no need to give paracetamol.

Table 5.4 Dosage chart for use of Paracetamol

Age	No. of Tablets of Paracetamol (500 mg tablets)
Less than 1 yr	¼
1-4 years	½
5-8 years	¾
9-14 years	1
15 yrs or more	1 or 2

5.2 Initiation of treatment and advice to the patient/caretaker

Once a suspected case is diagnosed positive by RDT or microscopy, treatment is started. The first dose is always taken in the presence of the health volunteer/worker. The blister pack with remaining tablets is given to the patient/caretaker to take home with clear instructions.

Caution: If the patient is a child under 5 years or pregnant, ask the patient to wait for 15 minutes after taking the first dose. If it is vomited within this period, let the patient rest for 15 minutes, then give the first dose again i.e. open a new blister-pack and discard what remains of the old. If the patient vomits the first dose

again, it is considered a case of severe malaria, refer the patient immediate to the nearest Block PHC/ CHC/ Hospital.

Explain to the patient/caretaker

- That if the treatment is not completed as prescribed, the disease may manifest again with more serious features and more difficult to treat.
- To come back immediately, if there is no improvement after 24 hours, if the situation gets worse or the fever comes back.
- That regular use of a mosquito net (preferably insecticide treated net) is the best way to prevent malaria.

5.3 Recording of treatment

The result of RDT or slide should be entered by ASHA in M register and by Health Worker/ MO in M-1 form. In case of Blood slide the date of receipt of result is to be entered. This will indicate the time lapse between the date of slide collection and receipt of results. If RDT has not been performed then simply mark a cross (X). Now depending upon the species, ASHA/ Health worker/ MO will decide the anti-malarials to be administered. These will be entered in M-1 form. Suppose ACT has been selected then the entry will be made for the same. The date of starting and completing the treatment will be entered. During supervisory visits the time lag between slide collection or RDT and initiation of treatment should be identified.

5.4 Resistance to antimalarial drugs.

Resistance can be defined as either the ability of a parasite strain to survive and/or multiply despite the administration and absorption of a drug given in doses equal to or higher than those usually recommended, but within the limits of tolerance of the patient.

In the last two decades, an increasing proportion of *Plasmodium falciparum* infections is proving to be resistant to chloroquine in India. Drug resistance is declared in a study area, when the proportion of treatment failures exceeds 10% of all falciparum infections. In these areas the decision has been taken to treat Pf cases with the second line drug i.e., ACT instead of chloroquine,

5.4.1 Why does malaria parasite become resistant to anti-malarials?

Drug resistance is a complex phenomenon, where by genetic mutation, a parasite acquires the ability to resist, partly or fully, the effects of one or more anti-malarial drugs. When the resistant parasites are exposed to the drug, they multiply selectively If parasites are resistant to the drug being used, the patient may not respond to treatment.

One of the commonest reasons for the development of drug resistance is that the parasites are exposed to insufficient amount of the drug due to

- Low prescription dosage
- Lesser amount of drug dispensed
- Incomplete treatment taken by the patient
- Drug vomited out
- Low absorption due to any reason, for example, diarrhoea.

In such cases, most of the sensitive parasites are killed by even these small doses, but resistant parasites survive, multiply and spread to other people by mosquitoes. The new patient then gets infection from the resistant malaria parasites and does not respond to the drug at all, or responds only partly. Meanwhile, the earlier patient may appear cured because most of the parasites were killed by the drug, and the symptoms abated.

5.4.2 Why is it difficult for parasites to develop resistance to ACT?

ACT contains three drugs: artesunate, sulphadoxine and pyrimethamine. Each drug acts on a different part of the parasite, in a different manner. It is very, very rare for three simultaneous genetic mutations to occur by chance to produce resistance to such diverse drugs. Resistance can be produced in multiple steps, one drug at a time, but this is expected to take many more years. At present, we do not expect resistance to develop to ACT. If resistance develops, it is expected to first develop against sulphadoxine or pyrimethamine, since they have been in use for a longer time. If this begins to happen, some other, newer drug will be used as a companion drug for artesunate, to which resistance has so far not been reported in most malarious areas of the world.

5.4.3 How can one suspect drug resistance in the field? What can one do when faced with treatment failure?

As mentioned above, when a patient fails to respond to treatment (symptoms fail to disappear, or they re-appear), one should think of the possibility of drug resistance. However, there may be many other causes of persistent symptoms:

- the diagnosis might be wrong (the patient had a positive test, but the symptoms were due to some other cause)
- the drug might not have been taken as expected (insufficient dosage was prescribed or swallowed), or may have been vomited out
- the drug was not absorbed in the gut (because of diarrhea, or other reasons), the drug may be of poor quality (past its date of expiry, or poorly stored, or of poor quality when supplied)
- the patient's body might handle the drug abnormally (there are genetic differences in the metabolism of some rare individuals, which may cause the drug to be altered or eliminated quickly)
- the patient might have had a fresh reinfection, or in the case of vivax malaria, there might have been a relapse of the malaria.

In the absence of any of these conditions, if a patient has completed full treatment and is still having symptoms after 72 hours, treatment failure may be suspected.

The course of action when a patient has persistent symptoms is:

- Ask the patient and the family a series of questions to help rule out some of the causes listed above (Did the patient get the drug from an authentic, designated provider? Did the patient get the right amount of the drug? Was all of it swallowed as prescribed? Was the drug vomited out? How many days has it been since drug treatment was begun (if it is not yet 72 hours, one can wait)? Can you see the packing to check the expiry date? Are there symptoms of other obvious causes of fever? If the symptoms had disappeared and then reappeared, how long was the interval (if more than 15 days, it could be a fresh infection)?)
- If it appears that the drug was not adequately taken or retained, a fresh course may be given at home unless the patient has symptoms of severe malaria. Take a fresh blood smear (take two, for checking in different laboratories, if need be), and ask the nearest health care provider to keep an eye on the patient.
- Refer any patient who has symptoms despite taking and retaining a full course of treatment, or who has developed symptoms of severe malaria.

5.5 Severe and complicated malaria

A case of uncomplicated malaria usually presents with fever, rigors, headache, bodyache, fatigue, anorexia and nausea.

Serious complications can arise in *P.falciparum* infection and rarely in *P vivax*. They may sometimes develop suddenly over a span of time as short as 12 -24 hours and may lead to death, if not treated promptly and adequately. Severe malaria is clinically characterized by confusion or drowsiness with extreme weakness (prostration). In addition, the following may develop:

- cerebral malaria with generalized convulsions
- pulmonary oedema
- severe anaemia
- renal failure
- hypoglycaemia
- metabolic acidosis
- circulatory collapse/shock
- spontaneous bleeding and laboratory evidence of DIC
- macroscopic haemoglobinuria
- hyperthermia
- hyperparasitaemia

In children, febrile convulsions, repeated vomiting and dehydration are common if the temperature is high due to any cause. Therefore, these symptoms are not

necessarily indicative of severe malaria. However, children with such symptoms should be managed as severe malaria in routine program situations, and a diagnosis of malaria should be confirmed at the earliest.

In pregnancy, malaria, especially *P.falciparum* is a serious disease because with each bout of malaria, there is a reduction in haemoglobin and profound anaemia may develop rapidly. They are also at high risk of abortions or intrauterine growth retardation because sequestration of parasites in placenta restricts oxygen and nutrients flow to the fetus.

The management of severe malaria is possible in health facilities which are equipped with the following:

- Parenteral Antimalarials , antibiotics, anticonvulsants, antipyretics
- Intravenous infusion equipment and fluids
- Special nursing for patients in coma
- Facilities for blood transfusion
- Well equipped laboratory
- Oxygen respirator

Often these items are not available at the PHC level. Under such circumstances, the Medical Officer, PHC and paramedical staff should be able to administer emergency treatment and refer the case without delay to other institutions where such facilities are available.

A list of all health care facilities in the district where emergency care for severe malaria is available should be kept in PHCs and with Community Workers like ASHA. MO-PHC will maintain liaison with all these institutions. For timely referral of severe cases, transportation arrangements should be made with the use of untied funds available under NRHM.

5.5.1 The role of peripheral workers

The community comes in contact with ASHA and MPW (M&F) as a routine. They depend on these persons for advice and treatment of different diseases, malaria being one of them. Therefore, while training these workers the need to recognize a serious case of malaria should be emphasized. These workers should be conversant with the signs and symptoms of malaria and those which are likely to indicate serious complications.

Severe malaria may be suspected, if the patient does not get relief from symptoms of malaria within 24 hours, and/or headache/fever continues to increase. Such patients should be referred immediately to the nearest PHC/CHC/Hospital.

5.5.2 Criteria for immediate referral to Primary Health Centre

a) Persistence of fever after 24 hours of initial treatment.
b) Continuous vomiting and inability to retain oral drugs.
c) Headache continues to increase
d) Severe dehydration – dry, parched skin, sunken face
e) Too weak to walk in the absence of any other obvious reason
f) Change in sensorium e.g. confusion, drowsiness, blurring of vision, photophobia, disorientation
g) Convulsions or muscle twitchings
h) Bleeding and clotting disorders
i) Suspicion of severe anaemia
j) Jaundice
k) Hypothermia

5.6 Chemoprophylaxis

Chemoprophylaxis should be administered only in selective grips in high P.*falciparum* endemic areas. Use of personal protection measures including Insecticide Treated bed Nets (ITN) / Long Lasting Insecticidal Nets (LLIN) should be encouraged for pregnant women and other vulnerable population including travelers for longer stay. However, for longer stay of Military and Para-Military forces in high *Pf* endemic areas, the practice of chemoprophylaxis should be followed wherever appropriate e.g troops on night patrol duty and decisions of their Medical Administrative Authority should be followed.

Short term chemoprophylaxis (up to 6 weeks)

Doxycycline : 100 mg once daily for adults and 1.5 mg/kg once daily for children (contraindicated in children below 8 years). The drug should be started 2 days before travel and continued for 4 weeks after leaving the malarious area.

Note : It is not recommended for pregnant women and children less than 8 years

Chemoprophylaxis for longer stay (more than 6 weeks)

Mefloqiune: 250 mg weekly for adults and should be administered two weeks before, during and four weeks after exposure.

Note : Mefloquine is contraindicated in individuals with history of convulsions, neuropsychiatric problems and cardiac conditions. Therefore, necessary precautions should be taken and all should undergo before prescription of the drug.

5.6.1 Use of chemoprophylaxis is limited to following situations:

Short term travelers/tourists (less than 6 weeks) from non-malarious areas to malarious areas. Drug of choice is Doxycycline 100 mg daily in adults and 1.5

mg/kg bwt in children above 8 years; beginning 2 days before travel – 4 weeks after leaving a malarious area. Doxycycline is contraindicated in children under 8 years and pregnant women, in whom personal protection should be used

In long term travelers where appropriate e.g. military & paramilitary troops on night patrol duty etc. in malarious areas, the decision of respective medical administrative authority is to be followed. Drug of choice in such cases is Mefloquine 250 mg weeky for adults and 5 mg/kg for children once a week; beginning 2 weeks before to 4 weeks after exposure.

Learning Unit 6. Integrated Vector Management (IVM)

6.1 Introduction

The role of vector control is to augment the impact of early diagnosis and prompt treatment of malaria cases. Integrated Vector Management (IVM) has been defined by WHO as a rational decision making process for the optimal use of resources for vector control. Vector control should be implemented:

- to reduce malaria to a low level in endemic areas
- to reduce malaria incidence where urgent malaria problems exist such as situations where previously malaria-free individuals, populations or communities are at high malaria risk
- to curtail the spread of malaria in areas where the parasite is resistant to antimalarial drugs
- to prevent epidemics
- preventing the reintroduction of malaria
- contributing to health, development and improvement in general living conditions

6.2 Vector Control Methods

Interventions using vector control methods are related to three major control measures:

Larval control

- Source reduction
- Larviciding
- Larvivorous fish

Reducing human-vector contact

- Insecticide-treated mosquito nets (ITN)
- Improved housing
- Repellents and mosquito coils

Adult mosquito control

- Indoor residual spraying (IRS)
- Insecticide treated nets
- Space spraying

General guidelines for the choice of measure to apply in a given situation may be summarized as under:

- In rural areas, high-risk populations must be protected by either IRS or bed nets

- In such contexts, bed nets will be preferred in those areas where IRS is operationally difficult to execute satisfactorily
- Over a period of time, the use of bed nets will be scaled up, and the use of IRS will correspondingly decrease to reduce reliance on insecticides.

It is recognized that epidemiological and entomological evidence, in addition to operational and local contexts would determine the choice of method to be used. Based of such considerations, guidelines will be refined from time to time.

6.3 Larval control

Larval control is indicated as the sole method of vector control only if a high proportion of the breeding sites within the vector's flight range of the community to be protected can be located, accessed and managed. Larval control may be also undertaken to supplement or synergize the effects of other vector control interventions. Larval control requires a high coverage to be effective.
Larval control is useful:

- in densely populated areas (like urban areas) with relatively few breeding places
- during very dry periods in endemic areas, when the breeding sites are very limited, definable and manageable
- in refugee camps or unorganized human settlements
- in development areas such as irrigation scheme and construction sites

6.3.1 Source reduction

The term **source reduction** refers to any measure that prevents the breeding of mosquitoes or eliminates their breeding sites. **Environment management** aims to modify the environment thereby causing reduction of vector breeding sources thus reducing human-vector contact and transmission risks.

If such measures bring about long lasting or permanent changes on land, water or vegetation, they are referred to as **environmental modification** (e.g. filling, drainage, planting water-loving trees such as eucalyptus trees in swampy areas and closing or covering breeding sites). When such measures have a temporary effect and need to be repeated, they are known as **environmental manipulation** (e.g. water-level fluctuation, intermittent irrigation, flushing, changing water salinity, clearing vegetation in streams and irrigation canals).

6.3.2 Larvivorous fish

One of the most successful and widely used biological control agent against mosquito larvae is the top water minnow or mosquito fish *Gambusia affinis*. Fish other than *Gambusia* which has received the most attention as a mosquito control agent is *Poecilia reticulata*, the common guppy. Fish have been extensively used for mosquito control in the urban malaria scheme. In recent

years some of the states have extended the use of *Gambusia* and *Poecilia* to rural areas in suitable breeding places as a supplementary measure for vector control. All the states have also been advised to upscale the use of fish as biological control method in rural areas wherever feasible.

Fish should be preferably introduced in all unused wells in the rural and peri-urban areas before the high mosquito breeding season to maximize impact. Fresh water bodies in rural areas such as stagnant ponds, slow moving streams quarry pits, large borrow pits, margins of ponds should be targetted apart from wells.

The hatchery for larvivorous fish can be established in natural water bodies or in a special hatchery. Fish hatcheries may be established at state, district headquarters, CHC/PHC and subcentre levels and other places so that adequate quantities of the fish are available for supply. The requirements of a hatchery are a constant supply of fresh water, vegetation such as hydrilla, vallisneria and salinity of water should not exceed 20 grams per litre. Hatchery should not be subjected to strong water current and should be protected from heavy rains and floods. The details of construction are beyond the scope of this manual.

For transportation, the fish are collected with help of netting, which is fitted on a circular iron ring of 60 to 90 cm diameter with a wooden handle. Fish are best transported in small containers of up to 40 litres, such as plastic buckets and jerry cans, or in strong plastic bags, half filled with water from the rearing pond. Fish should be released in the morning hours or in the evening.

Supervisors should check the following points at least once a month

- Functional status of mother hatcheries (both artificial and natural) at block and sub block levels
- Information regarding the water bodies where larvivorous fish have been released and where to be released
- Community participation and response

6.3.3 Larviciding

Larviciding includes the use of chemicals or biological agents or toxins to kill larvae and pupae. Larvicides are used in breeding sites that cannot be drained, filled or where other larval control methods are too expensive or impossible to use. Larviciding is indicated only for vectors which tend to breed in permanent or semipermanent water bodies that can be identified, and where the density of the human population to be protected is sufficiently high to justify the treatment. Thus, larviciding is restricted to urban areas, labour or refugee camps and development projects.

The residual effect of larvicides varies considerably depending on the water quality and type of the breeding place, but is relatively short for most larvicides.

Most treatments must be repeated at fairly short cycles which may vary from 2-10 weeks. Larvicides of potential use are discussed below.

6.3.3.1 Petroleum oils

These are used for stagnant water bodies which are unsuitable for animal drinking and irrigation. Oils act mainly by forming a film on the water surface, thereby preventing larvae from breathing.

6.3.3.2 Common chemical larvicides

Temephos, which has a very low mammalian toxicity, has been the most widely used mosquito larvicide worldwide. It may be applied to water used for the irrigation of food crops, and has also been used for treating drinking-water. It is, however, toxic to fish. Fenthion is also commonly used when there is no risk of contamination of drinking water and food.

6.3.3.3 Insect growth regulators

These are chemical compounds that are highly toxic to mosquito larvae by preventing their development into adults. Their use has generally been limited by their high cost.

6.3.3.4 Larvicides of biological origin

Bacillus thuringiensis israelensis (Bti*)* produces toxins which are very effective in killing mosquito larvae after ingestion. It is harmless to other insects, fish, higher animals and humans at normal dosages and, at appropriate doses, may be suitable for use in water used for drinking or for the irrigation of food crops. Another bacterium, *B. sphaericus*, also produces a toxin. It has characteristics similar to those of *Bti* but is more effective in polluted water while *Bti* is more effective in clean water.

6.4 Reducing human-vector contact

6.4.1 Improved housing and location of settlements

Household and community actions to improve the quality of housing (design, construction, alteration including screening/mosquito proofing) and to deter mosquito entry and indoor resting can have more permanent effects than insecticide related control methods. Improved housing also improves the living condition and general health of the population. These are also relevant in planned settlements including development projects.

Poor housing is linked to higher risk, for example, incomplete houses with open walls, wide or unscreened eaves, houses with open windows and doors or without ceilings favour mosquito entry. Houses with damp walls and floors favour

resting and increase malaria risk. House protection with screening of windows, eaves and doors is an effective method of reducing human-vector contact, if properly implemented and maintained. New settlements should be carefully planned, selecting the correct design, structure, construction material, and location in relation to breeding sites, to prevent malaria.

6.4.2 Repellents, mosquito coils and protective clothing

The use of repellents and protective clothing are useful for people who are outdoors during peak vector biting periods. Most repellents have a very short duration of effect (4-6 hours).

6.4.2.1 Repellents

Repellents are available as creams and lotions. These may be applied either directly on the skin or on clothes. They complement bed nets and house protection and can be used after dark before retiring under the mosquito net or by people who stay outdoors during part of the night. In epidemics, repellents have sometimes been distributed for malaria control, although their cost-effectiveness is doubtful.

6.4.2.2 Mosquito coils/Mats

Some insecticides kill or repel mosquitoes at a distance when vapourized with a heating device. Mosquito coils and mats are among the most popular and widely used insecticide vapourizers. Once lit, the coils smoulder, releasing the insecticide into the air at a steady rate for six to eight hours.

6.4.2.3 Protective clothing

Cloths that cover most of the body, i.e. long sleeve jackets and shirts, trousers and soaks can provide a certain level of personal protection from mosquito biting.

6.5 Choosing a measure of vector control for application in an area

Within the high-risk population, the populations that should be protected by particular vector control methods must be defined. In general, in rural areas, high-risk populations must be protected by either IRS or ITNs.

Given the difficulties in maintaining high coverage and quality of IRS, it is expected that over some years, ITNs will replace IRS in most areas, although the latter method will still be needed to combat epidemics and in areas, where people cannot use ITNs bed nets eg. hot and humid climate.

Where IRS is currently used to protect part of the high risk population in a district, priority should be given to providing ITNs to those high-risk populations, which cannot be reached by IRS because of operational factors such as poor road

access. In high-risk areas, pregnant women are usually highly vulnerable to malaria; they should be provided with an ITN at the first ante-natal consultation.

Like for IRS, it must always be planned in bed nets operations to achieve 100% coverage in each village. Although treated bed nets provide some protection to the individual using them, the full benefits are obtained only at high coverage levels.

Learning Unit 7. Indoor residual spraying (IRS)

7.1 Introduction

Malaria is transmitted by vectors that rest indoors and can be prevented or controlled by spraying the insides of houses with a **residual insecticide.** Before and more usually after biting, an endophilic mosquito rests on a wall, ceiling or in other dark areas inside the house. If the surfaces it rests on have been sprayed with residual insecticide, the mosquito may eventually pick up a lethal dose and be prevented from transmitting the parasite. The aim of residual spraying is to reduce the longevity of mosquitoes below the time it takes for the malaria sporozoites to develop and to reduce mosquito density.

Mosquitoes can develop resistance to a wide range of insecticides. It is important to know when a vector species develops resistance in order to decide change of insecticide.
IRS remains a valuable option for malaria control, when applied in the right circumstances. However, large-scale and continued application of insecticides is not sustainable because of the high costs (insecticide purchasing and operational costs), vector resistance to insecticides, and environmental concerns.

IRS is recommended only where:

- a majority of the vector population is endophilic
- the vector population is susceptible to the chosen insecticides
- a high percentage of the houses or structures in the operational area have adequate sprayable surfaces, and
- spraying is done correctly

7.2 Planning for IRS

Planning for IRS involves stratification and delineation of areas to be covered, with more precise definition of the operational boundaries and the frequencies and times of applications (i.e. macro-, micro-analysis of information to select targets). Issues to be considered in planning IRS are:

- transmission and burden of malaria are often focal and may vary with malaria endemicity and vector density even within a small area
- aggregate indicators such as annual parasite incidence rates should not be the only criterion for undertaking IRS. Micro-analysis (micro-stratification) is necessary for IRS targeting
- the size of operational areas is influenced by vector distribution, distance from important breeding sites, vectors' flight range, demographic features, and distribution of malaria

The first decision to be made is whether IRS is a suitable intervention for the malaria problem in a particular area. The choice should be based on an evaluation of the results of previous vector control activities. To improve the

interpretation of existing records it is necessary to collect information on local vector bionomics and behaviour.

When residual spraying is used, a plan must ensure that the required coverage will be achieved for the specified period and that sufficient human and material resources will be available for this purpose.

IRS requires very high coverage in order to be effective. Spraying should be:

- total - all the dwellings are sprayed
- complete - cover all sprayable surfaces
- sufficient - uniform application of the required dose to all sprayable surfaces
- regular - repeated at regular intervals to ensure an effective residue is present during the transmission season

Meeting these standards requires a disciplined and competent organization with properly equipped and trained spraymen and efficient logistic support. A successful IRS programme should pay special attention to:

- planning required for the regular application of IRS
- the logistics of operational support, supplies, supervision and monitoring
- the responsibility of individuals and the community

House spraying requires the coordinated coverage of all sprayable surfaces at regular intervals (spraying cycle). The aim is to have a high coverage of all potential vector resting places with the effective dose of insecticide during the entire period when transmission is to be controlled.

7.3 Insecticides used for IRS

Several factors are required to be considered in the selection of an insecticide, including vector susceptibility, safety, cost, availability, residual effectiveness, and excito-repellency. For IRS, the insecticides in use are DDT 50% WP, Malathion 25% WP and synthetic Pyrethroids (WP). Synthetic Pyrethroids include Deltamethrin 2.5% WP, Cyfluthrin 10% WP, Lambdacyhalothrin 10% WP, Alphacypermethrin 5% WP and Bifenthrin 10% WP. Synthetic pyrethroid insecticides are also used for impregnation of bed nets.

The choice of insecticide must be based on sensitivity testing in all areas. In principle, susceptibility should be tested at least every second year in one locality in each district. If a district has different eco-types of malaria with different vectors, or certain areas, which are more affected by agricultural use of insecticides than others, additional localities should be monitored. Since pyrethroid is the only class of insecticides recommended for treating nets it should be used for IRS, only if there is no other choice.

7.4.1 DDT (Dichloro-diphenyl-trichloroethane)

In India, DDT may be used for vector control, provided that all the following conditions are met.

a) It is used only for indoor spraying for disease vector control
b) It is effective
c) The material is manufactured to the specifications issued by WHO
d) The necessary safety precautions are taken in its use and disposal.

Govt. of India has constituted a mandate Committee on DDT which reviews the use of DDT in public health and decides its quantity to be released for the vector borne diseases control programme every year. Even in areas where resistance to DDT has been demonstrated, some epidemiological impact of good spray operations is seen because of the excito-repellent action.

7.4.2 Malathion

Malathion 25% WP is used in areas with DDT resistance. If transmission takes place over the whole year, three rounds of spray with malathion are done as against two rounds of spray with DDT. Malathion is an organophosphorus compound, and exposure to large amounts can lead to poisoning. In case of organophosphorus (OP) poisoning, the patient should be transported immediately to a doctor. 2-4 mg of atropine should be given intravenously (for children 0.5 to 2 mg according to weight). Depending on symptoms, further doses of 2 mg should be given every 15 minutes for 2-12 hours in severe cases.

7.4.3 Synthetic Pyrethroids

Pyrethroids are synthetic chemical insecticides that act in a similar manner to pyrethrum, which is derived from chrysanthemum flowers. Pyrethroids are widely used for controlling various insects. They may be used as space sprays, residual sprays and in Ultra Low Volume fogging for mosquito control. They are also used for impregnation of bed nets for malaria control.

7.5 Insecticide formulations and dosages for IRS

Dosage is the amount of insecticide applied per unit area. It is normally expressed as grams or milligrams of active ingredient per square metre (g/m² or mg/m²) of sprayable surface. Doses vary considerably for the different insecticides. The dosage schedules for the commonly used insecticides under NVBDCP are given in the following table.

Table: Dosage schedule for Insecticides

S. No.	Insecticide	Requirement (in MT) for 1 million population for 2 rounds	Quantity of insecticide added to 10 L water	Dosage per sq.m of active ingredient	Area (in sq.m) covered by 10 L suspension	Duration of Residual effect (in weeks)
1.	DDT 50% WP	150.00	1 kg	1 gm	500	10 – 12
2.	Malathion 25% WP	*900.00	2 kg	2 gm	250	06 – 08
3.	Deltamethrin 2.5% WP	60.00	400 g	20 mg	500	10 – 12
4.	Cyfluthrin 10%WP	18.75	125 g	25 mg	500	10 – 12
5.	Lambdacyhalothrin 10% WP	18.75	125 g	25 mg	500	10 – 12
6	Alphacypermethrin 5%WP	37.50	250 g	25 mg	500	10 – 12
7.	Bifenthrin 10% WP	18.75	125g	25 mg	500	10 – 12

* In the case of Malathion, the requirement shown above, is for the three rounds

7.6 When to spray

The repetition of spraying operations at regular intervals is called the “spraying cycle”. It is the interval between repetitions, e.g. a six-month cycle. Each spraying of all sprayable houses in an area over a period of time is called a “spraying round”. The requirement that effective coverage be maintained during the entire transmission season implies that spraying of the whole area to be protected be completed before the beginning of that season (often the rainy season).

7.7 Preparation of houses before spraying

Correct spraying requires the careful preparation of the rooms to be sprayed. In particular, all food, cooking utensils, bedding and clothes must be protected from the insecticide by taking them outside the house before spraying starts; and all portable furniture and any pieces of furniture leaning against the walls should be removed so that the walls and all sides of all the pieces of furniture can be sprayed.

It is always necessary to check the working practises of spraymen in order to ensure that neither humans nor the environment are endangered. IRS requires the application of a uniform dose of insecticide to all the sprayable surfaces. This can best be achieved by means of compression sprayers.

7.8 Target surfaces

Generally, all the interior walls and ceilings are treated. In addition to permanent human dwellings, field huts where people sleep during the planting or harvesting

season should be sprayed. The underside of furniture, back of the doors, outside eaves and porches must be treated. Human dwellings and mixed dwellings should be sprayed, but not cattle sheds, with a view to conserve insecticide, improve coverage of human dwellings and prevent diversion of mosquitoes from cattle sheds to human dwellings. The residual effect of insecticides may be short on some surfaces, e.g. porous mud walls, oil painted wood and alkaline white wash, so these may require re-treatment after, for example, three months.

7.9 Spray Technique

The required quantity of insecticide should be issued to the squads each day by the supervisor after checking balance stocks available from previous day's supplies. The insecticides used under the National Vector Borne Diseases Control Programme (NVBDCP) are available as wettable powders.

The preparation of the spray suspension is made just before the start of the spray operations every day. It is important that the suspension is made correctly so that the correct dosage is applied on the sprayed surfaces. The procedure for the preparation of the suspension is the same irrespective of the insecticide. However, the quantity of the insecticide used per 10 litres of water will depend on the insecticide used.

The required quantity of the insecticide is measured with a plastic mug and put inside a 15 litre bucket. A paste is made with a small quantity of water. The remainder of water is then poured slowly into the bucket and the insecticide water mixture is stirred vigorously to obtain a uniform suspension. The suspension is then poured into another bucket through a cloth sieve to remove any particulate matter that might clog the nozzle of the spray pump.

The barrel of the stirrup pump is put in the bucket containing the spray suspension. One man operates the pump and the other man sprays. In the case of compression sprayers, only one sprayer is required for the spray process. The spray lance should be kept 45 cms (18 inches) away from the wall surface. The swath should be parallel. Spray is applied in vertical swath of 53 cm (21 inches) wide. Successive swaths should overlap by 7.5 cm (3 inches). Spray is done from roof to floor, using downward motion, to complete one swath; then stepping sideways and spraying upwards from floor to roof. Do not let the spray drip to the floor. Spraying is done on inner surfaces including eaves and roofs.

The discharge rate should be 740 to 850 ml per minute. To obtain the above discharge rate, the pump man should give 20 to 26 strokes per minute with 10-15 cms plunger movement at a pressure of 10 PSI (0.7 kg/sq.cm) at the nozzle tip. Spraying into a bucket for one minute and measuring the quantity of the suspension in a graduated mug should check the correct discharge rate (740 to 850ml/minute). The nozzle tip should be discarded if the discharge rate exceeds 850 ml per minute.

If the spray stops due to a blockage in the nozzle, the nozzle cap should be unscrewed to remove the blockage and replaced with a new one. The blocked nozzle should be put in a container with water for a few hours before the blockage is removed with a fine wire.

A good quality spray should lead to uniform deposit on walls and other sprayable surfaces. This is easy to verify for DDT and malathion sprays as the insecticide deposits are clearly visible. Deposits of synthetic pyrethroids are visible on wooden structures. The supervisor through physical verification should verify the quality and coverage of spray randomly.

It takes about 5 minutes to spray a house with an average surface area of 150 sq. metres. A daily summary of spray operations should be maintained by the field supervisor and verified by the health workers showing the areas covered, percentage room coverage and insecticide consumption in the tables as below:

7.10 Supervision

Supervision of spray operations is important to ensure that operations are carried out according to correct technical procedures, so that corrective action can be taken, to achieve the programme goals. Supervision is carried at all levels of programme implementation. It can be concurrent or consecutive. A stratified sample should be taken for consecutive supervision.

7.11 Protective measures

The safe use of insecticides for IRS requires a number of precautions. The removal or physical protection of all foodstuffs and cooking or eating utensils is imperative. In addition, inhabitants should be advised not to enter a sprayed room until the spray is dry, and to sweep all floors before allowing free entry into the house. This is particularly important for families with small children or indoor domestic animals that may have greater contact with the floor.

The use of protective devices and safe working practises is essential to avoid or reduce the contamination of spraymen, packers and mixers with the insecticide. In most spraying programmes in which insecticides of low acute toxicity (such as DDT) have been used, it is sufficient to wear overalls, broad-brimmed hats to cover the neck of the overalls, gloves and shoes or boots (the openings of which should be covered by the long trousers of the overalls). More toxic or more irritating insecticides require more elaborate protective devices such as light masks, goggles, visors and respirators.

Packers and mixers have a higher risk of contamination and should therefore use rubber gloves, masks or respirators and protect their eyes with a visor made of transparent plastic attached to the hat. Squad leaders must enforce safe practises and the appropriate use of protective devices. They must be familiar

with early signs of intoxication and monitor members of their squad for any sign of poisoning.

Basic precautions to prevent unnecessary contamination include:

- Hands and face should be washed after filling each pump charge.
- Eating, drinking and smoking should be forbidden, except after washing and before starting to spray.
- Spraymen should not be exposed to insecticide for more than six hours each day.
- Overalls and hats should be washed daily, especially if they have been heavily contaminated.
- Spraymen must take a shower at the end of each day's work.

Empty insecticide containers must be collected by the team supervisors and brought to the central storage area for proper disposal by qualified staff. It is also essential to follow the recommendations for the disposal of larger metal containers. Reuse of containers is always dangerous.

7.12 Acceptability and Community Participation

Indoor spraying requires the continued collaboration of the population, which may easily be eroded if people are not made continuously aware of the need for vector control. This is particularly important if some of the early benefits of spraying, such as the control of nuisance insects, are lost with time. It is therefore essential to maintain active contact with the community through an effective information, education and communication mechanism.

Involvement of Panchayats in successful IRS is essential. Panchayats/ village/ local bodies/ village heads/ Block Development Officers/ Mahila Mandals, religious groups etc., are to be informed about spray schedule at least a fortnight before the spray. This advance information must be given by Surveillance Workers/Malaria Inspectors/ District Malaria Officer so as to facilitate the villagers to extend full cooperation in getting the spray inside human dwellings with the objective of full coverage of targeted population.

MOHFW has involved NGO partners to strengthen the programme implementation activities in the high endemic areas. Their primary focus is on community mobilization and involvement. Extensive IEC/BCC activities shall be under taken by them to achieve maximum community participation in the programme activities. Accordingly, pre IRS IEC is to be done by the NGO partners to increase community acceptance of IRS.

7.13 Conclusion

The effectiveness of IRS depends on adherence to the specified criteria of the insecticide and application procedure, public acceptance of spraying, the use of well maintained equipment, adequately trained personnel and effective

supervision. Timing of IRS is essential and must be based on epidemiological and transmission dynamics data. In general, spray operations should take place approximately one month before the start of the potential seasonal increase in incidence. In India, the peak transmission season(s) are usually determined by rainfall.

A systematic effort is needed to improve the quality of IRS. People's perception of IRS should be changed through dialogue and flexible communication methods instead of enforcement. Safe insecticide management practices must be incorporated in all chemical vector control operations. Systematic, supportive supervision should be based on standard operating procedures (SOPs). Replacement of stirrup pumps by more modern equipment is under consideration and subject to operational research.

Learning Unit 8. Insecticide Treated Bed Nets (ITNs)

8.1 Introduction

Insecticide treated bed nets can be either conventional ITNs or Long Lasting Impreganted Nets (LLINs). Conventional ITNs must be treated once or twice a year (depending on the duration of the transmission season). LLINs are mosquito nets, whose fibres have been impregnated with insecticide by a special technique, so that the insecticidal effect is maintained through about 20 washes, or as long as the net can withstand daily usage, i.e. 3-5 years.

Even when LLINs are available, re-treatment of nets, which have been distributed in the past or acquired by the population through commercial or social marketing may still be cost-effective. Re-treatment of ITNs should be done on priority in areas, where the community coverage of mosquito nets is at least 50% (where at least 50% of the population would answer yes to the question: “did you sleep under a mosquito net last night?” during the transmission season). When applying re-treatment of nets (rather than LLINs) in a village with at least 50% coverage of conventional mosquito nets, it is assumed that people will be encouraged by re-treatment operations and health education to acquire more nets, so that over time, coverage can reach 100%.

8.2 Long lasting insecticidal mosquito nets (LLINs)

Long lasting insecticidal mosquito nets (LLINs) are ready-to-use pre-treated mosquito nets, which require no re-treatment during their expected life span (4-5 years). They have several important advantages over conventional mosquito nets. These include eliminating the need to retreat the nets (one of the main obstacles to the use of insecticide-treated mosquito nets in many endemic countries), avoiding problems associated with the storage and handling of insecticides by nonprofessionals, and in the community, reducing insecticide use, and minimizing the environmental hazards caused by the release of insecticide into natural water bodies. The insecticide is slowly released from the polymer at the surface of the fibre. Residual efficacy is longer than that of conventionally treated nets. After washing, the biological efficacy is reduced initially, but diffusion of the insecticide from the inside of the yarn to the surface reinstalls it.

It is reiterated that Insecticide treated mosquito nets are now becoming one of the important methods for control of malaria vectors. Ordinary untreated mosquito nets provide limited physical barrier between mosquito and man; mosquitoes may still bite through the net or get inside the net following improper use. Mosquito nets treated with insecticides provide better and effective protection by keeping away mosquitoes as well as killing them.

In populations targeted for bed nets, coverage must be as close to 100% as possible and the delivery should be a free public service, as far as possible.

The type of bed nets that can be provided depends on the brands registered in India and the supply situation. NVBDCP will inform States about the expected effective life of the types of nets provided each year and any specific requirements.

8.3 Planning for Bed nets

Unless data to the contrary are available, it can be assumed that an average household has 5 members (2 adults and 3 children). It is then possible for one bed net to cover on average 2.5 persons (2 adults or 3 children or 1 adult plus 1-2 children). Thus, for a given village the number of bed nets is usually equal to the number of households multiplied by 2 or the total population divided by 2.5.

Generally, for a targeted village, the required number of nets should be distributed in one single operation. However, if nets are not in sufficient supply, it can be considered to distribute one net per household per year over a period of two years, i.e. with two rounds of distribution separated by 12 months. Timing of bed nets distribution is much less critical than the timing of IRS or re-treatment of nets. However, for educational as well as logistical reasons, distribution shortly before the start of the rainy season may be optimal.

In addition to distribution to targeted high-risk villages, bed nets should be given to pregnant women in high risk areas and to special groups such as children in tribal schools and hostels. These children should take the nets home with them during vacations.

Some of the questions that need to be considered when planning ITN strategy are:

- What are the behavioural patterns of the vectors? Are they mostly exophagic or endophagic
- What are the peak biting periods, especially in relation to peoples' sleeping patterns?
- Are people outdoors (outside ITNs) at times when mosquitoes bite most?
- What are the night time movements and habits of people likely to affect exposure to vectors, including the time they go to bed? (This will vary with age, gender, and occupation).
- What are the attitudes of the people towards net use?
- Is there any preference for size, shape and colour of the bed nets?
- Who uses nets already? From where do they get the nets and at what costs?
- Are there seasonal variations in net use patterns?
- How do people react to insecticide used?
- What is the economic status of most people – this will affect net ownership, the ability to pay for insecticides and net (re)treatments?

Sustainability is more likely when communities pay for the nets and ideally for net retreatments. ITN service delivery (i.e. ensuring that people needing ITN have

access to them) may be more promising and realistic where potential delivery systems and services already exist or when the potential exists to access these.

People often accept and use nets because they protect against nuisance mosquitoes including *Culex*, even though malaria control programmes promote insecticide treated mosquito nets with the objective of controlling malaria. It is therefore essential to bring about behavioural changes in the communities through continuous education and advertising the fact that the use of ITN protect against malaria, and to promote a sustained use even during seasons of low vector density.

8.4 Steps in Bed Net Programme

- Preparatory activities for distribution
- Impregnation of plain bed nets
- Distribution of bed nets
- Follow-up to ensure utilization
- Retreatment of plain bed nets
- Annual assessment and plan

8.4.1 Preparatory activities

Preparatory work should be done so that the nets are optimally utilized, including identification and recording of the eligible families and health educational activities in the community. Involvement of local community representatives, self help groups and NGOs should be encouraged to promote transparency of operations and optimal use by the community.

Health workers at health facilities and community health volunteers should provide key information during one-to-one encounters – especially when treating patients with malaria and during antenatal care and EPI attendance. Additionally, health talks can be given to small groups, especially those waiting for health services. Pre-recorded audio and video tapes may be used in this context and demonstrations, (e.g. of the correct way to hang bed nets), can be extremely useful. Existing materials, such as flipcharts, guidelines, leaflets and flash cards, should be adapted as necessary to support interpersonal communication within the context of an integrated curriculum for training health workers in malaria treatment and prevention. Informative print materials such as signs, posters and billboards are used to identify bed nets distribution points, including antenatal care facilities. The quantity of materials to be produced should be sufficient to cover the entire target population and will be determined by the number of outlets and communities.

The following activities should be completed by the health worker and Community health volunteers like ASHA prior to the distribution of the mosquito nets:

- Survey of the area

    - number of households
    - number of persons in each household
    - number of pregnant women and children under 5 years of age
    - number of mosquito nets in use
    - knowledge, attitude and practices

- Identification and involvement of

    - community representatives
    - self help groups
    - women's organizations
    - NGOs

- Preparation of the list of beneficiaries

- communication among the community for the regular and proper use of mosquito nets; for ensuring that especially pregnant women and young children sleep under a mosquito net; insecticide treatment of the bed nets and proper care of the bed nets

- Selection of site(s) and persons for insecticide treatment of the nets. Training of personnel and necessary items required for insecticide treatment should be arranged

8.4.2 Impregnation of Bednets

Impregnation of bednets supplied under the programme and community owned bednets is done at the community level through camps, by trained Health Workers, Community Volunteers, NGOs/ CBOs etc.

8.4.2.1 How to treat the net – 10 Easy Steps for Mass Treatment

- Mass treatment is done at fixed/designated sites.
- Insecticide treatment is **recommended** for synthetic nets (nylon, polyester), as treatment of cotton nets is **not** cost-effective and effect of insecticide is **not** long lasting.

Step 1: Collect the necessary equipment

The necessary equipment consists of: mosquito nets, insecticide, basin, measuring container, rubber gloves, soap.

- Make sure the net is washed/cleaned before treatment.

- Preferably, nets should be treated outdoors in the shade. If treatment is to be carried out indoors, a room with open windows should be used.
- Use basin, gloves that are **not** used for any other purpose.

Step 2: Put on protective gloves before treating nets

Step 3: Measure the correct amount of water

The amount of water needed depends on the net material. Regardless of the size and shape of net, the amount of water required for:

- One synthetic net (nylon, polyester) – ½ litre (if the net is very large, more water may be needed).

✓ If measuring container comes with insecticide, use it to measure water. Otherwise, use any measuring container, that is **not** used for food, drinks, medicines.

Step 4: Measure the correct amount of insecticide

- The amount of insecticide or "dose" needed to treat a net depends on type of insecticide used. Follow instructions on the container, sachet, packet. Generally, 10-15 ml of insecticide is required to treat one net.
  - [BIS Number of Liquid Synthetic Pyrethroid used for treatment of Bed Nets -
    i) Deltamethrin – IS14411: 1996; ii) Cyfluthrin – IS14156: 1994].
- Store leftover insecticide in its original container, in the dark and away from children.

Step 5: Mix the water and insecticide thoroughly by gloved hands in basin

Step 6: Treatment of nets

- **Always treat one net at a time**.
- Put the net in the basin containing water and insecticide.
- Soak the net long enough to ensure that all parts of the nets are impregnated.
- Take out the nets and allow excess liquid to drip back.

✓ Do **not** wring the treated net.

Step 7: Drying the nets

- *Let the net **dry flat in the shade on plastic sheets**.*
- **Later,** the net can be hung up to **finish** drying **in the shade**.

Step 8: Disposal of leftover mixture of water and insecticide and insecticide containers

- Following treatment of all available nets, leftover mixture of water and insecticide, if any, may be used to treat curtains.

- Otherwise, dispose the liquid in the toilet or a hole away from habitation, animal shelters, drinking water sources, ponds, rivers, streams.
- Destroy empty insecticide containers, sachets, packets and/or bury in a hole away from habitation, animal shelters, drinking water sources, ponds, rivers, streams.

Step 9: Washing and cleaning of hands, equipments

- Wash equipments (basin, measuring container) with lots of water while wearing protective gloves.
- Wash gloves (if non-disposable ones are used)] with soap and lots of water, or dispose with insecticide containers.
- Wash hands with soap and lots of water.

Step 10: Washing and re-treatment of nets

- Washing removes insecticide from the net. So, **wash the nets as seldom as possible** and gently with soap and cold water and **dry flat on plastic sheet in shade**.

- Do **not** wash/rinse treated net in or near drinking water sources, ponds, lakes, rivers, streams. Dispose of water for washing/rinsing in the toilet or in a hole away from habitation, animal shelters, drinking water sources, ponds, rivers, streams

- Nets must be **re-treated** again after it has been **washed three times**. Or, at least once a year even if it is not washed, preferably just before the rainy season. Nets may be treated twice a year in areas that have a lot of mosquitoes all year long.

Remember:

- **Use the insecticide-treated net every night, all year round, even if mosquitoes are not seen/heard.**
- **Preferably, everyone should sleep under a treated mosquito net. Or, at least pregnant women and children under five years must sleep under treated net.**
- **Insecticides used for mosquito nets are not harmful to people, if used correctly.**
  Direct skin contact with the insecticide on a still wet net may cause a tingling sensation on the skin. This is not harmful, even for small children.
- **After treatment, the net may smell of insecticide. This will go away in a few days and is not harmful to people who sleep under the net.**

8.4.2.2 Precautions

The insecticide should be kept out of the reach from children. To avoid risk of skin irritation, rubber gloves should be used during treatment. Care should be taken to prevent insecticide splashing on skin and eyes during treatment.

After impregnating the bednets, used containers must be cleaned, but never in rivers, streams or ponds as insecticides are toxic. Empty insecticide packets and contaminated containers must be destroyed to prevent their use for other purposes. They can be buried in a place, where they will not contaminate ground water. After that wash gloves and then hands and face thoroughly with soap and water.

Insecticide treated nets should not be washed in river, stream or ponds to avoid contamination of water sources.

- Mass treatment is done at fixed/designated sites.
- Insecticide treatment is recommended for synthetic nets (nylon, polyester), as treatment of cotton nets is not cost-effective and effect of insecticide is not long lasting.

Some Useful Tips

- Use the insecticide-treated net every night, all year round, even if mosquitoes are not seen/heard.

- Insecticides used for mosquito nets are not harmful to people, if used correctly. Direct skin contact with the insecticide on a still wet net may cause a tingling sensation on the skin. This is not harmful, even for small children.

- After treatment, the net may smell of insecticide. This will go away in a few days and is not harmful to people who sleep under the net.

Mosquito nets may be treated at the household (home treatment) or community (mass treatment) levels. Mass treatment by trained personnel may be provided by dipping centres and mobile teams.

8.4.3 Distribution of the nets

Efforts should be made to distribute insecticide impregnated bednets before the transmission season. While distributing bednets the following points should be considered:

- Generally, for a targeted village, the required number of nets should be distributed in one single operation.
- If sufficient nets are available, they can be delivered according to household size
- Villagers are informed of the date and place of delivery in the village at least two weeks in advance. Each household is asked to send only one representative.
- The ITNs/ LLINs are given to the householders, who acknowledge receipt with a thumb-print or a signature.

- The delivery is done by volunteers, who are trained on the spot and supervised by MPHW.
- MPHW uses the opportunity to interview some people queuing, know people's concerns regarding impregnated LLINs and answer them. He/she holds a talk, when the queue is at its largest, refers to the concerns he has heard and motivates people for correct use of the LLINs.
- After the session is over, MPHW plans follow-up activities with ASHA, AWW especially periodic home visits with one-to-one communication.

Transport of ITNs/ LLINs from district level storage to health facilities could be done, if needed, by the vehicles normally used to carry medicines, vaccines and other supplies within the district.

8.4.4 Post Distribution Activities

Periodic visits will be made to check net use. In communities which have not had a habit of using nets, frequent communication by local health workers after distribution is a most important measure. Arrangements will also be made for re-impregnation of conventional nets annually or bi-annually prior to the high transmission season (s)

One could categorize ITNs either as an adult mosquito control or reducing human-vector contact due to their combined effect. As a malaria prevention and control intervention, ITN programmes follow some basic concepts:

- used as a method of personal protection for high risk groups
- used for transmission control with a target of high coverage exceeding 80% of the entire population

Nets treated with pyrethroids give greater personal protection than untreated nets by irritating, repelling or killing mosquitoes before they can find a place to bite through the net. The presence of one ITN in a room may also partially protect individuals sleeping outside the net.

8.5 Social marketing of net

Social marketing of nets uses commercial marketing methods to create a demand for nets. Social marketing aims to meet a social need whereas traditional marketing aims to maximize profit. Social marketing could involve subsidy of nets and services.

When to apply - Special attention must be paid to net distribution systems and to periodic re-treatment of nets with insecticide. The activities required on the part of the malaria control programme will have to be adapted to the method of distribution when this vector control option is adopted. A more serious problem is that of establishing functional periodic re-treatment cycles based on the

epidemiological needs, the residual effect of the formulations on different materials, and the habits of the population in washing their nets. From the epidemiological point of view, maximum protection is required during the transmission season or its peak, where transmission is perennial. When control programmes play an active role in the distribution of nets, whether free or subsidized, re-treatment is normally carried out at special events, such as National Anti Malaria Week (or day) or Health Day. These should be timed, if possible, to ensure the maximum coverage with freshly treated nets during the transmission season.

Even when distribution is left to commercial undertakings, official events to promote and demonstrate the use of insecticide-treated mosquito nets should be organized just before the start of the transmission season. The periodicity of re-treatment should be based on regional investigations that determine the actual residual effect of the insecticide under the conditions of use in the area concerned (climate, exposure to direct sun when used outdoors, washing habits, etc.) and on the seasonality of transmission. These studies should determine the best method of washing the nets, taking into account effects of local soaps, use of hot water, drying conditions, frequency of washing etc., which should be promoted by information, education and communication and during treatment or promotional events.

If nets are sold commercially and individuals are responsible for treatment, the users should be informed that if they wash their nets more often than recommended, they should also re-treat them more frequently. Wherever possible, insecticide treatment is better provided free of charge especially to the poor and vulnerable group.

When the risk of an epidemic is detected or even when an actual epidemic is detected at an early stage, it will be desirable to organize a re-treatment event in areas where coverage with treated nets is high, provided that this will not interfere with the implementation of emergency control measures that may be more effective.

8.6 Operational planning for IRS and ITNs/LLINs

Within the target populations for IRS and ITNs (the latter of which is divided in conventional ITN and LLIN target populations) it is necessary to identify the populations to be covered in the year under planning: the annual-plan target populations. These must be planned under resource constraints giving priority to those with the highest burden.

This planning is done by the District VBDC Officer in collaboration with the block and PHC Medical Officers concerned. The epidemiological data should be thoroughly analyzed in this process. A meeting of Medical Officers and MPHW supervisers (M) must be convened by CMHO/DMO for this purpose, normally in

December. In some districts, it may be necessary to convene such meetings for each block or for clusters of blocks.

The population is obtained from the epidemiological data collected from each of the PHCs of the district. The PHC Medical Officers should bring this information to the meeting in the format given below for each sub-centre area including any high-risk population, and for each PHC area. During the meeting, the planning is reviewed, taking into consideration the epidemiological data and other factors. If needed, the PHC medical officers' plans are modified, and the agreed plans are then consolidated for each block and for the district.

8.7 Integrated Vector Management outcome and output targets

Intervention	Target (eligible) population (A)	Annual plan target population (B)	Coverage (%) at end of year (B/A)x100%	Output targets (nets to be treated/delivered/houses sprayed)	
				Pre-transmission season	Mid-transmission season
Bed nets treatment once				# of nets to be treated once (population/2.5)	# of nets to be treated once (population/2.5)
Bed nets treatment twice				# of nets to be treated twice (population/2.5)	# of nets to be treated twice (population/2.5)
Bed nets delivery				# of bed nets to be delivered [1]	# of bed nets to be delivered [1]
IRS one round				# of households to be sprayed once	# of households to be sprayed once
IRS two rounds				# of households to be sprayed twice	# of households to be sprayed twice
IRS three rounds				# of households to be sprayed thrice	# of households to be sprayed thrice

8.8 Estimation of coverage based on operations records

- Conventional bed nets: Population protected is the one that could be protected by nets, which were treated as many times as foreseen in the calendar year (usually one or two times in a year, depending on seasonality), assuming that one correctly treated net can protect 2.5 persons. Thus, if the target population was 1000 and 100 nets were treated as many times as foreseen, then 250 persons were protected, and the coverage was 25% (of target population).

- Bed nets: Population protected is the one that could be protected by bed nets delivered, or, # of bed nets delivered and not yet expired x 2.5. For bed nets with a useful life of 5 years, the numerator includes all the nets delivered within the last 5 years.

• IRS: Population protected corresponds to the number of inhabitants living in houses fully sprayed as many times as foreseen in a year.

Those with the responsibility for logistics must be able to ensure adequate storage capacity and reliable transport at all levels, as well as precise timing. The planning of logistics must include a detailed budget for all transport and storage needs. Most importantly, logistic mechanisms must ensure adequate supervision and control of all operations and full accountability at every stage. It is recalled that bed nets are saleable; their diversion could have extremely deleterious effects on the programme at all levels.

8.9 Storage

Table 8.1 Characteristics of bed nets relevant to logistics

Characteristics	Multifilament polyester bed nets (deltamethrin-coated)	Monofilament polyethylene bed nets (permethrin-incorporated)
Weight per LLIN	440 g	625 g
Bed nets per bale	100	40
Weight per bale	42 kg	29 kg
Volume per bale	0.1727–0.1894 m^3	0.127 m^3
Bed nets per 40-ft container	36 900	16 800

Bales of bed nets are well and securely packed; the nets are essentially non-perishable and are usually individually wrapped in sealed plastic bags. Nevertheless, it is important to ensure that warehouses are clean and dry. Shelf-life should be ascertained from the manufacturer.

Bales are relatively easy to handle, being light enough to be moved manually. The principal concern in their storage is thus one of volume rather than weight. The very large volumes involved make it critical that there is adequate storage capacity at all levels.

The tightly packed and tied bales can be stacked several layers high (up to a height of 5 m) without any damage to the bottom layers. In theory, 5.8 bales of polyester bed nets occupy a volume of 1 m^3; in practice, 4 bales/m^3 is a reasonable working figure. Thus, if a warehouse space is 10 m x 20 m with a storage height of 3 m, available volume is 600 m^3, which would accommodate 600 x 4 = 2400 bales or a total of 240 000 polyester bed nets.

Monofilament polyethylene bed nets can be stored at 6 bales/m^3, so that the same warehouse volume of 600 m3 would accommodate 3600 bales or 144 000 bed nets of this type.

Storage space can often be rented, but rental costs would then have to be weighed against the possibly greater cost of staggered delivery.

Stock management is relatively simple because bed nets are well packed and do not deteriorate physically. Stock management should be based on the “first in, first out” rule, making a methodical approach particularly important when containers are off-loaded in a large warehouse. Bales must be stacked in the same way throughout the operation, to create equal piles each identified by a bin card. Bales must be carefully counted by at least two individuals during off-loading of the containers; this provides a double-check of the quantities indicated on the bills of loading.

8.10 Logistics

Those with responsibility for logistics must be able to ensure adequate storage capacity and reliable transport at all levels, as well as precise timing. The planning of logistics must include a detailed budget for all transport and storage needs. Most importantly, logistic mechanisms must ensure adequate *supervision* and *control* of all operations and full *accountability* at every stage. It must be understood that LLINs are valuable as well as saleable. Hence their diversion could have disastrous effects on the programme if not prevented.

Learning Unit – 9 Prevention and Control of Malaria Outbreak/ Epidemics

9.1 Definition of epidemic

An epidemic is defined as the unusual occurrence in a community or region, of a disease or health-related event, clearly in excess of expected occurrence. A malaria epidemic is suspected, if a large number of fever cases report to the OPD of PHCs/Dispensaries/Hospitals and majority of these fever cases are clinically suspected to be suffering from malaria.

An outbreak indicates an upsurge of cases in a small geographical area. eg. Village, sub-center or PHC. It can also be monitored with the help of graphs using the month wise caseload of last five years and calculating and preparing the **Epidemic Threshold Chart**. You can develop it for your block with the help of Dist. VBD consultant.

9.2 Types of Malaria Epidemics

9.2.1 Climate-related

Malaria epidemics are usually seasonal, peaking during the rainy season and post monsoon period, which favour mosquitogenic conditions.

9.2.2 Population movement related

Population movements are an important cause of epidemics. Two main types may be distinguished:

(a) The ignition of an epidemic, usually in an area where economic development activity is taking place, by the arrival of individuals who are carriers of parasites.

(b) The arrival of a non-immune population group in a malaria-endemic area.

9.2.3 Health system related

In areas where control activities are disrupted, focal malaria outbreaks may occur.

9.2.4 How to Detect a Malaria Epidemic in early stage

The emergence of above early warning signals which may be obtained by inter-sectoral collaboration, with municipalities, agriculture, transport, the military, should lead to increased alert. This alert should be communicated to medical

officers at PHC level requesting them to pay the greatest attention to weekly trends.

On the basis of early detection signals the MO PHC and DMO/ DVBDCO will suspect an impending outbreak/ epidemic. The most important signs to look out for are the Fever rate in OPD, Fever incidence in population and Malaria Incidence (compared with the same period previous year - without outbreak). Fever alert surveillance for malaria has been integrated with the Integrated Disease Surveillance Project (IDSP). Once a strong degree of suspicion is present the following steps need to be taken:

a) Conduct a Rapid Fever Survey and collect blood slides/conduct RDT to find the Slide Positivity rate (SPR)/RDT positivity rate to assess the magnitude of disease
b) Compare the trend of Malaria Incidence in the area during the year under investigation to preceding 2 years.
c) Compare the SPR of the current month to the SPR of the same month of the previous year.
d) Collect information on supportive factors like Climatic conditions, vulnerability, receptivity, vector density etc and try to determine the cause-effect relationship.

High positivity rate should also be confirmed by cross-checking of slides by an independent LT for ascertaining the quality of lab work.

If an epidemic is predominantly of *P.vivax* infection, then it is likely that first round of insecticide had not been given in time as scheduled or coverage was poor. Further case management was not done for at least 2 or 3 months.

If an epidemic with *P.falciparum* predominance is seen with deaths of microscopically confirmed *P.falciparum* cases, then it is possible that both rounds of insecticidal spray were not given or coverage was extremely poor. Also, there may have been a problem in case management for at least 4 to 5 months.

9.3 Prevention and Control of Malaria Epidemics

The aim of the NVBDCP is to prevent or identify epidemics/outbreaks in their incipient stages and to prevent them from progressing into full-blown epidemics. Prevention requires high level of preparedness and this is closely linked with the Integrated Disease Surveillance Project. The DMO/ DVBDCO/ CMO should ensure that all measures related to preparedness and control in case of a confirmation of epidemic/ outbreak, are in place in the district. Following are the key actions to be taken:

9.3.1 Preparedness

The prerequisites for adequate preparedness are as follows:

9.3.1.1 Rapid Response Team (RRT)

Rapid Response Team is constituted in collaboration with IDSP, to undertake urgent epidemiological investigations and provide technical guidance and logistic support. The RRT at state/provincial levels will comprise epidemiologists, entomologists and a laboratory specialist. At district levels it will comprise of the District Medical officer, District Malaria officer/District Malaria Consultant, non-health staff, local government staff.

9.3.1.2 Logistics

The CMO/DMO/ DVBDCO and the MO PHC will ensure availability of adequate buffer stock of reagents, slides, RDTs, drugs, insecticides spray equipment etc to take care of any excess requirement during outbreak/ epidemic situation in the district and PHC during the transmission season. A contingency plan should be in place for mobilization of resources. There should be a plan for management of severe cases; adequate number of beds should be made available in the health facilities. In case of an anticipated shortage, a plan to convert schools or Panchayat Ghars into wards should be in place.

9.3.2 Control of Malaria Epidemics

Once an abnormal situation is confirmed the RRT should reach the area immediately. Adequate resources, logistics and manpower should be mobilized. For the control of outbreaks/ epidemics following steps are to be taken:

9.3.2.1 Step 1: Delineation Of Affected Area – Rapid Survey

Surveys will be done with RDTs only, with microscopy only or with both, depending upon the local situation of ready availability. If it is expected to be a vivax malaria epidemic, the microscopy is necessary, as the presently available RDT kits detect P. falciparum only.

9.3.2.1.1 Rapid Fever Survey. During Rapid Fever Survey, every village in the suspected epidemic zone is covered and only fever cases or cases with history of fever are taken up and their blood smears are examined.

9.3.2.1.2 Mass Survey. As an alternative, in case the affected population is relatively small, a mass survey of the entire population shall be carried out in every village irrespective of fever status. Children must especially be included in the survey.

It is necessary to expand the area of survey centrifugally from the epicenter of the epidemic till areas with normal positivity rates are reached. Thus the size of the area involved in the epidemic zone is delineated.

To carry out the surveys, it is always advantageous to establish field laboratories by pooling Laboratory Technicians from adjoining PHCs, Districts, Zonal Office or State Headquarters laboratories and pool the peripheral staff from the PHC area to collect blood smears so as to cover the entire population as quickly as possible. This operation should be over in 7 to 10 days.

- Blood smears collected should be examined within 24 hours or RDT should be conducted.
- All groups should be covered, especially high risk population i.e. children, pregnant women and migrants.
- All positive cases should be given radical treatment at the recommended doses according to the slide or RDT result. If initial results indicate a positivity rate above 30% among fever cases (either blood smears or RDT), it may be considered to treat all fever cases as soon as blood sample has been collected.

9.3.2.2 Step 2 - Estimation Of Population Involved

The next step in the exercise is to calculate the population living in the epidemic areas. This can be done by taking the village-wise population from R-1 (Family Register) or the census population of the villages identified, whichever is readily available at the PHC.

9.3.2.3 Step 3 - Measures For Liquidation Of Foci

Having ascertained the population affected and the number of households in which measures to liquidate the epidemic are to be implemented, the anti-vector and anti-parasitic measures should be planned as under:

9.3.2.3.1 Space Spray. Every house in all the villages of the area affected by the epidemic should be covered. Indoor space spray should be carried out for 7 to 10 consecutive days or till the residual insecticidal spray in all houses of the locality is completed.

9.3.2.3.2 Indoor Residual Spray (IRS). The indoor residual insecticidal spraying operation should be started simultaneously with indoor space spray. The insecticide of choice will be the insecticide to which the local vector is susceptible according to best available information. All houses and mixed dwellings including sleeping rooms will be covered, but not exclusive cattle sheds

Suspected malaria case

- Do RDT
- Prepare blood slide for microscopy

9.3.2.3.3 Entomological Investigations and other vector control measures

The Zonal Officer should depute the Zonal Entomological team to carry out vector density studies. They should report the findings to the RRT. They should point out the prolific breeding places requiring immediate action. If the epidemic is due to predominance of vector breeding in water storage tanks or in peri-domestic water collection, or in well delimited water bodies in arid areas, undertake anti-larval measures along with space spray and residual insecticidal spray. Later, entomological investigations may be carried out to update the susceptibility of the local vector(s).

The entire exercise should be completed in a period of 7 to 10 days and in any case not exceeding a fortnight (i.e. within one extrinsic incubation period) so that secondary cases are prevented.

9.3.2.4 Step 4 - Follow-up Action

To assess the impact of remedial measures, it is necessary to take the following follow-up actions:

- Continue close surveillance for one month (twice the incubation period) after the outbreak has been contained (as demonstrated by epidemiological indices).
- Strengthen case detection and treatment services at all levels in the vicinity by ensuring that laboratories are fully functional, the surveillance workers are deployed, the community volunteers are activated and supplies and logistics at all levels are ensured.
- Investigate cause of epidemic by an epidemiological investigation to find out whether the epidemic was due to for example:
    - Influx of migratory population which was not covered by routine control measures such as screening at the entry points and case management and surveillance in the project areas.
    - Breakdown of regular malaria control operations.
    - Natural calamities such as floods, heavy rains, drought with opening up of relief camps
    - Other relief measures with temporary shelters for migratory population

Learning Unit 10. Interaction and Coordination with other Departments

10.1 Introduction.

Coordination with other departments and their cooperation have a significant role to play in prevention and control of malaria. Therefore, it is important to interact with other departments to effectively implement antimalaria measures.

The different departments other than health which have a role in malaria control are Public works, Agriculture, Irrigation, Fisheries, Forestry, Environment, Education, Rural Development, Urban Affairs, Welfare, Information & Broadcasting, Communication, Transport, Railways and Defence etc. Their assistance will be solicited in our endeavour.

10.2 Interaction with Various Departments

10.2.1 Education Department. Health sector should work closely with the education sector to develop a health education component targeted at school children and devise and communicate appropriate health messages.

10.2.2 Public Works Department. The sector can contribute to source reduction by providing a safe dependable water supply with adequate drainage. In addition, through the adoption and enforcement of housing and building codes, a municipality may mandate the provision of utilities such as individual household piped water supplies or sewerage connections and rainwater (stormwater) run-off control for new housing developments or forbid open surface wells.

10.2.3 Agriculture Sector. Farmer Field School is a concept which can be used to teach the farmers regarding integrated pest and vector control. Agriculture fields can a potent source for anopheles breeding which requires vigilance and control measures.

10.2.4 Irrigation Department. It should be ensured that there are no breaches in lining of canals which may result in leakage and water collections that give rise to mosquito breeding.

10.2.5 Water Supply Department. Repair of leakages and coverage of overhead water tanks are some of the measures which can result in reduction of mosquito breeding.

10.2.6 Construction Works. Supervision of masonry tanks made during construction of buildings is required to be made regularly to ensure avoidance of mosquito breeding.

10.2.7 Road Construction. It will be ensured that excavations made ring the course of construction of roads do not become breeding grounds for mosquitoes.

10.2.8 Railways and Industry. Cooperation of Railways will be sought for visiting their yards and dumps to assess mosquitogenic conditions.

10.2.9 Municipal Health Authorities. Liaison with the municipality will be maintained for prevention of water logging, implementation of building bye laws concerning health, mosquito proof design of buildings and safe rain water harvesting.

10.2.10 Fishery Department. Assistance from the fishery department will be obtained for procurement of larvivorous fish and also for advice on construction and maintenance of hatcheries.

10.2.11 Forest Department. Assistance from the Forest department will be required in relation to control of forest- and forest fringe malaria

10.2.12 Panchayats. Close cooperation with village Panchayats and Village Health and Sanitation Committee is required for effective implementation of malaria control activities.

10.2.13 NGOs. A good knowledge of the NGOs including Civil Society Organizations such as Community based organizations and Faith based organizations is important for optimal implementation of malaria control.

10.2.14 Police. A good liaison with the police is required to ensure that unforeseen difficulties are amiably resolved.

10.2.15 Road Transport. Constant liaison will be maintained with transport department for various programme related efforts including transportation of microscopy slides and the results, display of malaria slogans and messages etc.

Learning Unit 11. Community Participation and Behavior Change Communication (BCC)

11.1 Introduction. The NVBDCP envisages strong community participation and behavior change components in the malaria control program to meet the challenges in malaria control. This chapter deals with potential of simple approaches to optimize community participation and encourage correct community and family practices in dealing with malaria.

Behaviour Change Communication (BCC)

Definition 1

BCC is about changing specific behaviour(s) – "well defined actions at the household, community and health service levels". BCC approaches recognize that behaviour change is more about identifying the causes and barriers to behaviour change and overcoming the barriers. It is about understanding the communities, contexts and environments in which behaviour(s) occur. BCC is also about using persuasive techniques to demand health rights and to make public sector health services available and accessible to the neediest. BCC is about integrating new practices into long standing social, cultural and communication systems.

Definition 2

BCC is a research-based, consultative process of addressing knowledge, attitudes, and practices through identifying, analyzing, and segmenting audiences and participants in programs and by providing them with relevant information and motivation through well-defined strategies, using an appropriate mix of interpersonal, group and massmedia channels, including participatory methods.

IEC and BCC

The terms "IEC" (Information, Education and Communication) and "BCC" (Behavior Change Communication) are commonly used in discussing health related issues. What exactly do they mean and what is the difference between BCC and IEC?

Information, Education and Communication (IEC)

IEC is a process of working with individuals, communities and societies to:
- develop communication strategies and tools (information material) to promote positive behaviors which are appropriate to their settings.

Behavior Change Communication (BCC)

BCC is a process of working with individuals, communities and societies to:
- develop communication strategies to promote positive behaviors which are appropriate to their settings;
AND

- provide a supportive environment which will enable people to initiate and sustain positive behaviors.

Difference between BCC and IEC

Experience has shown that providing people with information and telling them how they should behave ("teaching" them) is not enough to bring about behavior change. While providing information to help people to make a personal decision is a necessary part of behavior change, BCC recognizes that behavior is not only a matter of having information and making a personal choice. Behavior change also requires a supportive environment. Community and society provide the supportive environment necessary for behavior change. IEC is thus part of BCC while BCC builds on IEC.

Communication is a process of "convergence"

"Communication is a process in which participants create and share information with one another in order to reach to a mutual understanding". Mutual understanding builds the foundation for mutual agreement, which in turn makes collective action possible. Effective communication begins with the audience and continues over time as a process of mutual understanding and convergence. The definition of BCC is comprehensive and includes the role of assessment and analysis to guide the development of communication strategies with a mix of different media and channels for effective communication or spread of message. The main difference between IEC (information education and communication) and BCC is that while IEC is more one-way and focused on "messages", BCC is more "outcome oriented" and also includes the role of participatory methods and motivation in the behaviour change process. IEC is based on the implicit assumption that awareness creation will automatically lead to behaviour change. Hence the emphasis of IEC is on "creating messages", entertainment and media. However this strategy document uses an operational definition of BCC that includes: (1) the need to define behavioural actions that require change,(2) to assessing the barriers to behaviour change, (3) demanding health rights and making health services available and accessible to marginalized groups (Vulnerable Communities) and (4) using persuasive techniques to integrate new practices into existing social environments.

Communication for behavioural change is used to encourage target populations to adopt appropriate behaviour. Interventions can be combined; depending on the local situation and the characteristics of target group the strategies include involving the community, village leader, village health volunteer, representative of

mass organization, including youth unions, women's unions, school teacher and religious leader. Other strategies include social mobilization advocacy and the use of mass media channels like Radio, Television, Traditional performances and Printed Media.

An effective communication strategy is the key to appropriate health seeking behavior. The strategies must be multi focal, targeting individual, house hold and communities, as well as health workers. It must be designed to improve understating of individual behaviour and practice as a basis for reinforcing positive behaviour and modify less beneficial action. A team of facilitators and community mobilizers (like ASHA, NGOs staff, ANMs and others) should be trained in various aspect of malaria and other vector borne disease prevention and control, including communication skills.

Steps for BCC Planning

The steps to be considered in scientific planning of effective communication strategy are:

Step 1 indentify risk factors

Knowledge attitudes, practices and beliefs about prevention and seeking diagnosis and appropriate treatment should be identified through an analysis of existing studies of prevention and control of VBDs and reports on lessons learnt and best practices. A small survey could also be conducted.

Step 2 Identify target populations

People will be reached more effectively if information and messages are tailored to their needs. The primary target population might be children under five years of age, pregnant women, school children, legal and illegal migrants and farmers. Secondary target groups are those who influence or deliver information to the primary population, such as community leaders, village health workers, ASHA, VBD control officers (DMO), local health workers, peer educators, pharmacists, religious leaders and school teachers. Sensitization of these secondary target audiences and their involvement in the programme will help in better implementation of the programme as these will act as change agents for ensuring inflow of desired information to the general masses in consistent way.

Step 3 Indentify the desired behaviour and attitude changes

Decide which behaviour and attitude should be addressed to help your group to lower their risk for infection of Malaria, Dengue, Chikungunya, JE, Kala-azar and

Filariasis. While doing this also workout and brainstorm about the possible and actual barriers in the community which creates hindrance in adopting any desired behaviour change.
Recognize and plan for improvement in three key areas:

- Personal commitment to make a change by raising awareness about the extended effects of VBD infection on patients and their families and on the community's socio-economic situation.
- Acquiring knowledge and skills to bring about change, for example, properly impregnating bed nets, taking anti-malarial medicines optimally.
- Creation of a supportive environment to facilitate behaviour change
    - Improving the availability and price of quality bed nets, insecticide for impregnating bed nets and ant malarial drugs.
    - Not allowing water stagnation in any container in and around human dwellings to prevent breeding of Aedes mosquitoes.
    - Sanitation in and around human dwellings and cattle sheds to prevent breeding of sand flies.
    - vaccinating the children with JE vaccine
    - keeping the piggery away from human dwellings
    - consuming the medicines (DEC and albendazol) distributed under MDA

VBDs are not equally distributed across the sates. In some areas all the 6 VBDs may be present and in some areas only 1 or 2 diseases may be prevalent. Hence while working on step 1 to 3 visit your local area (villages) and discuss with the community, local health workers and key opinion leaders about the disease and its possible ways of prevention and control. Analysis the key observations before proceeding to step 4.

Step 4 Design messages

When the target population and the risk factors have been indentified and the goals and objectives have been set, the next step is to design messages that will appeal to the target group and their social customs. The target groups should be involved in this step, which will enable the programme (NVBDCP) staff a better understanding of attitudes and to teach them to work with the target groups. Existing messages and materials could be re-used or adapted. If the existing materials are not suitable for particular group, changes/modifications may be made accordingly discussing with the target group.

The key messages in case of malaria includes - if a fever develops, seeking proper care and medicines from a recognized and trained service provider; taking the right medicine for age or weight as directed by the services provider and finishing a full treatment course as advised by the doctor or health worker.

Any fever not responding to anti malarial may be a case of Kala-azar seeking proper care and medicines from a recognized and trained service provider; taking the right medicine for age or weight, as directed by the services providers and finishing full treatment course.

If fever develops with joint pain and (or) rashes, seeking proper laboratory diagnosis and symptomatic treatment for Dengue and Chikungunya, from a recognized treatment facility. Messages should also be on water storage practice, elimination of Aedes breeding sources. Likewise messages may be developed for JE & Filariasis.

These messages should be adapted to the situation and needs of the target groups and should be prepared in all the appropriate languages for the groups. Community should be informed about the services available in nearby health facility for diagnosis, care and treatment.

Step 5 Identify communication channels and media

The appropriate channels should be determined and messages designed for the type of communication media that will be most effective in reaching the target groups. These can include interpersonal communication, print, audio and video media driven by the requirements of the target population.

Key messages should be designed for dissemination via radio, television, newspapers and theatre to promote health-seeking behaviour and compliance with artemisinin -based combination treatments with full community participation. Repeated input must be ensured, the impact must be monitored and new themes or presentation formats should be developed for messages over time. Special events and other interventions could also be considered. Combinations of these methods are the most effective, as they can reinforce each other.

Various channels of communication can be used to deliver messages:

- Television, which has a primary role in advocacy and in reinforcing messages sent through various channels for behavioural change;
- Participatory community radio, for regular updating of information on malaria and other health issues by various partners, including audiences, and for reporting improvements in living conditions as a result of malaria

prevention and control, with various audio formats (spots, drama, documentary, songs) to suit local socio-cultural and economic conditions, including local languages and terminologies;

- Print media, such as posters, pamphlets and leaflets, developed with the participation of target groups and local health workers and the community, including innovative print materials such as pictures, to educate specific target groups (e.g. illiterate persons);
- Innovative methods, e.g. games for children and adults, and campaigns for malaria control in communities and schools, with child-to-child and child-to-community approaches for educating and mobilizing the community;
- A group consisting of district and local heath personnel and partners to educate, mobilize and support village volunteers in VBD control, with activities planned to suit the local situation, including service delivery;
- Advocacy, building partnerships with politicians, decision-makers, donors, nongovernmental organizations and other resource providers to ensure that the political commitment and resources required for implementation are forthcoming.

Step 6 Pre-testing materials

All materials, whether new or adapted, must be pre-tested on the target group for comprehension, acceptance, attractiveness, inducement to action and involvement.

Step 7 Interventions

Social mobilization should be part of the overall communication strategy, to encourage participation and thus create sense of ownership. The community should be prepared to meet the demand created by such activities. Availability of and easy access to effective treatment is the most important sign that the services are ready. Good malaria case management services advertise themselves, e.g. a patient who receives effective treatment from a health facility of community-based health provider, who makes a good clinical recovery and who is well treated in every sense of the term is a better “poster” than printed support materials.

Step 8 Monitoring and evaluation

Indicators of the outcomes and goals set should be used to monitor implementation of a communication strategy. An evaluation to measure the success of interventions against the set objectives should also be undertaken. Examples of communication strategy indicators are:

- Whether messages can be remembered;
- Number of people trained;
- Number of health education sessions conducted:
- Numbers of insecticide-treated bed nets, rapid diagnostic tests and artemisinin-based combination treatments distributed;
- Responses to activities and campaign;
- Actual production and distribution of materials among target groups;
- Numbers of radio and television messages aired;
- Findings from surveys of behaviour of attitude.

Note: ***While designing BCC action plan states should give priority to specific activities undertaken under Anti Malaria Month (AMM), Anti Dengue Month and MDA for ELF as part of overall communication campaign for prevention and control of VBDs.***

Annual Action Plan for BCC

a) <u>Objective:</u>

- Sensitization of the community/masses to take proactive steps to stop mosquito breeding near human habitation (inside and outside houses, agricultural fields, surroundings of water sources-taps wells & hand-pumps etc.)
- Increase awareness about LLIN/ITN and thereby create increase demand among the families/communities residing in high mosquito prevalent areas.
- Sensitization of the community about IRS (DDT spray) so as to decrease family's resistance towards spray team to carry out indoor spray.
- In case of any sign and symptoms related to VBD (like fever, fatigue etc.) individuals should immediately contact nearest PHC/ASHA/Govt. hospital.
- If medicines are required for treatment of any VBD, then drug adherence should be ensured. (*Complete and correct intake of medicine*)

b) <u>BCC Strategies at various levels:</u>

Level	Channel	Detail about channels
State	• Mass Media	• Electronic (TV, Radio, Cable channels) and Print media (newspaper, magazines, periodicals, posters, pamphlets, flyers, mailers)
	• Public Relations/ Advocacy	• Press/media relations, Celebrity endorsements, Event management, Sponsorship of events, Brand Ambassador
	• Out-door and Mid media	• Hoarding at bus stands/railway station/airport/busy public places, Wall writing, Sinages, Panels, Mobile van
District	• Out-door and Mid media	• Hoarding at bus stands/railway station/airport/busy public places, Wall writing, Sinages, Panels, Mobile van
	• Trainings/Capacity Building sessions	• SPO, IEC consultant, VBD Consultant, ASHA, MPW, PRI
	• Innovative media	• School based programme, kiosks at haat/mela
Village	• Interpersonal Communication (IPC) through ASHA	• One to one interaction • Individual counseling • Small group meetings
	• Community/local media	• Street plays • Health Fair • Puppet shows • Rallies • Miking
	• Out-door and Mid media	• Wall writing, Mobile van
	• Innovative media	• School based programme, kiosks at haat/mela

Note: The purpose of giving above table is to broadly describe the probable IEC channels at State, District and Village levels. As per local needs and community demands channels can be relocated within different levels.

c) <u>Standard Format to Develop IEC/BCC Action Plan (May be modified as per local need in consultation with the DMO/SPO and NGO partners</u>

Description	Unit	No. of Units	Unit Cost	Total Cost	Level (*refer table above*)	Fund Allocation State	GOI
							(NVBDCP/NRHM)
1. Mass Media							
a. Electronic (Spots)	Duration of the spot	No. of spot					
b. Print (Insertion)	Size	No. of Insertion					
Sub Total (1)							
2. IEC material production, replication							
a. Name the IEC material	No.						
b. Name IEC material	No.						
c.							
Sub Total (2)							
3. Out-door & Mid Media							
a. Hoarding							
b. Wall writing							
c. Sinages							
d.							
Sub Total (3)							
4. Training/Capacity Building sessions/Workshops							
a. ASHA							
b. PRI							
c. Village health sanitation committee							
d. DMO and Medical officials							

e. Any other (pls. specify)							
Sub Total (4)							
5. Organizing Events							
a. Street plays							
b. Health Fair							
c. Puppet shows (traditional media)							
d. School programme							
e.							
Sub Total (5)							

The activities proposed above should also be indicated in terms of time line and frequency as shown in the table below.

d) Calendar of Events

Activity	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
TV spots	**4**					**5**						
Radio spots						**10**	**8**					
Street play						**5**	**7**	**4**	**2**			
Wall writing			**20**	**15**	**15**							

Note: Activities plan should be as per the transmission period of the VBDs.

e) <u>Requirement from States</u>

1) Completely filled "Standard Format to Develop IEC/BCC Action Plan"
2) Descriptive note for every major activity proposed. Highlighting the target audience covered with approximate age group. This note should also cover the major outcome of the activity proposed and how the outcome would be measured.
3) Completely filled "Calendar of Events"
4) Activity plan should be developed with special focus on AMM (in June) and Dengue month (in July).

11.2 Interventions Available. Three interventions of proven value are now being introduced at large scale into the program, each of which has benefits tangible even to the lay person, and thus having high likelihood of acceptability and utilization:

11.2.1 Diagnosis. In the place of slide tests which involved delay in getting results, rapid diagnostic tests (RDT) for diagnosis of *P vivax* and *P. falciparum* are now available. These tests can be conducted at the most peripheral levels by any one with simple training.

11.2.2 Treatment. ACT has been introduced for the treatment of all Pf cases which is nearly 100% effective and is not associated with any major side effects. For P vivax a full 3 day course of chlroquine and 14 days' course of primaquine is given.

11.2.3 Bed nets. In place of Insecticide impregnated Bednets which required periodic reimpregnation, now we have Long Lasting Insecticidal bed nets which do not require reimpregnation, remaining effective even after 20-25 washes and lasting for 3-5 years.

11.3 Scope for Communities to Participate

The malaria control program offers considerable scope for communities to participate in and own the program. An illustrative list of actions that communities can take is provided in the following tables.

11.3.1 Early Diagnosis and Treatment

Community Support	Community Monitoring
• Selection of appropriate volunteer • Spreading word about availability and reliability of RDT & ACT • Spreading word about need of early reporting for testing and treatment of fever cases	• Ensuring availability and accessibility of health care workers and volunteers • Alerting authorities about non-availability of health care provider • Alerting authorities about stock-outs

• Facilitating quick transport of slides to the laboratory	of test kits or medicines • Alerting local providers and higher authorities about outbreaks

11.3.2 Insecticide Residual Spray

Community Support	Community Monitoring
• Informing people about necessity of IRS • Spreading the word about dates of spray • Accompanying spray teams to convince residents about the necessity of IRS	• Monitoring whether spray operations are conducted as per norms and plans • Providing feedback about perceived effectiveness of insecticide spray

11.3.3 Bednet Distribution and Re impregnation

Community Support	Community Monitoring
• Deciding mode of bednet distribution in partnership with authorities • Educating people about consistent and correct use of bed nets • Determining convenient dates for impregnation work • Providing labor for impregnation	• Ensuring equitable distribution in selected habitations • Minimizing sale of bed nets by recipients • Alerting authorities about malpractices • Monitoring to ensure impregnation of bed nets as per planned schedule • Providing feedback about perceived effectiveness of impregnated bed nets

11.3.4 Referral Services

Community Support	Community Monitoring
• Ensuring early transport of patients of severe malaria to the correct referral institution • Helping the family avail of government schemes supporting costs of transportation and treatment (such as untied health funds available to CHC, PHC, Subcenters and Village Health Committees)	• Demanding and ensuring immediate care for cases of severe malaria at institutions • Ensuring that untied funds at village and subcenter levels under NRHM are made available in a timely manner for poor families needing referral.

11.4 Behaviour Change Communication (BCC)

Behaviour Change Communication has been defined a process of learning that empowers people to take rational and informed decisions through appropriate knowledge; inculcates necessary skills and optimism; facilitates, stimulates pertinent action through changed mindsets, modified behavior and reinforces the same.

- The analysis of values, beliefs and practices will tell us what the most relevant barriers to behavior change are, and what messages and approaches are likely to be most effective, for which segment of the potential audience.
- Simplicity, brevity, do-ability and relevance are the cornerstones of effective communication for behavior change.
- Interpersonal communication or counseling (IPC) is the preferred primary approach, particularly when introducing new practices that people are not familiar with, since this permits adaptation to a specific context and set of circumstances, but less intensive methods may suffice to sustain change.
- There are no guaranteed success formulas. Every intervention must be periodically evaluated for effect and reasons for success or failure. This should lead to minor or major revisions to strategies and plans. Thus, BCC is an evidence-based process involving continuous learning.

11.4.1 BCC in the malaria control program: the goals, and a practical approach

The communications strategy of the malaria control program is expected to serve the larger goal of the program: the reduction in morbidity and mortality from malaria. Specifically, effective communication is expected to lead to the following:

A. People and their representatives, particularly in high-burden districts, become aware of their entitlements under the malaria control program, and actively demand and monitor the realization of these entitlements.
B. Services offered by the program are widely and correctly utilized by affected families and communities.

11.4.2 Start with a basic plan

11.4.2.1 IPC for early diagnosis and treatment. As the new interventions roll out in high burden districts, a large number of volunteers and health workers will be trained in the use of RDT and ACT. A few basic “messages”, based on a best-guess list of potentially effective ones, should be included in these training modules, along with simple job-aids as necessary. Table 9.2 offers an illustrative list of such messages that each provider can use. In the initial weeks and months, the volunteers will need support through supervisory field visits of MPHW and MTS.

11.4.2.2 Simple mass communication before IRS and bed net distribution rounds: This can consist of recruitment of local folk media, NGOs and CBOs to explain the benefits and use of IRS and bed nets to communities.

11.4.2.3 Simple information on entitlements provided to people's representatives and CBOs: Existing functional forums of the NRHM in the district (Missions and committees) can be addressed by the malaria program staff in the district, explaining the changes being brought into the malaria control program, and the expected benefits. Such communication should highlight the specifics of services such as habitation-level availability of diagnostic and treatment facilities, and the large-scale availability of bed nets, as well as the terms of availability (time, cost, quality, etc). there is also need for making the services of ASHA / CHV known to the community so that they can access the services in their village.

11.4.3 Information

Some of the information that may be delivered for BCC are given below

11.4.3.1 To community at large:

- Fever could be malaria
- Malaria can be dangerous, so should be treated in time
- I can test and tell you immediately if you have dangerous malaria or not
- I have free medicines which are very effective against dangerous malaria
- Come to me immediately when you have fever, anytime, without losing time
- Make sure you sleep under bed nets treated with insecticide. They keep malaria-causing mosquitoes away. It is particularly important to make sure that pregnant women and children sleep under the net

11.4.3.2 To patients (family) with a positive RDT:

- You have malaria.
- Taking these tablets in the correct dose will cure you
- Let me know if you still have fever after you complete treatment
- If you develop drowsiness, severe vomiting, or convulsions, you need to rush to (specified) hospital. You will get free admission and treatment there.

11.4.3.3 To patients with a negative RDT:

- You have not been tested positive for malaria, but it could still be malaria
- I will send your slide for testing and let you know the result in 2 days time
- You can take these tablets (paracetamol) to bring down the fever for a few hours after each dose, but these tablets cannot cure the cause of fever
- If you think you are getting worse, go and consult a doctor

11.4.3.4 While distributing bed nets:

- (Demonstrate how to put up a bed net indoors and outdoors)
- Wash this net as infrequently as possible, so that its effect lasts longer
- (ITN:) Bring this net back to me every six months, I will dip it in insecticide for you.
- (LLIN:) This is a special and expensive bed net. If you wash this infrequently (once every few months), the effect of the net will last 3 years. Selling this net is not allowed. You may be punished if caught.

- Use the bed-net every night even if sleeping outdoors
- If you are going to the field (Jhum cultivation etc..) use LLIN regularly in the field also.

11.4.3.5 Before and during the IRS round:

- Make sure you are available when the spray teams come on (date)
- The actual spraying will last only a few minutes
- The sprayed insecticide will not harm you, but it is best to wash utensils before use for cooking or eating
- Make sure all rooms are sprayed, especially rooms that you sleep in
  Do not wipe off the insecticide from the walls, or paint it over

11.4.4 Assess after a reasonable period:

About 3-6 months after the roll-out, even as early as during the first transmission season, a quick but formal, independent assessment of the program interventions can be carried out in multiple locations, to identify gaps in service availability, utilization and quality. If the results indicate the need for either closer community monitoring or for behavior change support, or both, a more in-depth study in a few sample districts should be conducted aimed at finding specific gaps and evolving specific messages and plans as part of comprehensive BCC and Community Participation strategy.

11.4.5 Implement a comprehensive strategy:

Within a year of the roll-out of interventions, and before the second transmission season, a comprehensive BCC and Community Participation plan can be put in place, and assessed again during the transmission season to iron out the remaining wrinkles. This plan will include the use of all channels of communication deemed to be appropriate, and accordingly, a larger budget.

Learning Unit 12. Monitoring & Evaluation

12.1 Terminologies

12.1.1 Indicators

The data collected through the system of HMIS consists of volumes of information but this is useless, unless it is converted to relevant information through the application of intelligence. Indicators are therefore derived from this data and are used as variables that indicate a particular condition or situation. These indicators point towards programme performance in different areas and help identify problem areas to enable corrective action. Eg. Annual Parasite Incidence (API) is an indicator of disease burden and programme impact.

12.1.2 Surveillance

Surveillance has been defined as continous scrunity of the factors that determine the occurance and distribution of disease. Surveillance is essential for effective control and prevention, and includes the collection, analysis, interpretation and dissemination of relevant information for action. In the programme Active Surveillance is carried out by Multi Purpose Worker through domiciliary visit while passive surveillance is carried out by the facilities like ASHAs, Subcentres, PHCs, Malaria Clinics etc where the patient come for diagnosis and treatment.

12.1.3 Monitoring

Monitoring encompasses on-going follow-up of the planned program activities / processes to examine whether the program is being implemented as planned and whether it is on track to reach stated goals.

12.1.4 Evaluation

Evaluation tells the program whether it has achieved stated goals in defined time-periods, and why it may have succeeded or failed.

12.1.5 Planning

Planning means the rational use of any and all relevant data to make the most effective possible utilization of program resources, based on the best understanding of cause-effect relationships, leading to the achievement of program goals. Planning is a necessary element of program management.

In the malaria program, routine planning is an annual feature at block, district and higher levels, usually undertaken by core malaria program staff. Typically, surveillance and other program monitoring data is used to plan insecticide spray and outbreak preparedness planning, as well as planning for supplies and training related to case detection and management. In addition, supervisors at

different levels within the health delivery system use weekly or monthly reports to investigate and manage outbreaks.

12.2 Types of indicators used for surveillance, monitoring and evaluation

12.2.1 Input Indicator

Input indicators tell us what the program is investing. Besides financial resources, the timely procurement of equipment and supplies, recruitments of staff and training provided to all functionaries are program inputs.

12.2.2 Process Indicator

Process indicators tell us whether specified program activities are happening as planned, in quantity and quality. Quality of training or the quality of supplies provided are processes that are often measured. Similarly, review and planning meetings held, plans made, supervisory visits made, contracts awarded, are all processes.

12.2.3 Output Indicator

Output indictors tell us what the immediate results of the inputs and processes were. Typically, what health workers do are outputs, which have come about as a result of many inputs and processes. The distribution of bed nets, the detection of fever cases, the achievement of insecticide spray targets are all outputs.

12.2.4 Outcome Indicator

Outcome indicators tell us whether the program interventions are having desired effects. Timely case management, the correct use of bed nets, reduction in vector density are all outcomes.

12.2.5 Impact Indicator

Impact indicators tell us whether we have reached. In the context of malaria, these are indicators of the burden of disease: the incidence of malaria, the incidence of severe malaria and the death rates from malaria.

The categorization of a given indicator as input or process or output is often subjective and a matter of convenience. This categorization should not be considered rigid, but should be utilized as a convenient framework to facilitate communication and planning within the program.

12.3 DEFINITIONS

Definitions in malaria control are to be applied to diseases management as well as selection criteria of Target Population for Vector control. Standard case definitions are required to bring about uniformity in management of cases as well as their reporting, which enables comparability within the same reporting unit over a period of time and across different reporting units. These case definitions are to be used at all levels in the programme.

12.3.1 Case Definitions

Table 12.1 provides case definitions for use in conjunction with indicators related to case detection and management.

Table 12.1: Case definitions used in NVBDCP

	Terms	Definitions
1	**Suspected Malaria**	A patient with fever in endemic area during transmission season, or who has recently visited an endemic area, without any other obvious cause of fever like: 1. Cough and other signs of respiratory infection 2. Running nose and other signs of cold 3. Diarrhoea 4. Pelvic inflammation indicated by severe low back ache, with or without vaginal discharge and urinary symptoms 5. Skin rash suggestive of eruptive illness 6. Burning micturition 7. Skin infections e.g. boils, abscess, infected wounds 8. Painful swelling of joints 9. Ear discharge **However, none of these symptoms exclude malaria with certainty. Only an experienced health functionary can exclude other "obvious causes of fever".**
2	**Clinical Malaria**	A patient with fever in endemic area during transmission season, or who has recently visited an endemic area, without any other obvious cause of fever will be considered as a case of clinical malaria if diagnosis cannot be established within 24 hours and treated accordingly. For ruling out other causes of fever, the following should be looked for.

	Terms	Definitions
		1. Cough and other signs of respiratory infection 2. Running nose and other signs of cold 3. Diarrhoea 4. Pelvic inflammation indicated by severe low back ache, with or without vaginal discharge and urinary symptoms 5. Skin rash suggestive of eruptive illness 6. Burning micturition 7. Skin infections e.g. boils, abscess, infected wounds 8. Painful swelling of joints 9. Ear discharge **However, none of these symptoms exclude malaria with certainty. Only an experienced health functionary can exclude other "obvious causes of fever".**
3	**Uncomplicated malaria (confirmed)**	A patient with fever without any other obvious cause and diagnosis confirmed by microscopy showing asexual malaria parasites in the blood and/or positive rapid diagnostic test (RDT). These cases are recorded as either *Pf* or *Pv*; a case of mixed infection is recorded as *Pf.*
4	**Severe malaria**	A patient, who requires hospitalization for symptoms and/or signs of severe malaria with laboratory confirmation of diagnosis. Severe malaria is clinically characterized by confusion or drowsiness with extreme weakness (prostration). In addition, the following may develop: cerebral malaria; generalized convulsions; pulmonary oedema; severe anaemia; renal failure; hypoglycaemia; metabolic acidosis; circulatory collapse/ shock; spontaneous bleeding; laboratory evidence of DIC; macroscopic haemoglobinuria; hyperthermia; hyperparasitaemia.
5	**Malaria Death**	Death of a patient with severe malaria, defined according to the above criteria. A death can only be medically certified as due to malaria if blood smear and/or RDT have been positive for *P.falciparum*.

Notes:
1. As per the revised Drug Policy (2010) all fever cases suspected for malaria should be investigated by microscopy or RDT. Therefore all efforts should be made to diagnose a suspected case. With the availability of RDTs in remote areas it is possible to confirm

diagnosis in the remotest area. Only in exceptional circumstances where diagnosis by microscopy or RDK is not possible, cases with fever without any other obvious cause should be considered as 'clinical malaria' and treated. All cases diagnosed as Pf malaria should be treated with SP-ACT in the whole country. All P. vivax cases should be treated with full dose of Chloroquine and followed by Primaquine for 14 days

*2. Recent literature points to the possibility of severe malaria in patients with Plasmodium vivax. Although this is very rare, it should be recognized, so cases with only P.vivax may also be recorded as severe, **if they fulfill the clinical criteria**.*

3. If the slide is positive for P.vivax only, death can only be certified as due to malaria by a tertiary level or higher facility, and a case report must be submitted to the State VBDCP for detailed death investigation.

12.3.2 Integrated Vector Control

As per the modified Plan of Operation (MPO) areas recording more than 2 API taking Sub-centre as unit are eligible for Indoor Residual Spray with appropriate insecticide. The Expert Committee (1995) further devised high risk criteria taking village as unit for identification of areas to be sprayed. However, for judicious use of resources and focussed intervention the Technical Advisory Committee (2002) on Malaria has rationalized the criteria for selection of villages for undertaking indoor residual spraying as indicated in the table below.

At present Indoor Residual Spray (IRS) and Bed-nets (ITNs/ LLINs) are the two key vector control interventions used in malaria control. Programme experience, drawn from years of operational problems encountered, has taught that IRS is a cost as well as labour intensive activity. In-depth review conducted by NIMR in the year 2006 also indicates the low coverage rates of IRS. Studies conducted across the globe in malaria endemic regions have shown that the average annual cost of bed-nets is much less than the cost of IRS; however, the use of bed nets requires continuous measures to improve community utilization. The NVBDCP has therefore taken the conscious decision to use either IRS or Bed-nets in a given area which means areas chosen for one method will usually not be covered by the second method of vector control. Therefore the criteria for selection of Target Populations for either method are laid in Table 12.2.

Table 12.2: Selection criteria for Target Population for Vector Control

	Vector Control Method	Target Population
1	IRS	**Areas with API more than 2 are classified as high risk.** The Technical Advisory Committee on Malaria in its meeting held on 30.05.2002 has rationalized the criteria for undertaking indoor residual spraying. These criteria are as follows: • To spray on priority basis all areas taking sub-

	Vector Control Method	Target Population
		centre as a unit, with more than 5 API with suitable insecticides where ABER is 10% or more. • To spray on priority basis with suitable insecticide all areas reporting more than 5% SPR (based on passive collection of blood slides), if the ABER is below 10% • Due priority be accorded for spray if Pf proportion is more than 50%. • To accord priority for IRS in areas with less than API 5 / SPR 5% in case of drug resistant foci, project areas with population migration and aggregation or other vulnerable factors including peri-cantonment area. • To make provision for insecticidal spraying in epidemic situations. • Rotation of insecticides may be done so as to prolong their effectiveness. • Other parameters including entomological, ecological parameters etc., may also be considered while prioritizing areas for spraying. The population must be defined in terms of its size, as well as the no of households. It should be estimates annually **village wise**. It should also be mapped at the beginning of each year.
2	**Bed-nets (ITNs/ LLINs)**	The High risk area requiring vector intervention and 1. difficult for conducting spray operations and supervision of spray activities (remote, inaccessible areas, hilly terrain, forested area etc.) Or 2. areas where bednet usage and acceptability is high, would be covered with ITNs/ LLINs. The unit of area for coverage will be village.

12.4 MONITORING & EVALUATION SYSTEM

The system for monitoring and evaluation of malaria in the country comprises of

1. Routine Health Management Information System (HMIS)
2. Sentinel Surveillance of severe cases and deaths
3. House and Health Facility Survey
4. Central Evaluation
5. Supportive Supervision

The above components provide data on case management, Vector control, programme management, coverage and utilization of services. In addition very specific monitoring for Pf Resistance, Entomological aspects and Quality assurance are carried out. These are however, highly specialized issues and are beyond the scope of this document.

12.4.1 Routine Health Management Information System (HMIS)

The routine Health Management Information System (HMIS) is a series of recording and reporting formats to be maintained and transmitted by different tiers of the health care delivery system. The records and reports are to be maintained in such a way that high quality reliable data is generated from them. This data is the treasure house of information from which a series of indicators are derived at different levels.

12.4.1.1 Recording and Reporting

Integration of all Public Health Programmes and concerted service delivery under the umbrella of NRHM along with changing data and information needs of NVBDCP have prompted the revision and simplification of the HMIS. New interventions like RDTs, ACT, ITNs which have been recently introduced, are expensive inputs into the programme and it becomes important to closely monitor their utilization. Reporting on training activities, field visits, logistics & LQAS are to be done as part of Programme management Monitoring. For the purpose of routine recording and reporting the following M Formats and VC1 to VC 4 Formats and Programme Management Monitoring Report are used.

1. Case Detection and Management

- M Register : M Register for ASHAs/ CHV
- M1 : Fortnightly Report of Fever Cases by MPW/ Health facility
- M2 : Laboratory Request for Slide Examination
- M3 : Record of slide Examination in PHC Laboratory
- M4: Fortnightly Report of Cases From Subcentre/ PHC/ District/ State (Health facility)
- M4: Fortnightly Report of Cases - Provider wise

2. Integrated vector Control

- VC1: Primary record of IRS
- VC1S: Wall Stencil

- VC2: District IRS output Form
- VC3: Primary record of bednet delivery and impregnation
- VC 4: Bednet Delivery and Impregnation form
- VC 5: District Annual Stock report on vector control supplies
- VC-6. IVM Plan - Block level

3. Programme management Monitoring Report

An overview of these records and reports is provided below:

12.4.1.2 Case Detection and Management

The recording and reporting of cases is done in the following forms:

- M Register : M Register for ASHAs/ CHV
- M1 : Fortnightly Report of Fever Cases by MPW/ Health facility
- M2 : Laboratory Request for Slide Examination
- M3 : Record of slide Examination in PHC Laboratory
- M4: Fortnightly Report of Cases From Subcentre/ PHC/ District/ State (Health facility)
- M4: Fortnightly Report of Cases - Provider wise

Forms M, M1, M2 M3 and M4 of the HMIS are concerned with case-management data and are given in **Annexure1-6.**

1. M Register : M Register for ASHAs/ CHV

Whenever an ASHA/ FTD holder sees a patient having fever, the details of the patient should be recorded in M Register of ASHA.

Which cases should be recorded in this form?

All new cases of fever coming to ASHA/ FTD are recorded in Malaria (M) Register for ASHA:

Both, positive and negatively tested cases should be recorded. Even if the patient is not tested for any reason, the details of the patient should be recorded in M Register. Even those cases where the patient does not belong to her village, but may only be a visitor, should be recorded in M Register. Any patient, with fever suspected to be suffering from malaria is to be entered in M Register. At the end of the month, ASHA will provide the total of column numbers 5&6 for total suspected cases, column number 8 for RDT positive, column numbers 8,9&10 for Total positive (RDT& slide)

How are cases to be recorded in each M Register?

M Register is meant for recording patients of fever seen in one reporting year. Serial numbers of Patients begin fresh each year and continue over following months. For each month a new page in M Register is started.

Filling of the M Register form:

When starting to use a fresh page at the beginning of the month, first fill out the name of the block, subcentre & Village, name of ASHA, her code and the name of the reporting month and year at the top of the form.

When a patient of fever comes the form is filled up in the following manner:

Column 1: S. No./ Slide No. : is the serial number of the patient. The serial numbers begin fresh each year and continue over the months till the end of the year. This number is also applicable when labeling the sides/ RDTs. On the thin film of slide and RDT the unique identification number is to be written. This is PHC code/ ASHA Code/ S. No. With this unique identification number it is possible to ascertain precisely which ASHA prepared a particular slide/ RDT.

Column2: Name of the Head of family: This is the name of the person by whom the family is known in the village.

Column 3: Name of the Patient: This is the name by which the patient is known in the village, and it may include the name of the patient's father or husband, and the family name or surname.

Columns 4: Age, in completed Days, Months or Years: Write the age in completed months or years:
-If the patient is less than one month old, write the number of completed days in the column and put a D along side. (such situations will be very rare)
-If the patient is more than one month old but less than one year old, write the number of completed months and put an M
-If the patient is more than one year old, write the number of completed years.

Column 5 and 6: Sex and pregnancy status: Tick the appropriate column - "M" or "F" for sex of the patient. If the woman is pregnant, write P after ticking in the F column.

Column 7: Date of RDT/ slide: All patients of fever should have a blood test as soon as possible. ASHAs would need to perform an RDT and/or slide test. The date on which the test was performed needs to be recorded in column 7. Usually, this is the date on which the patient first came. Record the date, month and year, for example, "23.09.09" or "23.09.2009". In areas where RDTs are supplied, an RDT is done and slide is made at the same time.

Column 8: RDT Positive: If you have performed an RDT, and it is positive, put a plus (+) in red; if negative, put a dash (-). If you have not performed an RDT, put a cross "X" in this column. In case the RDT is positive, the side is not sent to the lab immediately. The RDT and slide are, however, preserved for quality assurance.

Column 9 & 10: Result of slide testing (Pv and Pf +ve/-ve): The report of the slide examination that is received from the lab should be entered in these columns. If it is positive for P falciparum write +; if negative, write – in column 9; if positive for P vivax write +, if negative, write – in column 10.

Columns 11: Date of starting treatment: the date of initiation of treatment is to be recorded like date, month and year, for example, "25.09.09" or "25.09.2009".

Columns 12, 13, 14, 15, 16, 17, 18: Treatment Given Pf/ Pv: medicines are administered according to the test result and according to the age of the patient,

referring to the dosage chart in the Register. In these columns, tick mark (√) the day for which dose has been administered.

Column 19: Date of completion of treatment: the date of completion of treatment is to be recorded like date, month and year, for example, "27.09.09" or "27.09.2009" for a 3 day treatment for Pf which started on 25.09.09. The date of completion of treatment in Pv cases should be the date on which the last dose of PQ was administered.

Column 20: Date of Referral: If the patient is pregnant, or exhibits signs of severe malaria, refer the patient and mention the date of referral. Write R for referred cases.

Column 21: if died, date/ place: in case of death of patient the Date/ Place of death is to be mentioned.

Reporting at the end of the Month.

1. **Add columns 5 and 6 to find the total suspected cases (M and F).** Fill this figure in the box indicated
2. **Add column 8 and write down the total RDT positive cases.**
3. **Add positive cases (from columns 8, 9 and 10) to find the total number of confirmed cases.**

Stock Position:

Whenever medicines are received or supplied from the MPW or from the PHC, enter the number of tablets or blisters received in the relevant columns in the row "Received during the month" in the page on Stock Keeping given at the end of M Register.

At the end of the month, count the number of tables or blisters of each type remaining and enter these numbers in the relevant columns in the row "In stock at end of the month".T he stock at the 'end of the month' becomes the 'opening balance at the beginning' of the following month.

2. Fortnightly Surveillance Report of Fever Cases by MPW/ Health facility (M1)

This is the primary case record for all suspected malaria cases i.e it is actually a line list of all fever cases to be maintained by MPW and MO or any other health facility screening fever cases for malaria. This form is to be filled by any health facility/ worker which are directly involved in case detection and treatment. In M1 too, each row corresponds with one patient record. Serial No is filled in column 1 which is started fresh each month.

- Details of village, village code, name of fever case and Head of Family are entered in Col 2 to 5. Each village and provider will be assigned a code which is to be retained once and for all. In exceptional cases where a fever case is a visitor to the village, 991/ 992 is filled in the respective Col.
- Whether collection is through Active / Passive case detection is filled as A or P in Col 6. For all purposes the ASHA/ CHV/ MO PHC will be passive agencies. Therefore in these cases the entry in Col 6 will be always P. It is only an MPW who can be involved in both types of collections. Fever cases coming to the MPW on their own will be entered as P while fever cases detected actively will be entered as A.

- Age is entered in Years/ months. Sex is to be entered as M for Male or F for Female. Duration of fever, date of RDT/ BSC, Slide No, sending and receipt of slides, result of examination of slides and RDTs, date of start of treatment, Nos of Tablets, referral and deaths if any are to be sequentially entered in the form.
- If the RDT is positive, the blood slide need not be sent for examination and therefore Col 14 to 18 are to be skipped and are simply slashed (/).Treatment in such cases is started immediately for Pf.
- In cases where RDT is negative blood slide is sent for examination. The result of RDT or slide should be entered by ASHA/ Health Worker/ MO in column 13, 17 & 18 of M1. Any positive test result is to be marked in red with a tick (√).
- Slide No is started fresh at the beginning of each year and continued over the subsequent months. In areas where RDTs are not supplied and RDTs have not been done column 13 is simply marked with a cross (X).
- In case of Blood slide the date of dispatch of slide and receipt of result are entered in column 15 and16. This will indicate the time lapse between the date of slide collection and receipt of results. During supervisory visits the time lag between slide collection or RDT and initiation of treatment should be identified.
- Col 18 denotes whether a women in reproductive age group is pregnant. If the answer is in affirmative it is to be marked with a tick (√).
- Depending upon the species, ASHA/ Health worker/ MO will decide the anti-malarials to be administered. The date of starting treatment will be entered in column 20. Suppose ACT has been selected then Number of Tablets/ blisters will be entered in column 21 while in columns 22 to 27 a cross (X) is put.
- Mark a tick (√) in column 28, if severe malaria is suspected. In column 29, date of referral of pregnant women suffering from malaria or severe malaria cases is entered. Date of deaths is entered in column 30.
- The lower part of the form consists of record of logistics. Opening balance at the beginning of the month, stock received, utilization and closing balance should be entered by ASHA or other service providers after physical verification of stocks.
- The ASHA/ CHV will fill M1 in duplicate and at the end of the fortnight, after allowing for 7 days for completion of patient records of the last few days of the reporting fortnight will forward the form to the Subcentre.
- In the middle of M1, the MPW will enter the summary of cases.
- The MPW will compile M4-SC by compiling the M1 of all ASHAs and adding his/ her own M1.

3. Laboratory Request Form for Slide Examination (M2)

Fever cases are diagnosed using RDT and/ or Blood Slide. In areas where RDTs are supplied, RDT and Blood slide are done at the same time. However, only if the RDT is negative, the blood slide is forwarded to Lab for further examination. Areas where RDTs are not supplied also rely on microscopy for diagnosis. M2 ie the Laboratory Request Form for Slide Examiantion, is filled in duplicate by ASHA/ CHV/ MPW whenever blood slides need to be sent to the Lab. In this form Col 1 to 7 are filled from M1 by ASHA/ CHV/ MPW. It is to be sent to PHC lab whenever required. Eg if 2 slides collected by an ASHA in a day, need to be examined, they are entered into M2 and sent to PHC Lab. The result of microscopy and feed back on smear quality are filled by the LT. All efforts should be made by LT to examine the slides on the day of receipt or the following day and send the results back to ASHA/ CHV/ MPW on the same day as examination of blood slides. The results obtained are entered into M1 by ASHA/ CHV/ MPW.

How to give Slide Nos:

All PHCs and MPWs/ ASHAs/ CHVs are to be given a unique code for identification as follows:

a. PHC Code: is given by first and last alphabet of the name of PHC where blood slides are collected eg. The code of Sundargarh PHC in Orissa will be SH.
b. ASHA/ CHV Code: all the ASHAs/ CHVs in the PHC area are to be serialized like 01,02,03…….the code of the ASHAs will therefore be, PHC cd./ ASHA serial no. eg ASHA no. 10 in Sundergarh PHC will be given the code SH/ 10.
c. Serial no. of blood slides: all the slides collected by the ASHA should be given serial no. which will run serially through the calendar year. It is used in identification as well as labeling of slides. This serial number is written after the PHC and ASHA code on the slide. Eg. Slide number 35 of ASHA number 10 in PHC Sundergarh will be written as SH/ 10/ 35.
d. RDT Code: The RDT which is done along the slide will also have the same code as is given to the blood slide

Similar system of coding is to be followed for all categories of Health Workers in the area involved in screening of fever cases.

All fever cases which approach the ASHA/ MPW/ CHV will be screened using RDT and blood slides. Fever cases which turn out to be RDT positive will be provided treatment immediately and the positive RDT along with the blood slide is to be stored by ASHA/ MPW/ CHV for Quality Assurance (QA) at a later date. For cases which are RDT negative, the ASHA will send blood slides to laboratory and upon receipt of result, positive cases will be treated by ASHA as per the drug regimen.

Transport of slides & result of slides

The slides collected by ASHAs/ private providers/ community health volunteers will be delivered at subcentre by them or by any of their representative on day to day basis which shall be transported to the PHC lab preferable biweekly, by MPW (M) and MPW (F). The results will be conveyed back by MPW (M) and MPW (F) to these providers in subsequent visit.

3. Record of slide Examination in PHC Laboratory (M3)

M3 is the Subcentre wise record, of slides examined in the PHC Lab. Slides reach the lab from the ASHA/ CHV/ MPW of the SC area. Slides will also be collected and examined for suspected malaria cases referred from the PHC OPD. Therefore at the beginning of each year, the M3 register is divided into sections for different subcentres as well as PHC OPD. In each subcentre section Serial Nos are started fresh at the beginning of each year. Record of slides sent along with M2 is entered serially into M3. As soon as M2 is received Col 3 to 10 are entered from M2 followed by the date of receipt. The date on which the slides are examined is entered in Col 2. The slide results are entered in Col 12, 13. The remarks column can indicate the quality of smear and other information like reasons of delay in examination.

4. **Fortnightly Report of Cases (M4)** is a village-wise/ subcentre wise fortnightly consolidation of all M1 forms belonging to a subcenter/ PHC area. From the M register of ASHA/ CHV the MPW will replicate an M1 after 7 days of completion of the reporting fortnight. The MPW then compiles all M1s of his subcentre area into M4. During compilation the Subcentre MPW will fill out aggregates of each health care provider in Subcentre area in one row and in the last row enter the compilation of his own M1. The report is made in triplicate and 2 copies are forwarded to PHC on the 25th of the month for the 1st fortnight and 10th of the following month for the 2nd fortnight. The PHC does a Subcentre wise compilation in a similar M4 format and in the penultimate row enters the consolidation of PHC M1. The PHC forwards its M4 along with one copy of M4s submitted by Subcentres on the 28th of the month for the 1st fortnight and 13th of the following month for the 2nd fortnight, to the district. The district further compiles this data and sends a PHC wise report to the state on the 30th of the month for the 1st fortnight and 15th of the following month for the 2nd fortnight. The state will send the compiled report to the Centre on the 5th of the following month and 20th of the following month for the 2nd fortnights. The district is required to enter Subcentre wise data from M4 of PHCs into NAMMIS as soon as the reports are received to avoid delay in transmission of reports.

5. **M4: Fortnightly Report of Cases - Provider wise:** this provider wise M4 is to be compiled similar to the M4 (Health facility wise), based on the M1 reports from all reporting units. The only difference being that it is to be compiled according to the category of service providers like ASHA, health facility and private providers eg. All ASHAs of the SC or PHC area are to be compiled together. This would provide a fair estimate of the cases being diagnosed and treated by each category of health provider.

   All private providers/ community health volunteers will provide their M Register to the MPW at the end of the reporting fortnight/ month. The MPW will prepare M1 of all private providers/ community health volunteers in the area of a sub-centre, collate these into the M4 report of the sub-centre and also prepare the M4-provider wise.

12.4.1.3. Integrated Vector Control

The Vector Control Formats (**Annexure 7-13**) are to be utilized for the purpose of reporting of Vector Control activities undertaken during the transmission season.

1. **Primary Record of IRS (VC 1)**

   This record is to be maintained by the Spray supervisor/ Superior Field Worker (SFW) and is a house wise record of spray activity undertaken in the village. One such record is maintained for each Village in each round. VC 1 is submitted to MPW within one week of completion of the respective IRS round as per schedule. The details on village name, village code, date of spray, Round, Spray squad No, Spray supervisor are to be entered in the left upper corner of the format. Similarly summary of the coverage is given in the right upper corner of the format. The lower part consists of the house wise log of room coverage. As soon as IRS is completed in the village VC1 format is submitted by the Superior Field Worker (SFW) to the PHC-MO

where a village and subcentre wise compilation is done by PHC-MO with assistance from the Health Supervisor.

2. Wall stencil (VC 1S)

Wall stencil (VC 1S) is to be written by SFW on each house after the house has been sprayed. Date, round, insecticide and Squad No. are written as applicable. In SR/ TR the No of rooms sprayed/ Total no of rooms, is entered.

3. IRS Output Form (VC2)

The IRS Output Form (VC 2) is the IRS report to be generated by the PHC & District. It is a village/ Subcentre/ PHC wise compilation of VC1 formats received from the SFWs. As soon as the VC 1 of a village is received, the entire information is transferred into VC 2. It is to be filled in duplicate. Once the spray is completed in the PHC area all the VC1s should be entered into VC2. The PHC-MO shall submit one copy of VC 2 within 15 days of completion of spray in the PHC area to the district and the second copy is retained by the PHC. The DMO shall do a similar PHC wise compilation at the district and send the report within 15 days to the State. The state level report should reach NVBDCP within 45 days of completion of the Round.

4. Primary record of bed net delivery and impregnation (VC3)

The Primary record of bed net delivery and impregnation (VC3) is village level record of bednets available in the households and the details of house wise distribution and impregnation of nets. Prior to the onset of the transmission season the MPW (M) with assistance from ASHA/ AWW/ CHVs will undertake a survey in villages of his subcentre area to enumerate the no. of nets available at the household level. The top left corner of the form pertains to information on the dates of survey, impregnation & distribution of bed nets, village name, SC etc. The house wise details of activities are listed in the middle part. The total requirement of bednets in each household is listed in Col. 4. House wise enumeration of ITNs and LLINs available at the beginning of the current year is done in Col. 5 & 6. This information is filled based on the information available from village survey undertaken by MPW (M). Col 7 & 8 pertain to the actual no. of ITNs/ LLINs distributed in the village in the current year. The total no. of ITNs (available in Col. 5 & 7) in each house impregnated in the current year is entered in col. 9. Based on the no. of bed nets available, distributed and impregnated the no. of effective bed nets in each house hold is estimated in col. 10. The top right corner is a summary of bed net coverage in which % houses with at least two effective nets is entered. The stock status of synthetic pyrethriods is summarized in the lower part of this form.

5. Bednet Output Form (VC 4)

Bednet Output Form (VC 4) is a village/ subcentre/ PHC wise compilation of Bednet impregnation and distribution activities. The village level VC3 is submitted by MPW (M) to the PHC at the completion of bed net distribution and impregnation activities. As soon as VC3 from a village is received it is entered in VC 4. VC4 is filled in duplicate. This report of monthly LLIN distribution in the PHC is to be furnished to the district at the end of each month by the 7th of the following month.

Once all the LLINs have been distributed in the PHC area, the completed VC4 format (for the entire distribution campaign) is sent to the DMO within 15 days of completion of all activity. One copy is retained at the PHC for its own record. The DMO consolidates these reports in next 15 days and sends it to the state. The State should compile and forward the report to NVBDCP. The state report on Bednet Delivery and Impregnation should reach NVBDCP within 45 days of completion all activity in the state.

6. District Annual Stock report on Insecticides (VC 5)

The district should furnish the detailed PHC wise stock report on insecticide usage during the year in VC 5. The report corresponds with the Calendar year (1st January to 31st December). The columns are self explanatory. The report should be compiled by the district from PHC stock registers within 15 days of completion of the reporting year. The state should compile and forward the report within 30 days of completion of reporting year to NVBDCP. Eg The Annual Stock Report on Insecticides for the year 2008 should reach NVBDCP by 31st January of 2009.

7. District LLIN Log (VC 6)

Data on annual distribution of LLINs is entered into District LLIN Log (VC6) at the end of each year from VC4. For the annual planning, the cumulated number of LLINs is calculated from VC6. For LLINs with an expected effective life of 3 years sum the numbers distributed over the last 2 years is taken. Eg. when planning for 2011, the numbers distributed in 2009 and 2010 should be used (LLINS distributed in 2008 will expire during 2011 and must be replaced). For LLINs with an expected effective life of 5 years sum of the numbers distributed over the last 4 years is taken. Eg. when planning for 2011, the number distributed in 2007-2010 are added. LLINs delivered through ANC must also be included. If LLINs with two different durations are included, use two separate forms for keeping log. Besides when planning for LLIN distribution, the village level bednet surveys undertaken to enumerate the nos existing in each village also needs to be undertaken.

12.4.1.4 Programme Management Monitoring Report (PMMR)

This report is to monitor progress made on different programme processes and other management issues. Update on Training status of the staff as well as the trainings conducted, field visits & reviews conducted and reviews undertaken as well as situation of logistics & stock outs are to be provided on a quarterly basis. The report is given in **Annexure 14.** It has the following three sections:

Part A: Field visits & reviews
Part B: Quality of service delivery
Part C: Training Activity
Part D: BCC Activity for Malaria Control
Part E: Status of Logistics

This report will also contain data collected by Malaria Technical supervisors through Lot Quality Assurance Sampling (LQAS) based surveys. The report is generated by the district at quarter ending and sent to the State by the 15th of the month following the quarter. The Quarterly State level report should be compiled and should reach NVBDCP

by the 21st of the month following. Eg for the 1st Quarter 2009 (1st Jan – 31st Mar 09) the district should forward the report to the state by 15th April 09 and the state should send its report to NVBDCP by 21st of April 09.

Data Quality

Under the programme it is important to ensure that the data collected through reports should be complete, accurate and consistent. This is possible only when records are maintained immaculately on a regular basis and a system of verification of reports exists. Therefore, the quality of data is the responsibility of the Officer Incharge/ signing authority. Whenever reports are complied the signing authority should validate a sample of records and reports e.g. the BMO should recheck the compliation of M4 of all Subcentres into M4 at PHC each month. It is also necessary to verify data during onsite visits of villages, subcentres and districts. During field visits the supervisory staff like MTS, PHC/ District /State/ Centre level personnel should make an effort to crosscheck M1 for the individual patient records and visit patients diagnosed and treated in the previous month. Similarly a sample of reports should also be reworked from the records to check for their validity. The reports should also be tracked for timeliness and complete each time they are received. The time schedule for each report is mentioned in **Table 4**.

S. No.	Report	Time Schedule
1	Fortnightly Report by ASHA/ Community Health Volunteer/ MPW/ PHC (M1)	Ist Fortnight- 21st of the month IInd Fortnight- 7th of following month
2	Fortnightly Report of cases (M4-SC)	Ist Fortnight- 25th of the month IInd Fortnight- 10th of following month
3	Fortnightly Report of cases (M4 PHC)	Ist Fortnight- 28th of the month IInd Fortnight- 13th of following month
4	Fortnightly Report of cases (District)	Ist Fortnight- 30th of the months IInd Fortnight- 15th of following month
5	Fortnightly Report of cases (State)	Ist Fortnight- 5th of the months IInd Fortnight- 10th of following month
6	IRS output (VC2) – Round wise	PHC– 15 days of completion of Spray Dist.–30 days of completion of spray State- 45 days of completion of Spray
7	Bednet Delivery and Impregnation form (VC 4)	PHC–15 days of completion of activity Dist. – 30 days of completion of activity State - 45 days of completion of activity
8	District Programme Management Monitoring Report (PMMR)	15th day of the following quarter
9	State Programme Management Monitoring Report (PMMR)	21st day of the following quarter

Feedback Mechanisms, Data sharing and Transparency

There should be a two way flow of information in any system of data management. Therefore, a system of preliminary traking of reports for data timeliness, completeness and consistency should be in place and a system for prompt feedback on such discrepancies observed should be establised at all levels. Beside this there should be timely review of all reports received on epidemiological and programme management aspects. Any unusual deviation in various monitoring parameters should be communicated to the reporting units. The Centre/ State/ District / PHC should establish this system through regular letters and e-mails, with their respective reporting units to notify the observations made. The reporting unit should respond within one week to such correspondence with required clarifications.

The centre/ district and state should also come up with Annual reports for the reporting units which should be widely disseminated.

12.4.1.5 Monitoring Indicators

The data collected through the system of HMIS consists of volumes of information and is used to assess the performance of the programme at the local level. The monitoring indicators that are used in the programme are given in the **Table 12.3:** There is a complete range of indicators reflecting programme areas like case finding, disease burden, programme management etc. The requirement of indicators, at each level of health care delivery, is very specific. At the lower levels like PHCs and Districts indicators are utilized for local decision making while at the National level they are more relevant for policy making and assessing the overall progress.

A complete list of levels of health care delivery along with the indicators to be determined at each level is laid down in **Table 12.4.** Each level of health care delivery is to be encouraged to analyse data based on these recommendations on a regular basis.Therefore when visiting a health facility the MTS should assess the situation based on the prescribed indicator at each level. Such an analysis should also be discussed with the health care providers at the respective level to objectively show to them the performance evaluation. Eg an ASHA can be shown that the No of Pf cases is rising or more No of deaths are being reported than the previous year. Therefore she should focus more on timely case detection. One of the suggestions given to her by MTS could be increased advocacy in the community to improve its health seeking behaviour for fever.

Table 12.3: Monitoring Indicators used in malaria control					
S. No.	**Area**	**Indicator**	**Definition**	**Frequency**	**Source of Indicator**
A.	**SURVEILLANCE**				
1.	Surveillance/ case finding	No of Fever cases No of Malaria cases No of Pf cases	Fever cases screened Malaria cases diagnosed Pf cases diagnosed	Fortnightly/ Monthlly/ Annual	M1, M4-SC, M4-PHC
2	Surveillance/ case finding	Monthlyl Blood Examination Rate (MBER) (should be more than 1%of population during the transmission season)	Number of blood smears examined & RDTs positive in a Month / Total Population X 100	Monthly	M4-SC, M4-PHC
3	Surveillance/ case finding	Annual Blood Examination Rate (ABER) (expected to be more than 10%of population)	Number of blood smears examined & RDTs positive in a year / Total Population X 100	, Annual	M1, M4-SC, M4-PHC
4	Disease burden & impact	Annual Parasite Incidence (API)	Total No. of positive blood smears & positive RDTs for malaria Parasite in a year / Total Population X 1000	Annual	M1, M4-SC, M4-PHC
5	Disease burden & impact	Annual Falciparum Incidence (AFI)	Total No. of blood smears & RDTs positive for Pf malaria Parasite in a year / Total Population X 1000	Annual	M1, M4-SC, M4-PHC

6	Disease burden & impact	Test Positivity rate (TPR) (Test = Slide+RDT) Is independent of surveillance activity, therefore a better indicator for impact assessment	Total No. of positive blood smears & positive RDTs for malaria Parasite / Total No. of blood smears examined & positive RDTs X100	Monthly, Cumulative for the year	M1, M4-SC, M4-PHC
7	Disease burden & impact	Test falciparum Rate (TfR) It is independent of surveillance and indicates Pf preponderance	Total No. of blood smears & RDTs found Positive for ***P.falciparum /*** Total No. of blood smears examined & positive RDTs X 100	Monthly, Cumulative for the year	M1, M4-SC, M4-PHC
8	Disease burden & impact	Pf Percentage (Pf %) Indicates trends in proportion of cases due to Pf out of total cases	Total No. of blood smears & RDTs found Positive for ***P.falciparum /*** Total No. of positive blood smears & positive RDTs for malaria parasite X 100	Monthly, Cumulative for the year	M1, M4-SC, M4-PHC
B.	**INPUT**				
1	Input	% of Staff in Place (ASHA, MPW, MTS, LT, DVBD Consultant)	No of Staff In place/ Total no of Staff Sanctioned X 100	Quarterly, Annual	PMMR
2	Input	Nos of RDTs & ACTs Planned versus Received & used	• Number of RDTs Planned to be used • Number of RDTs received • Number of RDTs used	Annual	M1, M4-SC, M4-PHC PMMR

			• Number of ACTs Planned to be used • Number of ACTs received • Number of ACTs used • Number of functional microscopes		
3	Input	% of spray Equipment in working condition	No of Spray Equipment in Working Condition/ No of Spray Equipment Present X 100	Annual (Pretransmission)	VC 2
4	Input	% of Spray squads engaged	No of Spray squads engaged / No of Spray squads required X 100	Annual (Pretransmission)	VC 2
C.	**PROCESS**				
1	Process	BCC Activities	No of BCC/ IEC Activities eg meetings, rallys, exhibitions, street plays, miking, posters/ pamphlets, wall paintings, etc.	Quarterly, Annual	PMMR
2	Process	% of facilities (SC and PHC) / village level functionaries (ASHA, AWW) reporting stock-out of antimalarials during the fortnight	No of Health facilities reporting Stock outs in the previous fortnight/ No of Health facilities X 100	Fortnightly	M4-SC, M4-PHC
3	Process	% of MPHW/ASHA/other	Total No of MPW/ ASHA/	Quarterly, Annual	PMMR

		volunteers trained for use of RDT / ACT (calculated separately for different staff)	other volunteers trained for use of RDTor ACT / Total No of MPW/ ASHA/ other volunteers X 100		
4	Process	% of Diagnostic facilities functional with microscopy/RDT in the last reporting period	Total No of PHCs/ Pvt Sector Centres with functional microscopy X Total No of PHCs/ Pvt Sector Centres X 100	Quarterly, Annual	PMMR
5	Process	% of Community level facilities RDT in the last reporting period	ASHA/ other community volunteers equipped with RDT ÷ Total ASHA / other community volunteers X 100	Quarterly, Annual	PMMR
D	**OUTPUT**				
1	Output	Distribution of ACT	No of Pf cases treated with ACT	Quarterly, Annual	M1, M4-SC, M4-PHC
	Output	Distribution of ACT	No of severe cases treated with inj arte-ether		
2	Output	Bed Nets distributed	Number of nets distributed	Quarterly, Annual	VC-4
3	Output	Bed Nets treated	Number of nets treated	Quarterly, Annual	VC -4
4	Output	Insecticide use Average insecticide per bednet	• Volume of Insecticide used for treatment of Bednets • Volume of insecticide	Annual	PMMR

			used for bednet treatment/ No of bednets treated • Volume of insecticide used for IRS		
E	**OUTCOME**				
1	Outcome	% of Eligible population Covered by ITN Should be 80% or more	No of Eligible population X 2.5 / Eligible population X 100	Annual	VC 4
2	Outcome	% of Eligible villages with more than 80 % population Coverage with ITNs	No of Eligible villages with more than 80% coverage with ITNs / No of Eligible villages X 100	Round wise, Annual	VC 2
3	Outcome	IRS Coverage – Population (%) Should be 80% or more	Population covered with IRS / Total Eligible population X 100	Round wise during transmission season	VC 2, VC 3
4	Outcome	IRS Coverage – Rooms %	Rooms sprayed in houses Covered/ Total no of Rooms Targeted X 100	Round wise during transmission season	VC 2, VC 3
5	Outcome	% of fever cases with access to prompt diagnosis & treatment	Fever cases who were tested for malaria by microscopy or RDT with a positive test result and were started on treatment no later than the next day with ACT/ Total no of	Quarterly/ half yearly	PMMR Based on LQAS

			fever cases who were tested for malaria by microscopy or RDT with a positive test X 100		
6	Outcome	% households adequately protected by personal protection methods	House holds in which beneficiaries reported having slept under ITNs or LLINs previous night/ Total No of houses with bednets X 100	Quarterly/ half yearly	PMMR Based on LQAS
7	Outcome	% of PHCs with acceptable level of utilization of ITNs/ LLINs	PHC sampled in which utilization of ITNs/ LLINs was more than 80%/ PHCs sampled for utilization X100	Quarterly/ half yearly	PMMR Based on LQAS

Table 12.4: Monitoring at each tier of Health Care Delivery

S. No.	Health Care Level	Programme Area	Indicator (Source of Indicator)
1.	**Village - ASHA/ other Community Volunteer**	Surveillance/ case finding	- No of Fever cases **(M1)** - No of Total Malaria cases **(M1)** - No of Pf cases **(M1)** - No of RDTs used **(M1)** **- No of slides sent to laboratory (M1)** - No of ACT Blister Packs used **(M1)**

		Programme Management (Inputs, Process, Outputs)	**- No of bednets impregnated** - No of houses assisted in acceptance of spray operations
2.	**Subcentre – MPW (M)/ MPW(F)**	Surveillance/ case finding	- No of Fever cases **(M4-SC)** - No of Malaria cases **(M4-SC)** - No of Pf cases **(M4-SC)**
		Programme Management (Inputs, Process, Outputs)	- MPW in position **Yes/ No** - Trained MPWs Present **Yes/ No** - No of RDTs received & used **(M4-SC)** - No of ACT Blister Packs received & used **(M4-SC)** - No of ITNs/ LLINs distributed **(VC 4)** - Bednets Treated **(VC 4)**
		Outcome	- IRS Coverage – Population (%) **(VC 2)** - IRS Coverage – Rooms (%) **(VC 2)** - % of Eligible population Covered by ITN**(VC 4)**
3	**PHC**	Surveillance/ case finding	- Monthly Blood Examination Rate (ABER) **(M4-PHC)** - Annual Blood Examination Rate (ABER) **(M4-PHC)**
		Disease Burden/ Impact	- No of Fever cases **(M4-PHC)** - No of Malaria cases **(M4-PHC)** - No of Pf cases **(M4-PHC)** - Annual Parasite Incidence (API) **(M4-PHC)** - Annual Falciparum Incidence (AFI) **(M4-PHC)** - Test Positivity rate (TPR) **(M4-PHC)** - Test falciparum Rate (TfR) **(M4-PHC)** - Pf Percentage (Pf %) **(M4-PHC)**

		Programme Management (Inputs, Process & Outputs)	- No of RDTs received & used **(M4-PHC)** - No of ACT Blister Packs received & used **(M4-PHC)** - % of MPHW/ASHA/other volunteers trained for use of RDT / ACT **(PMMR)** - % of Diagnostic facilities functional with microscopy/RDT in the last reporting period **(PMMR)** - % of spray Equipment in working condition **(VC 2)** - Insecticide use **(VC 2, VC 5)** - No of ITNs/ LLINs distributed **(VC 4)** - No of BCC Activities **(PMMR)**
		Outcome	- IRS Coverage – Population (%) **(VC 2, VC 3))** - IRS Coverage – Rooms (%) **(VC 2, VC 3)** - % of Eligible population Covered by ITN **(VC 2, VC 3)** - % of Eligible villages with more than 80 % population Coverage with ITNs- Bednets Treated **(VC 4)** - % of house holds in which beneficiaries reported having slept under ITNs/ LLINs previous night **(PMMR)** - % of fever cases who were tested for malaria by microscopy/ RDT with a positive test result for RDT and were started on treatment no later than the next day with ACT **(PMMR)**
4	**District**	Surveillance/ case finding	- Monthly Blood Examination Rate (ABER) **(M3)** - Annual Blood Examination Rate (ABER) **(M3)**

		Disease Burden/ Impact	- No of Fever cases **(M4)** - No of Malaria cases **(M4)** - No of Pf cases **(M4)** - Annual Parasite Incidence (API) **(M4)** - Annual Falciparum Incidence (AFI) **(M4)** - Test Positivity rate (TPR) **(M4)** - Test falciparum Rate (TfR) **(M4)** - Pf Percentage (Pf %) **(M4)**
		Programme Management (Inputs, Process & Outputs)	- Full Time DVBDCO/ DMO **Yes/ No** - No of RDTs Planned versus received & used **(M3)** - No of ACT Blister Packs Planned versus received & used **(M3)** -% of facilities (SC and PHC) / village level functionaries (ASHA, AWW) reporting stock-out of antimalarials lasting more than 15 days during the quarter **(PMMR)** - % of Staff in Place (ASHA, MPW,MTS, LT, DVBD Consultant) **(PMMR)** - % of MPHW/ASHA/other volunteers trained for use of RDT / ACT **(PMMR)** - % of Diagnostic facilities functional with microscopy/RDT in the last reporting period **(PMMR)** - % of spray Equipment in working condition (**VC 2**) - % of Spray workers trained (VC ----) - Insecticide use (**VC 2, VC 6**) - No of ITNs/ LLINs distributed **(VC 4)** - No of BCC Activities (**PMMR**)
		Outcome	- IRS Coverage – Population (%) **(VC 2)** - IRS Coverage – Rooms (%) **(VC 2)** - % of Eligible population Covered by ITN (**VC 4**) - % of Eligible villages with more than 80 % population Coverage

			with ITNs- Bednets Treated **(VC 4)** - % of house holds in which beneficiaries reported having slept under ITNs/ LLINs previous night **(PMMR)** - % of fever cases who were tested for malaria by microscopy/ RDT with a positive test result for RDT and were started on treatment no later than the next day with ACT **(PMMR)** - % of PHC sampled in which utilization of ITNs/ LLINs was more than 80% **(PMMR)**
5	**State**	Surveillance/ case finding	- Annual Blood Examination Rate (ABER) **(M3)**
		Disease Burden/ Impact	- No of Fever cases **(M4)** - No of Malaria cases **(M4)** - No of Pf cases **(M4)** - Annual Parasite Incidence (API) **(M4)** - Annual Falciparum Incidence (AFI) **(M4)** - Test Positivity rate (TPR) **(M4)** - Test falciparum Rate (TfR) **(M4)** - Pf Percentage (Pf %) **(M4)**
		Programme Management (Inputs, Process & Outputs)	- Full Time SPO **Yes/ No** - No of RDTs Planned versus received & used **(M3)** - No of ACT Blister Packs Planned versus received & used **(M3)** -% of facilities (SC and PHC) / village level functionaries (ASHA, AWW) reporting stock-out of antimalarials lasting more than 15 days during the quarter **(PMMR)** - % of Staff in Place (ASHA, MPW,MTS, LT, DVBD Consultant) **(PMMR)** - % of MPHW/ASHA/other volunteers trained for use of RDT / ACT **(PMMR)**

			- % of Diagnostic facilities functional with microscopy/RDT in the last reporting period **(PMMR)** - % of spray Equipment in working condition (**VC 2**) - % of Spray workers trained (VC--) - Insecticide use (**VC 2, VC 6**) - No of ITNs/ LLINs distributed **(VC 4)** - No of BCC Activities (**PMMR**)
		Outcome	- IRS Coverage – Population (%) **(VC)** - IRS Coverage – Rooms (%) **(VC 2)** - % of Eligible population Covered by ITN (**VC 4**) - % of Eligible villages with more than 80 % population Coverage with ITNs- Bednets Treated **(VC 4)** - % of house holds in which beneficiaries reported having slept under ITNs/ LLINs previous night **(PMMR)** - % of fever cases who were tested for malaria by microscopy/ RDT with a positive test result for RDT and were started on treatment no later than the next day with ACT **(PMMR)** - % of PHC sampled in which utilization of ITNs/ LLINs was more than 80% **(PMMR)**
6	**National**	Policy and strategy development,	- Sites to monitor post-purchase quality of RDTs, drugs and insecticides recommended for use by national policy - Each of the established drug resistance monitoring sites completes at least one successful study every second year - Independent external evaluations carried out at least twice during 80 project implementation - All endemic districts have quality-controlled data on incidence of vector-borne diseases segregated by age-group and gender

		Surveillance/ case finding	- Annual Blood Examination Rate (ABER) **(M3)**
		Disease Burden/ Impact	- No of Fever cases **(M4)** - No of Malaria cases **(M4)** - No of Pf cases **(M4)** - Annual Parasite Incidence (API) **(M4)** - Annual Falciparum Incidence (AFI) **(M4)** - Test Positivity rate (TPR) **(M4)** - Test falciparum Rate (TfR) **(M4)** - Pf Percentage (Pf %) **(M4)**
		Programme Management (Inputs, Process & Outputs)	- No of Full Time SPO - Full Time DVBDCO/ DMO **Yes/ No** - No of RDTs Planned versus received & used **(M3)** - No of ACT Blister Packs Planned versus received & used **(M3)** -% of facilities (SC and PHC) / village level functionaries (ASHA, AWW) reporting stock-out of antimalarials lasting more than 15 days during the quarter **(PMMR)** - % of Staff in Place (ASHA, MPW,MTS, LT, DVBD Consultant) **(PMMR)** - % of MPHW/ASHA/other volunteers trained for use of RDT / ACT **(PMMR)** - % of Diagnostic facilities functional with microscopy/RDT in the last reporting period **(PMMR)** - % of spray Equipment in working condition (**VC 2**) - % of Spray workers trained (VC--) - Insecticide use (**VC 2, VC 6**) - No of ITNs/ LLINs distributed **(VC 4)** - No of BCC Activities (**PMMR**)
		Outcome	- IRS Coverage – Population (%) **(VC 2)** - IRS Coverage – Rooms (%) **(VC 2)**

			- % of Eligible population Covered by ITN (**VC 4**) - % of Eligible villages with more than 80 % population Coverage with ITNs- Bednets Treated **(VC 4)** - % of house holds in which beneficiaries reported having slept under ITNs/ LLINs previous night **(PMMR)** - % of fever cases who were tested for malaria by microscopy/ RDT with a positive test result for RDT and were started on treatment no later than the next day with ACT **(PMMR)** - % of PHC sampled in which utilization of ITNs/ LLINs was more than 80% **(PMMR)**

12.4.2 Sentinel surveillance

There are three kinds of sentinel surveillance envisaged under the malaria control program, each serving a different purpose:

- Monitoring drug sensitivity of malarial parasites
- Monitoring effectiveness of insecticides used, including for IRS and bed nets
- Monitoring the incidence and outcomes of severe and complicated malaria

12.4.2.1 Set-up and functioning of Sentinel Sites

A minimum of two sentinel sites will be established in each district. As this is a new activity and quality is paramount, districts should normally start with only two sites and consider expansion later. Hospitals with large OPDs and inpatient case loads should be chosen. Therefore, the district hospital should automatically qualify as one such site. Other sites are selected amongst the PHCs/CHCs/private/faith-based hospitals. It is desirable to have sentinel sites among the private/faith-based sector as many patients seek care there and this data is most often not reflected in the HMIS. Districts which have Medical Colleges should establish a site in these tertiary care centers, if they are known to handle a sizeable load of malaria cases.

The Sentinel Sites should be adequately staffed and Medical Officers and laboratory technicians (LTs) should be trained. A nodal Medical Officer (SSMO) should be in charge of all activities regarding malaria in the sentinel sites. In each out-patient unit, a separate register for fever cases without any other obvious cause (suspected malaria) should be maintained. Information on in-patients is entered on the same form to avoid double-counting and difficulties in patient identification. There should be a laboratory with a qualified laboratory technician in charge, where malaria microscopy is quality controlled. At each sentinel site, an LT (SSLT) working under the supervision of the SSMO will be responsible for the quality of the malaria laboratory results and for data compilation.

Table 12.5: Indicators for malaria sentinel surveillance

S. No.	Indicator	Description	Breakdown (with percentages)
1	Number of out-patient cases of malaria	Self-evident	Clinical/confirmed, <5/5+, M/F, PV/PF, sub-centre area
2	Number of in-patient cases of malaria	Self-evident	Clinical/confirmed, <5/5+, M/F, PV/PF, sub-centre area

S. No.	Indicator	Description	Breakdown (with percentages)
3	Number of cases of severe malaria	Self-evident	Clinical/confirmed, <5/5+, M/F, sub-centre area
4	Number of malaria deaths	Self-evident	Clinical/confirmed, <5/5+, M/F, sub-centre area
5	% OPD cases attributed to malaria	Total no of cases of OPD malaria/Total OPD X 100	<5/5+
6	% in-patient cases attributed to malaria	Total no of cases of in-patient malaria/Total OPD X 100	
7	Proportional mortality due to malaria	Total no of deaths due to malaria in hospital admissions / Total no of deaths in hospital admissions X 100	
8	Case fatality rate of falciparum malaria	Total no of confirmed malaria deaths/total no. of falciparum malaria cases	
9	Case fatality rate of confirmed severe malaria	Total no of confirmed malaria deaths/total no. of confirmed severe malaria cases	
10	Case fatality rate of all severe malaria	Total no of malaria deaths (confirmed + clinical)/total no. of severe malaria cases (confirmed + clinical)	

12.4.2.2 The interpretation of Indicators

The main disease incidence indicators listed in Table 12.3 can be calculated from the data available from M4 for virtually any level, from village to national level. If all suspected cases of malaria in the country (or district or village) are actually captured in M1 and consolidated correctly into M4, the resultant indicator values for API, TPR etc., will not be estimates based on samples but actual incidence values based on universal data. In practice, the capture is always less than universal, and thus an estimate. All indicators should be assessed for an increase or decrease from the previous year. When the current year is being considered the corresponding period of the previous year is used for comparison. API of More than 5%, SPR of more than 5%, Pf% more than 50% should always

raise an alarm. These indicators are also used to identify high risk areas and identify areas to be focused on priorty.

Some of the common ways in which appropriately disaggregated surveillance data can be meaningfully interpreted is described in Table 12.6.

Table 12.7 Interpretation of trends in malaria surveillance indices

Indicator trends	Interpretation
Number of cases in one week in a village more than twice the number of cases in the previous week	Outbreak. The provider should alert the PHC staff immediately.
Sudden increase in suspected malaria cases and number of tests conducted, but no change in SPR	Not malaria. Investigate outbreak for other causes of communicable disease.
Increase in SPR, but only in adults, mostly males, no increase in cases or tests in children.	Provider is missing children OR Not local transmission. Investigate for migrant adults and their migration history.
Increase in cases of severe malaria reported from a sentinel institutions, most cases belong to a specific block or PHC	Outbreak, which should have been detected in routine surveillance. Hence, probable failure of case detection and management in the identified area.
Increase in cases of severe malaria reported from one sentinel institution, no geographical trends in the data	Recently improved recording and reporting at sentinel institution OR Geographic data available at the sentinel institution is faulty or incomplete OR General improvement in referrals of severe cases from field areas all over (unlikely) OR General failure of the malaria control program (unlikely)

12.4.3 Supportive Supervision:

Supportive supervision is a continuous process which aims to increase the knowledge, develop the skills, improve the attitude and enhance the motivation of the health care functionaries. Supportive supervision is not an instrument for fault finding but aids in identification of problems, solving them and improving performance. It provides an opportunity to the supervisor and health workers to identify and address weaknesses together, thus preventing poor practices from becoming routine. Progression from traditional to supportive supervision may require changes in attitudes, practices and perceptions on the part of supervisors.

The protocol of supervision for MTS and their role is given in detail in the roles of MTS given in ***Annexure 18***

12.4.3.1 How To Establish Supportive Supervision

A. Improve performance

- Use a protocol/standard operating procedure including a supervisory checklist for each type of unit supervised. **(e.g. Checklist of MTS at Annexure 16)**
- Conduct supportive supervisory visits also **within** health care facilities.
- Provide staff with updates on policies or new recommended practices. Undertake on-the-job training see above supported by guidelines, manuals, visual aids.
- Plan supervision schedule in advance and communicate it to all those, who need to know. Lesser performing health facilities should receive extra, or lengthier visits, so make sure that the initially planned schedule has slack time for this.
- Plan these visits as much as possible, when it is possible to observe the staff and interview patients. Talk to patients about the quality of services, preferably away from the health facility.
- Plan to spend sufficient time (from several hours, to a full day or more) to conduct the supervisory visit to each unit. Rushed visit with no time for dialogue are inefficient.
- Follow up on recommendations made during previous visits. Discuss progress with the health facility
- Check the stocks and the condition of equipment. Compare stocks with records. Are storage conditions correct? If not, help find solutions. Carry materials, and supplies for the health facility according to requests made or needs identified at previous visit.
- Review health facility records and provide feedback to the staff as well as MO in charge.
- Analyse programme indicators for the health facility to make the performance objective and measurable.
- Involve the community in the evaluation process. Ask community members how they are treated when they visit the facility. Talk to community leaders during the visit to get their feedback and identify jointly, what the community can do.
- Find out, if the relationship between community and health workers is good; if not, find out what is wrong and remedy the situation.
- Discuss strengths and weaknesses, and actions to be taken (by whom and by when).
- Identify gaps and solve problems in positive ways

- Praise health workers in public for good performance and for practices that meet quality. Correct performance only through person-to-person contacts.
- Work with other health programmes to coordinate supervisory activities in a spirit of mutual support.
- Schedule a return visit before leaving the site.

B. Maintain and enhance motivation

- Give praise and recognition to health workers for what they are doing right.
- Act on feedback from the health workers, health workers will feel valued that they have an impact. Show that you trust them (as much as you actually do)
- Attend monthly meetings in all health facilities within the Block. This provides an opportunity for health workers to learn new approaches and strategies used in different health facilities and to receive continuing education. It can also be a forum to acknowledge their achievements.

C. Build sustainability

- Collect data on positive results gained from supportive supervision, such improved performance of health workers, improved coverage of IRS, better treatment etc.
- Develop a team approach involving Health supervisors & MPWs to increase supportive supervision at the health facility and make it a routine procedure, with or without frequent visits from the central or district level.

12.4.3.2 Monitoring of ASHAs /CHVs

The ASHAs are to be monitored regularly for the blood slides made, RDTs performed and treatment of positive cases detected by RDT/ slide. During the visit the MPW (M)/ MPW (F)will verify the RDTs and blood slides done between the current and previous visit. This is done by checking the positive RDT retained by ASHA and verifying the slides prepared for fever cases mentioned in M Register. She/ he will also verify, by making household visit, the completion of radical treatment treatment (including 14 day PQ for Pv cases.) of positive cases. Subsequent to the verification she/ he will submit the information on slides prepared, RDT positive cases completed treatment and slide positive cases completed treatment and put his/ her remarks & signature in the remarks column of M Register. Beside MTS, MO PHC and other visiting officers will also monitor the performance of ASHA during their visit. All these functionaries will provide supportive supervision to ASHA i.e. training and retraining her on spot to improve her skills for carrying her work in prevention & control of malaria and other vector borne diseases.

Payment of incentive to ASHA: the ASHA is to be given incentive as per following approved rates.

S. No.	Activity	Rate of incentive (Rs)	Source document for verification
1	Prepare blood slide/ Conduct RDT	5/-	`M Register of ASHA (Column 1))
2	Provide complete treatment to RDT Positive Pf case	20/-	M Register (Column 19 based on positive detected in column 8)
3	Provide complete radical treatment to positive Pf and Pv case detected by blood slide, as per drug regimen	50/-	M Register (Column 19 based on positives in columns 9 & 10)

The performance incentive is to be paid at the end of the month during the monthly review meeting convened by MO PHC or it should be synchronized with the payment of incentives under NRHM for other activities in order to avoid visiting PHC, just for such payments. The payment shall be made on the basis of M Register for ASHA. At the end of each month, the information on slides prepared, treatment completed of RDT positive and slide positive cases, will be verified and transmitted by MPW (M)/ MPW (F) from M register to the PHC MO. The ASHA will bring the M Register at the monthly meeting for verification of incentive payment. The mechanism of payment will be similar to what has been adopted under NRHM. The incentive will be paid together with other monthly incentives under NRHM. The monthly record of payment is to be maintained in the Payment Register (***Annexure 15***) at the PHC level by the accountant.

12.5 Special Surveys

The surveillance and program monitoring on the basis of data reported through the routine system and sentinel sites provides a fairly comprehensive picture of the progress of the program towards its objectives. However, this is not sufficiently objective, because it consists of reports of implementers of the program. Any shortcomings inherent to the system are therefore inadvertently incorporated into the picture drawn by them. This system also does not cover the patients seeking care from the private sector (other than a few sentinel sites). The programme indicators thus obtained from the routine and sentinel surveillance system are not true estimates, therefore, to plug such gaps, and to lend more objectivity to program monitoring and evaluation, assessments independent of the HMIS will be periodically carried out.

Two types of surveys are to be conducted in the programme:

A. Small scale Quarterly or Half yearly Surveys based on Lot Quality Assurance Sampling (LQAS)

It is envisaged that different kinds of formally designed but simple assessments can be conducted by the MTS, and possibly by other means, annually or more frequently. These could assess the coverage and quality of case management efforts and bed net use, and the coverage and quality of IRS, using household surveys and service provider observations and interviews. The detailed guidelines for the same including the questionnaire to be used for data collection and the compilation sheets are given at the ***Annexure: 17*****.** The guidelines may be changed according to the requirement of the programme from time to time.

B. Large scale Surveys every 3-5 years

The surveys will be designed to capture the main outcome indicators of the programme and other data. Such house hold level surveys are conducted every 2-3 years by an Independent agency. Expertise of WHO, NIMR is also sought to support the planning and implementation of these surveys and to participate in the evaluation exercise together with NVBDCP and selected Indian institutions. The methodologies of these surveys are developed in consultations held with the Independent agency hired for the purpose.

The programme also undertakes in-depth review of programme implementation through Joint Monitoring Missions organized together with its partners in malaria control like NIMR, WHO and World Bank. Such reviews bring to light programme short comings in the area of policy and implemantaion and enable improvements in programme design.

The role of the MTS will be to facilitate such survey in their respective blocks or as per the states guidance and to monitor the data quality.

Learning Unit 13. Coordination with NGO partners at all levels (for GFATM Project areas with Caritas)

Coordination between the Caritas India consortium and NVBDCP is considered imperative for harmonized planning, implementation and M&E of IMCP—II in North East States. Consultations were held with regard to the specifics of coordination especially at sub national levels and subsequently, consensus had been reached regarding defined structures, systems and processes. The coordination will be effected by involvement of all relevant stakeholders in such bodies as the Project Steering Committee, M&E Technical Working Group as well as through project MIS, various planned meetings, workshops and consultations. Besides, synchronization of practices/services in line with national policies and guidelines will be ensured through standardized capacity building and supervision and monitoring, joint reviews and evaluations.

The planning of activities will be bottom-up from the district level supported by top-down supportive supervision reviews, and concurrence.

The key coordination structures, systems and processes at various levels of implementation (national/regional/state/district levels) are presented below.

A. Inception stage:

- Consultation and communication to/with national progranmme stakeholders
- Constitution of Project Steering Committee (PSC)
- Identification of focal persons
- Participation in planning and review of Annual State Action Plan (SAP) and Annual District Implementation Plan (DIP)
- Inclusion of Caritas India consortium's logistics requirements in SAP and DIP
- BCC strategic planning
- Development of Project Implementation Plan and Project M&E Plan
- Technical Support for Induction Training/Capacity Building of Project personnel/consultants/Supervisors

B. Implementation Stage:

 Service Delivery

o **LLIN distribution:** With regard to LLIN distribution, the Caritas India/concerned SRs will carry out the entire operations in targeted villages under their domain. As per NVBDCP policy, the targeted village will be fully covered. If NVBDCP/ state, district VBDCP authority so desires, then entire sub centre will be covered. However, necessary logistics (LLIN) will be discussed and reflected in the DIP. In the event the NVBDCP and/or state VBDCP desires the Caritas

India consortium to distribute additional LLIN that is more than the number reflected in the performance framework and budget, additional financial requirements will need to be provided by the programme. The ASHA/ Health Worker (with the public sector) in targeted villages for LLIN distribution will share information on with Caritas India consortium including household lists, etc. The district VBDCP authority will make available requisite LLIN to Caritas India consortium as per plan. The Caritas India consortium (District Project Officers of Caritas India, SR2, SR3) will take delivery of LLIN at district level from the District VBDCP authority.31 Thereafter, the LLIN will be transported to the targeted villages under the supervision of District Project Officer and Field Supervisor. The Logistics and SCM Officer at regional level will keep track of the LLIN received, distributed, etc. through project MIS. The entire exercise from receipt of LLIN to distribution will be completed in one single exercise, spanning over seven days, except in exigencies.

o **RDT and ACT use:** NVBDCP policy and guidelines will be followed with regard to RDT and ACT use. Necessary logistics (RDT, ACT, micro slides and other necessary supplies for preparing blood smear) will be discussed and reflected in the DIP. In the event the NVBDCP and/or state VBDCP desires the Caritas India consortium to cover additional geographical areas and/or if the load of fever/positive cases is more than the number reflected in the performance framework and budget, additional financial requirements will need to be provided by the programme. In each village with Caritas India consortium, hamlets will be assigned to community health volunteer and/or their peripheral health facility and ASHA (if ASHA is present, trained and functional in that particular village), following mutual agreement at district level that will be mediated by NVBDCP. Discussions will be held between State Programme Officers, District VBDC authorities, VBDC Consultant, PHC Medical Officers, Malaria Technical Supervisors, Health worker/ASHA with PR1 and District Project Officers, Field Supervisors, Cluster Coordinators, Volunteers/ Workers with PR2 to identify and allocate the catchment area in the presence of NVBDCP and Caritas India. This will preclude duplication and overlap of services. The Caritas India consortium (District Project Officers of Caritas India, SR2, SR3) will take delivery of RDT/ACT at district level from the District VBDCP authority.

o **Community outreach/social mobilization:** During the initial stages of implementation, the NVBDCP will provide appropriate BCC tools/materials to Caritas India consortium to synergize dissemination of messages for various SDAs like LLIN distribution, RDT/ACT use, etc. Subsequently, Caritas India consortium will develop BCC/IEC messages, tools/materials and translate those in local languages in consultation and coordination with national/state/district programme personnel/consultants. Likewise, consultations and coordination will continue for community outreach/social mobilization activities for harmonized message dissemination, social mobilization. It is expected that any workshop/meeting related to implementation of community outreach activities are

organized by NVBDCP, state/district VBDCP, Caritas India consortium will be involved.

o **Inventory Management (including storage arrangements) and Distribution of Logistics (LLIN, RDT, ACT)**

o Pharmaceuticals, health products & commodities (excluding pharmaceuticals & health equipment), health equipment (X-rays, laboratory equipment, etc.) will not be procured by Caritas India under the IMCP--II. One-time procurement of non-health products like computers, printer, scanner, furniture, etc will be undertaken by Caritas India.

o ***For health products—LLIN:*** Under IMCP—II, LLIN is envisaged to be distributed twice annually, preferably prior to transmission season. However, NVBDCP will prioritize/decide on the distribution timing and coverage area through a consultative mechanism that will include Caritas India consortium. The requisite number of LLIN (labeled with NVBDCP logo) will be received from the District VBDCP official (DMO or his designate) in presence of one official witness as per approved Action Plan of NVBDCP, by the DPO and one authorized designate (the FS or DEO or an official with partner network/SSR). Necessary formalities will be completed including recording in the designated register that will have signatures of all four persons. Subsequently, transportation arrangements will be made for taking the LLIN to the distribution point in hired private vehicle for which provision exists in the Round 9 budget.

Before distribution, Caritas India will initiate receipt and transportation of LLIN only after receiving written communication from NVBDCP and/or State/District VBDCP regarding the timing/targeted area for distributing LLIN. For a targeted area (village), the required number of LLIN will be distributed in one single exercise that will include recording in the designated reporting forms. Caritas India will complete the entire exercise from receipt of LLIN from district to distribution in village in seven days, except in unavoidable exigencies. This will avoid storage at district level and make the delivery to the end beneficiaries faster. Additionally, staggered receipt of LLIN from District VBDCP may also be considered, as/if locally feasible, to avoid large stocks of LLIN at district project office. LLIN received from district, will, as far as practicable, be protected to ensure safety and their quality until such time as they are transferred to the end beneficiary, according to the NVBDCP guidelines. Distribution of LLIN will be done in coordination with ASHA/Health Worker.

In order to ensure that the households have received the nets a random household verification will be carried out by the cluster coordinators and MTS under NVBDCP. A further small sample check will be carried out by the Field Supervisors/DPO during their field visits and inventory checks will also be carried out by them. All LLIN distribution related reports will be uploaded on to the project MIS as well as shared with NVBDCP through PHC level.

All personnel involved in inventory management and distribution activities will be trained in the requirements of good storage/distribution practices during their induction/refresher trainings as well as through supportive supervision. The NVBDCP and/or State/District VBDCP/PHC will be part of the resource pool for trainings.

o ***For health products--RDT/slides and necessary laboratory supplies, and pharmaceuticals:*** Caritas India consortium and one authorized designate (DPO and the FS or DEO or an official with partner network/SSR) will receive requisite number of RDT, ACT, etc. (labeled with NVBDCP logo) from the District VBDCP official (DMO or his designate) in presence of one official witness as per approved Action Plan of NVBDCP, on monthly basis through monthly indents to District VBDCP, similar to the process followed by NVBDCP. A specified date will be mutually fixed at the district between District VBDCP and Caritas India consortium for this task. The monthly indents will be prepared by the CC based on information from the CHV/peripheral health facility. The DPO and FS may also carry indent(s) back in the event they are on field visit in such villages, where logistics are required. A comprehensive stock report on opening balance/supply received/consumed during the previous month and requirement for the current month will need be attached with the indent for perusal and record. Each CHV/peripheral health facility will keep a copy of the stock report. Any emergency requirements will be requested (on account of seasonal upsurge of cases or other unforeseen circumstances, etc.), as necessary. Necessary records will be completed in the designated register that will have signatures of all four persons.

Once the pharmaceuticals and health products like (RDT/ACT) are collected from the District VBDCP and accepted into inventory, efforts will be made to ensure supply to the distribution points within three to five days (or, a minimum lead time, under local conditions like road conditions particularly in the rainy season, consumption rate of drugs). In most instances, the required stock of RDT/ACT, etc. will be provided to the participating FS or CC/CHV, during monthly planning and review meetings in the beginning of the month or the DPO/FS may carry the stock back to CHV/peripheral health facility as well, in the event any field visit is scheduled at that point of time, if practicable. Only a small amount of stock hence may at times be at the District Project Office premises, although efforts will be made to minimize such scenario. Buffer stocks will be provided by the NVBDCP according to the technical calculations.

RDT/ACT, etc. received from district, will, as far as practicable, be protected to ensure safety and their quality until such time as they are used, according to the NVBDCP guidelines. The arrangements for mitigating any risk (related to local pressures, expiry, misuse, etc.) will be part of the Project Operational Guidelines. Efforts will be made to ensure —First Expiry/First Out‖ (FEFO), —First In/First Out‖ (FIFO) at district and sub-district levels, which mean stock with the earliest

expiry date is used before an identical stock item with a later expiry date is used. In the event stocks near expiry date, those will be mobilized for distribution to other CHV/peripheral health facility. Caritas India consortium will seek RDT/ACT, etc. with sufficient window period in terms of expiry dates. However, in the event of any expired stock, the same will be returned to the District VBDCP for necessary action after completion of formalities.

All personnel involved in inventory management and distribution activities (including the DPO) will be trained in the requirements of good storage/distribution practices including optimal storage temperature, avoidance of humidity and direct sun light, principle of FEFO/FIFO etc. during their induction/refresher trainings (as well as supportive supervision as mentioned later). The CHV/peripheral health facility will be trained on rational use of medicines (ACTs) at community level. The NVBDCP and/or State/District VBDCP/PHC will be part of the resource pool for trainings.

Stock registers will be maintained at all levels (District, CHV/peripheral health facility). The stock monitoring (including physical checking) will be done on regular basis, through supervisory visits to villages/peripheral health facilities using appropriate checklists34 as well as during monthly meetings, with guidance from NVBDCP guidelines. Besides, an agency hired by the NVBDCP for logistics management may also be involved from time to time. At community level, RDT/ACT, etc. will be stored safely and securely at the premises of CHV/peripheral health facility, as per NVBDCP guidelines. The supervisory checklist will include noting of observations regarding storage of health products/medicines. The visiting personnel (trained FS/others) will physically conduct checking on a sample and provide support regarding good practices besides redeploying products/medicines at risk of expiry, as done under NVBDCP.

The project MIS (paper based below district level) will use necessary forms for logistics supply chain monitoring (opening balance, consumption and closing balance). The forms will be drawn from NVBDCP and customized, as appropriate. Monthly reports will be prepared and analyzed at DPO/RPMU/NPMU levels in relation to opening balance, stock received in the previous month, stock distributed, balance and requirements. The Logistics and Supply Chain Officer at Regional level will analyze the discrete requisitions and provide feedback within two days.

 Training/Capacity Building

o **Training of community health volunteer/ASHA:** In coordination with NVBDCP, training of community health volunteers will be organized in 3rd quarter of IMCP—II. The District VBDC Officer, VBDC consultant, MOPHC, MTS will provide support and will be part of resource pool. The Caritas India consortium will provide honorarium, TA/ DA for resource persons, as necessary.

Meanwhile, the NVBDCP will write to state/district VBDCP authorities, who in turn, will coordinate with appropriate NRHM authorities/MOPHC to share the load of ASHA to be trained as well as to provide necessary support for trainings of ASHA at district/sector PHC level.

o **Mapping & training of private health care providers:** Under IMCP—II, an attempt will be made to initiate mainstreaming of private health care providers who are already involved in diagnosis and treatment of fever/ malaria cases. In the Year 1, mapping of such providers at district and sub-district (village) levels will be done. Caritas India consortium will carry out mapping of private health care service providers at district/block levels and community level. Subsequently, training/capacity building of a section of mapped providers is planned, especially to ensure rational treatment and initiate reporting of cases from them. These activities will be carried out in coordination with the District VBDCP Officer, VBDC consultant, MOPHC, MTS and ASHA.

o **Customization of training modules:** Existing modules related to trainings of ASHA/ volunteer and private health care providers (on malaria prevention and control) will be shared by NVBDCP with Caritas India consortium for studying and customization, as appropriate. Subsequently translation in local languages and replication will be carried out by Caritas India consortium.

o **Technical Support for Refresher Training/Capacity Building of Project personnel/consultants/Supervisors:** NVBDCP will provide technical support for capacity building of project personnel/consultant/community health volunteers during induction trainings (and later during refresher trainings). The Caritas India consortium will share the training calendar, training plan.

 Monitoring & Evaluation

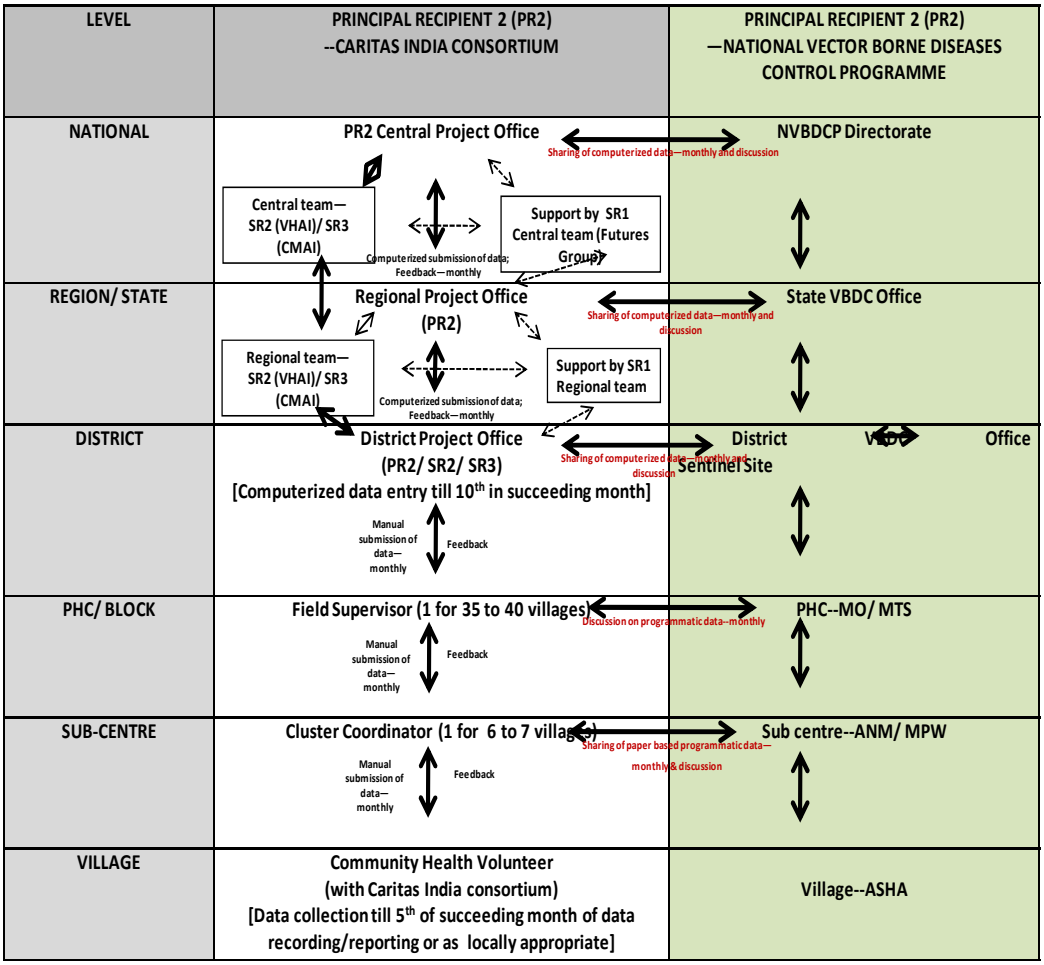
o **PSC meetings:** Every quarter the PSC meeting will be held by NVBDCP with participation from Caritas India. In addition to the monitoring of project progress, the NVBDCP and Caritas India through PSC structure will jointly take stock of the coordination mechanisms and suggest solutions for possible bottlenecks and challenges.

o **Annual review meetings at national/regional levels:** Caritas India consortium will conduct annual review meetings at national/regional levels. Representatives from NVBDCP, state VBDCP will be invited, as appropriate, to review and plan project related activities for the succeeding year.

o **Monthly review meetings at state/district levels:** At state levels, the focal point of Caritas India will interact with the state VBDCP, take stock of the project progress and discuss coordination, capacity building aspects. At district levels, the District VBDCP will participate in the monthly planning and review meetings conducted by Caritas India consortium. At the PHC level, a monthly review

meeting is held by the MOPHC for the sub centres/ villages falling under their jurisdiction. The national/ state/ district VBDCP authorities will facilitate participation of Caritas India implementing partners in such meetings.

M&E--Data Collection, Reporting and Feedback



o **Other coordination meetings/workshops:** NVBDCP will invite Caritas India to various coordination meetings/workshops, as appropriate.

o **Harmonization of recording and reporting systems and sharing of programmatic reports:** Towards one M&E plan and system, village wise data (from 5,661 villages) in connection with the performance indicators for Caritas India (related to implementation of malaria control interventions like case diagnosis and treatment, LLIN distribution, BCC, trainings, as planned) will be recorded and reported on monthly basis by the service delivery points of the Caritas India consortium (community health volunteers and peripheral health facilities), using existing forms/ registers of NVBDCP, namely, M1, M2, M4 and

VC3, VC4, VC5, VC6, thus harmonizing recording and reporting between national programme and Caritas India consortium. However, appropriate customization of forms will be done according to the Caritas India‘s recording/reporting requirements. With this, complementary reporting by non-government organizations is to be initiated for the first time in the country in a systematic manner.

The village level programmatic data will be recorded/collected by the community health volunteer/personnel at peripheral health facilities and submitted to the identified Cluster Coordinator36 on monthly basis for onwards transmission to the PHC level [manual submission], before a set date of the succeeding month of data recording for village/SC wise compilation. However, the date of manual submission will be mutually agreed between the stakeholders (NVBDCP/state/district VBDCP and Caritas India consortium) in the beginning of the project. In other words, a data recording/reporting routine will be finalized for each village in consultation with the cluster coordinator, field supervisor, data entry operator, and the district project officer with the Caritas India consortium and district VBDCP/sub-district health authorities for smooth and timely data flow from the village to PHC to district headquarters. The Cluster Coordinators will undertake preliminary data check, in terms of obvious mistakes, missing data.

At the same time of submission of data to the PHC, the Cluster Coordinator will manually submit programmatic data as well as logistics, finance related information to the identified Field Supervisor37, i.e., before a set date of the succeeding month, for onwards transmission to the District Project Office--the first level reporting unit for the Caritas India consortium.38 Or, the Cluster Coordinator may directly submit to the District Project Office, if necessary or the District Project Office personnel/FS may collect, if on duty travel.

The monthly reports (outputs) will provide information pertaining to the current‘ month, while the quarterly reports (outputs) will provide information pertaining to the ‗current‘ quarter. Besides, a system of tracking (on line/ off line) of reports for data timeliness, completeness and consistency will be in place.

At the PHC/ Block level, the identified Field Supervisor, in some instances together with District Project Officer will ensure timely submission of data at the District Project Office in addition to fulfilling other responsibilities like data quality check, etc. He/ she will also will attend the monthly meeting at PHC level and share copies of monthly reports/discuss bottlenecks. All efforts will be made by him/her to reconcile the issues related to delay in data reporting or obvious data inconsistencies including possible double counting of cases. For each patient, identifiers (Unique Identification number--UID) will be introduced on the reporting forms, using the Registration Number, Patient‘s Name, Village Name, Block (PHC) Name and District Name. This UID will attempt to uniquely identify a patient and avoid double counting.

At the district level, in the district project office, the Data Entry Operator will further screen, compile the monthly data village wise and sub centre wise and report/ transmit to the Regional GFATM Round 9 Intensified Malaria Control Project--II Project Implementation Plan (2010—2012). Project Office (second level reporting unit of the Caritas India consortium) through web based (computerized) project Management Information System (MIS). Data entry, data check/ validation will be completed by the 10th of the succeeding month of data recording or as agreed at district level. The data entry will be on line as well as off line at District Project Office, in view of the ground situation. The District Project Officer will organize and preside monthly review and planning meeting (details are presented in a separate section), wherein data related issues will also be discussed and reconciled. At the district level, data will also be shared (simultaneously) with District VBDCP.

Programmatic data will also be shared with NVBDCP, state and district VBDCP on quarterly and/or monthly basis and related discussions will be held in PSC meetings.

o **Avoidance of duplication of reports:** The problem of possible duplication of reporting is recognized. It will be resolved by cross-matching/discussing the reporting every month at village level by the Cluster Coordinator of the Caritas India consortium after submission of reports in monthly PHC meeting. In addition, regular contact with concerned Health Worker/ANM/ASHA will be maintained. The FS will also check with Health Worker/ASHA from time to time. Any issue related to data reporting/sharing by the Caritas India consortium will also be discussed at the monthly meetings of District Project Office.

o **Harmonization of feedback mechanisms:** A system for prompt feedback for any error, inconsistency, deviations will also be established. Feedback from the national/ regional project units to district units of Caritas India consortium and below will, in general, be provided within 4-6 weeks of the reporting month or earlier, as feasible and necessary. Feedback will also be provided during the supportive supervision visits on site and/ or within one month of the visit. Feedback on the programmatic data recording and reporting by the national programme, state/district VBDCP will be provided within 30 days of receipt of the same. In addition, report of supervision and monitoring visits by national programme personnel undertaken in Caritas India consortium project areas will be shared with the consortium. Likewise, synthesis of field visit reports will be shared by Caritas India with the national programme.

A data analysis system at district (and also regional/national levels) through regular letters and e-mails with their respective reporting units will inform about any unusual deviations in fever/ disease trend. The respective reporting unit will respond within one week of such correspondence with required clarifications/ support, as necessary in consultation with the national programme. Thus, the national programme will have continued access to peripheral level data from non-

government organizations, while Caritas India will have a well defined system for reporting and feedback on their performance framework indicators, as well as fund flow and logistics. The district project officers will be the highest supervisory level for the villages and they will visit the villages on a sample basis drawing from discussions with the field supervisors and the cluster coordinators and/or as needed.

o **Field level coordination for supervision:** There will be 900 Cluster Coordinators chosen from among the volunteers for provision of services at the village level to additionally carry out supervisory function for recording and reporting at the field level. The Cluster Coordinators will be trained on such supervision. The supervisory visits of the Cluster Coordinator will be on a pre-planned calendar of visits to the different villages under their ambit of supervision. The calendar of monitoring and supervisory visits will be planned for a quarter initially and then revised every quarter. The visits may be intensive in the initial phase of the project. Later, visits will base on prioritization of villages for close attention. It is envisaged that the Cluster Coordinator will interact with the field level personnel/volunteer (health worker/ASHA) and any supervisory level personnel visiting the field (DMO/MTS/VBDC Consultant) as frequently as possible.

Supervisory agenda at village level will look into the following:

i) Distribution process for LLIN and the BCC accompanying the same, post-distribution monitoring

ii) Inventory management and data recording, reporting, maintenance with respect to LLIN, RDT and ACT

iii) Random household checks to ensure actual distribution of bed nets

iv) Observation of the process of using RDT for diagnosis and ensure that the procedures spelt out in the guidelines are followed and provide feedback to the community health volunteers/facility

v) Assessment of the use of results of RDT in administering ACT or treatment, as appropriate

vi) Observation of the process of making blood smear to be sent for examination by microscopy, at the time of RDT use

vii) Observation of BCC sessions being conducted and and feedback provided

viii) Observation of IPC/mid-media messages and assess effectiveness of the same through random discussion with the village population

ix) Assessment of referral management.

In a similar manner, the 145 field supervisors will supervise the villages based on a pre-planned supervisory calendar. They will review the findings from the cluster coordinators and provide feedback to them to improve the quality of services being provided as well as conduct village level visits with above-mentioned agenda.

At regional level, in the regional offices of Caritas India consortium, the designated personnel for data management guided by their seniors will carry out scrutiny of data as well as district wise data compilation, and reporting/ transmission to their Central Project Offices (third level reporting unit of the Caritas India consortium). The central units of VHAI and CMAI will transmit the data, as received from their regional offices to the Caritas India central project management unit. The complete project data will get collated at the PR2 Central Project Office on to web based project MIS. Thereafter, generation of dynamic and configurable reports, graphics for onwards transmission to NVBDCP on monthly and/or quarterly basis, as mentioned previously and to GFATM, on quarterly basis. All reports, graphics will also be in printable mode. The information in these reports will also be utilized for development of the newsletters. GFATM Round 9 Intensified Malaria Control Project--II Project Implementation Plan (2010—2012)

 Private health care service providers' involvement

Under IMCP—II, an attempt will be made to initiate mainstreaming of private health care providers who are already involved in diagnosis and treatment of fever/malaria cases. Consultation will be held with NVBDCP, state and district VBDC authorities to consider supply of logistics (RDT, ACT) to a subset of private providers. These providers will be encouraged to not to charge for diagnosis by RDT and ACT treatment. Each of them will be provided the standardized NVBDCP data input forms, which will be duly completed at the time of consultation. At village level, these forms will be collected by the respective Cluster Coordinator by the 10th of the succeeding month for data collection, or on a mutually agreed date for data collation at village level for onwards transmission to the Field Supervisor as well as to the Sub centre.