Malaria Control

Capacity Building in Community based NGOs/Workers

VOLUNTARY HEALTH ASSOCIATION OF INDIA

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Contents

Acknowledgement

No Public Health Programme is successful without the active involvement and participation of the public. Malaria is exclusively a local and focal phenomenon. The intensity of its transmission, prevalence and distribution of parasites are determined by local malariogenic conditions which differ from area to area. It is therefore, essential to understand that the epidemiological approach to malaria control is of paramount importance. In the context of malaria control the strategies adopted are (i) early case detection (ii) prompt treatment of cases and (iii) control of mosquitoes. It is hoped that this book will serve the purpose of capacity building of community based organizations/workers to implement the strategies of malaria control at the community level. Dissemination of information and involvement of community will go a long way in containing the disease and reducing the mortality.

I express my gratitude to Mr. Alok Mukhopadhyay, The Executive Director and Mr. Cedric B. Finch, Administrator for their support in the preparation of this book. I am thankful to Mr. Som G Agnihotri Artist and Mr. Sandeep Bahl, Manager VHAI Press for preparation of illustrations and layout respectively of the this book.

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(P.N. Sehgal)

Foreword

Malaria has been known in India from time immemorial. However, towards the end of last century extensive research unraveled the mechanism of transmission of human malaria through Anopheles mosquitoes. This led to the understanding of the involvement of biological factors namely malaria parasite, mosquito, human host and their dependence on environment for perpetuation of the disease.

Widespread prevalence of malaria in India, among other factors, was responsible for the slow economic and industrial progress during the last two centuries. In India National Malaria Eradication Programme was started in 1958. The programme progressed satisfactorily initially but suffered setbacks from 1965 onwards. During 1994-95 there were epidemics of malaria in Rajasthan and North Eastern states of India for the control of which VHAI contributed significantly. A major cause for failure of malaria control is the poor functioning of our health infrastructure. There is need to tone up drastically primary health care based on the fundamental principles of Public health.

The present strategy for control of the disease is based on early diagnosis and treatment with anti-malarial drugs. But this is not working satisfactorily because of lack of involvement of the community and the NGOs working at the grass-root level. Malaria can strike anyone, but history and experience show that it affects primarily the poorest, most peripheral and most marginalised group of populations.

This booklet will go a long way in educating the people in general, grassroot level organisations, community leaders, members of the village panchayats, opinion leaders among urban slum dwellers etc. for early recognition of the disease, timely treatment and effective mosquito control measures to prevent epidemics and deaths due to malaria.

Alok Mukhopadhyay
Executive Director
VHAI

Preface

Prevention, diagnosis and treatment of malaria is well known. When people die of malaria and die in large numbers and many more suffer from it - it means that something is missing in the efforts of malaria control.

As long as malariogenic conditions continue to be created by building of dams, canals, major construction sites, roads, etc. with water logging, water stagnation and breeding of mosquitoes the malaria incidence will stay at the same as it has for several years i.e. over 2 million cases per year.

Understanding the breeding & biting habits of mosquitoes, the nature of malaria today, its varied presentation, the complications seen, the recommended therapeutic regimens and the resistance patterns of the malarial parasite to different antimalarials and of the anopheles mosquito against the insecticidal sprays.

Effective malaria control is possible through multisectoral approach by related departments like Education, Agriculture, Sanitation, Housing & Urban Development etc. and involvement of the community.

The book has been prepared by Dr. P.N. Sehgal ex Director, NICD, who has had several decades of experience & insight in malaria care and malaria control. This is a comprehensively written, technically sound book with updated information.

With resurgence of malaria, there is a pressing need for simple, effective health education material on malaria such as this, not just for health personnel, but also for Panchayat members, MLAs, MPs and those involved in educational and development work to help governments efforts for the prevention and control of malaria in the National Malaria Eradication Programme, which is an important National Health Programme of our country.

(Dr. Mira Shiva)
Head, Public Policy Div.

What is Malaria ?

Malaria is a febrile disease caused by the presence of malaria parasites in human body.

What are signs and symptoms of Malaria ?

Patient has chills or shivering followed by high fever daily or on alternate days. The patient may also complain of headache, bodyache and vomiting. Fever comes down with profuse sweating.

The signs and symptoms of malaria appear in stages as follows:

Premonitory/Initial stage (lasting a few hours)

i. **Sensation of general discomfort, lassitude.**

Cold stage (lasting ¼ to 1½ hours)

i. Headache, gradually becoming severe;
ii. Nausea;
iii. Shivering starting with chilly feeling; (Fig. 1)
iv. Cold skin;
v. Fever, rising rapidly to 102^0 to 106^0 F (38.8 to 41^0 C)

Fig. 1

Hot stage (lasting ½ to 5 hrs.) (Fig. 2)

i. Very hot feeling
ii. Face, hands and skin flushed
iii. Severe headache
iv. Vomiting
v. Rapid respiration
vi. Fever starts falling

Fig. 2

Sweating stage

i. Profuse sweating (Fig. 3)
ii. Temperature become normal (no fever)
iii. Comfortable sleepy feeling.

Fig. 3

Symptom - free interval

Depending on the type of malaria, that is the type of parasite, the signs and symptoms listed above recur every day, on alternate days, or every 3rd day, if the patient does not receive treatment. There is feeling of fatigue and weakness.

The spleen is often enlarged and tender during the bouts of fever. Malaria may simulate other diseases, e.g., influenza, Or Dengue, Viral Fever. The absence of the Classical picture described above should not exclude malaria.

Malaria with cerebral symptoms: In some malaria parasite infections, such as **P. falciparum,** the brain might be affected giving signs and symptoms, like delirium, drowsiness, or unconsciousness which may lead to death unless treatment is given in time.

How to differentiate malaria from other Fevers ?

A person suffering from malaria will always get fever but all fevers are not due to malaria.

Whenever you see a case of fever without any other signs & symptoms such as rash, diarrhoea or cough, always consider it to be a case of malaria.

If you do not have a thermometer, check for fever by feeling the forehead and the chest with the back of the hand.

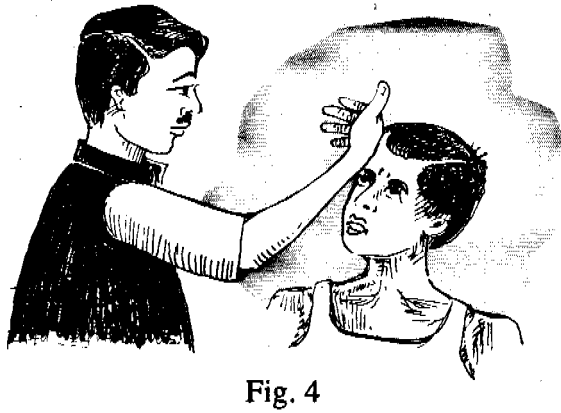


Fig. 4

How to use a Thermometer to take the temperature?

1. Clean the thermometer well with soap and water or siprit/savlon solution and wipe with clean cloth or cotton starting from tip to bottom. Shake it hard, with a snap of the wrist until it reads less than 36 degrees. Do not hold or touch the tip of the thermometer because the silver line will go up and you might get a wrong reading.
2. Put the thermometer under the tongue (keeping the mouth shut) or in the armpit if there is danger of biting the thermometer). If the sick person is unconscious, put the thermometer in the armpit.
3. Leave it there for 3-5 minutes.
4. Read it. (An armpit temperature will read a little lower than a mouth reading).
5. Wash the thermometer well with soap and water and dry it with a clean cloth.

Note: If oral thermometer is used and the patient has taken in hot or cold liquid a few minutes back, wait for 10-15 minutes before taking the temperature.

Do not use an oral thermometer when the person is having fits, is unconscious, restless or unable to close his mouth.

How to read the thermometer (using one marked in degrees Centigrade - ^{0}C): (Fig. 5)

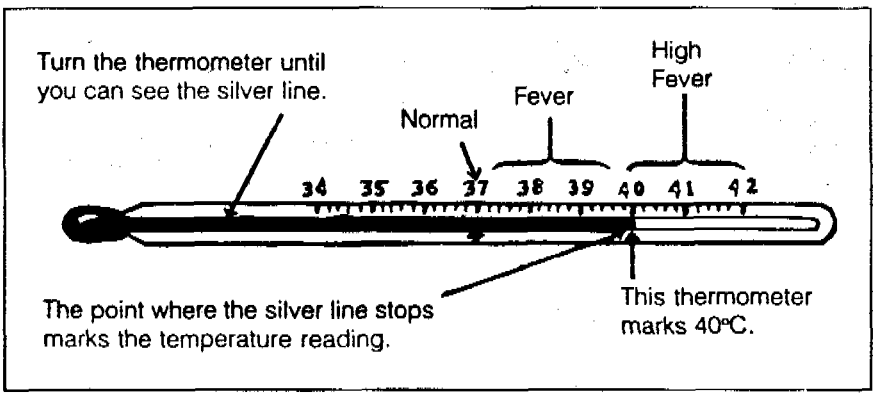


Fig. 5

What causes Malaria ?

Malaria is caused by malaria parasite. A parasite is a small living organism that lives in the body of another living creature such as human being, animal, bird, insect etc.

Where Malaria parasite is seen in the body of a human being ?

The parasite is found in the red blood cells (RBCs) of human being. We can neither see the malaria parasite nor the red blood cell with our naked eyes. We can see them under a microscope which is a special equipment which magnifies the objects. (Fig. 6)

Fig. 6

– A person looking into Microscope – RBC with parasites

Malaria is not caused by:

- Bad air
- Bad water
- Bad food
- Getting wet in the rain
- evil spirits

How many types of malaria parasites are there ?

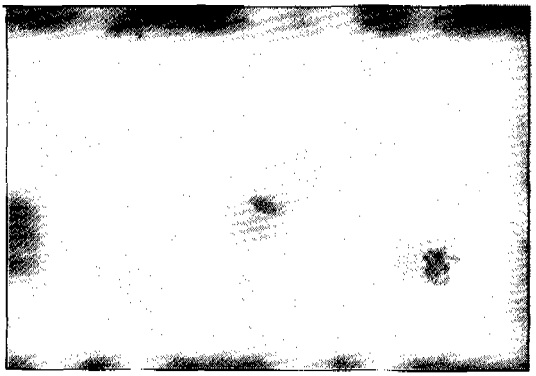
Malaria parasites are of four types:

(i) Plasmodium vivax (ii) Plasmodium falciparum

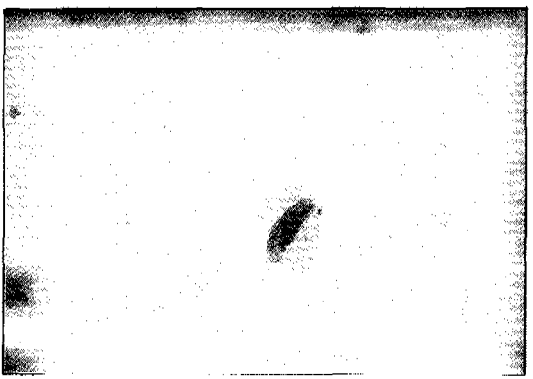
(iii) Plasmodium malariae (iv) Plasmodium ovale

In India **P. vivax** and **P. falciparum** are found in every part of the country. **P. malariae** is very rare. It is commonly found in tribals, in forests and hilly areas. **P. ovale** is rarely found in India.

The parasites can be differentiated under the microscope. There can be mixed infections in endemic areas. Under the microscope the red blood cells (RBCs) and the malaria parasite in RBCs look as shown in the figures given adjecent : (Fig. 7 & 8)



Plasmodium vivax
Fig. 7



Plasmodium falciparum
Fig. 8

How does Malaria spread from one person to another?

Malaria is spread by the female species of a particular type of mosquito called Anopheles. The male mosquitoes do not transmit the disease as they feed only on plant juices and do not bite to suck-blood. Whenever the female Anopheles mosquito bites a person suffering from malaria, the malaria parasites enter into its body along with the blood sucked. The parasites develop in the gut of the mosquito. It takes 10 to 15 days for the malaria parasite to develop inside the body of the mosquito. If after this period the infected mosquito bites a healthy person, she injects the parasites 'sporozoites' while sucking the blood of the healthy person. The parasites are passed on through the saliva of the infective mosquito each time it takes a new blood meal. Once a female mosquito become infective, it remains so for rest of its life.

The parasites injected by the mosquito in a person enter the liver and multiply there. These parasites then come in the blood and attack red blood cells (RBC), which cause the sickness. The person gets fever within 10 to 14 days (incubation period). When another female Anopheles mosquito bites this malaria patient, she sucks the malaria parasites 'gemetocytes' along with the blood. Thus the life cycle of malaria parasite is completed and they keep on spreading malaria from patient to healthy person through mosquitoes. (Fig. 9)

How many days after the bite of an infected mosquito will a person get fever ?

The individual will suffer from fever 10 to 14 days after the infective bite of the mosquito (as the parasites develop and multiply in the liver of the infected person). After this period the malaria parasites come in the blood, attack the red blood cells and cause malaria fever. The period when a person gets the infection to the appearence of symptoms of the disease is called **incubation period**.

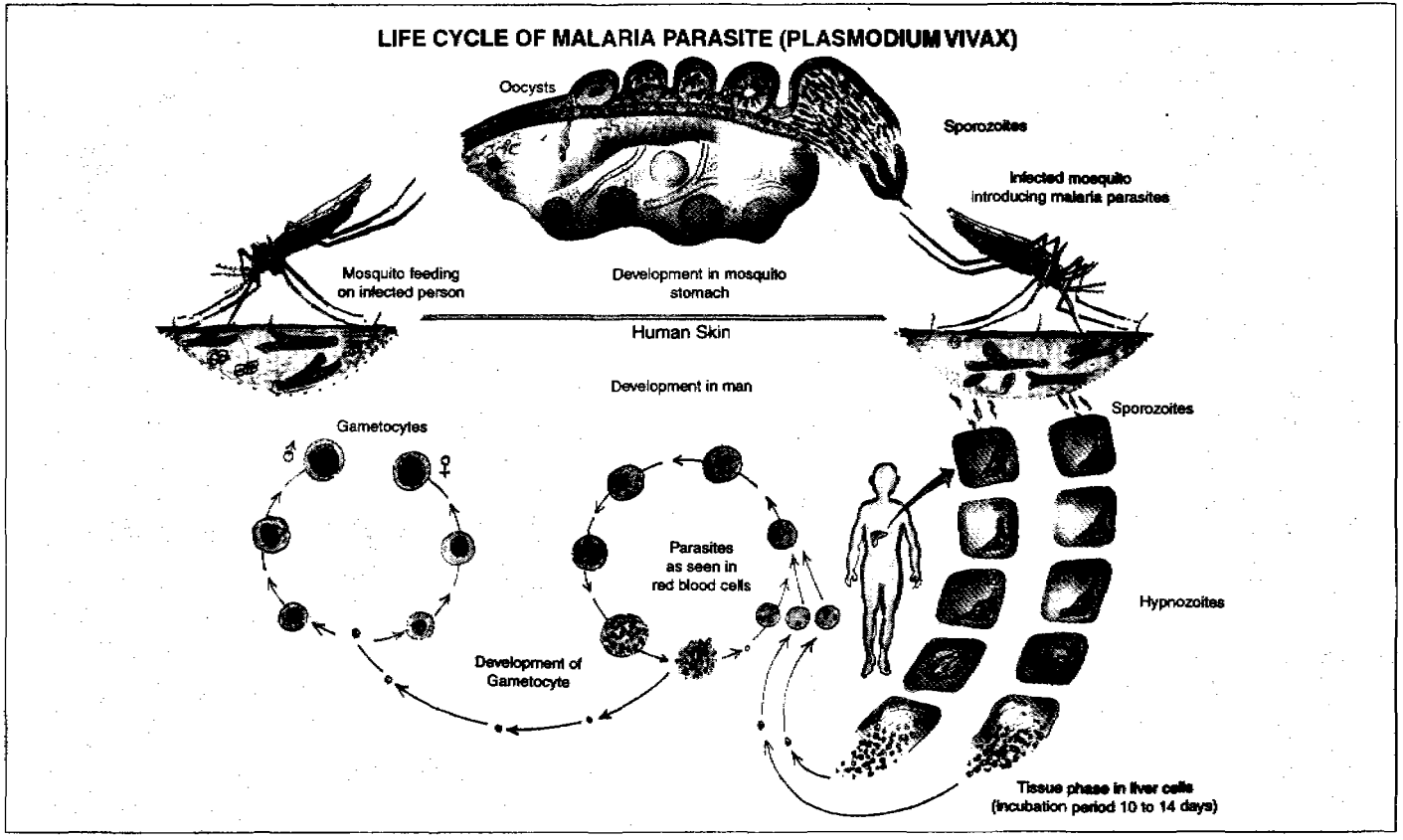


Figure: 9 (Life Cycle of Malaria Parasite in man and mosquito)

Can the bouts of fever in malaria occur more than once ?

Yes, unless treated promptly, malaria causes fever every atterrate day or 3rd day depending on the type of malaria parasite. In the beginning it may cause fever daily. Also in small children and persons who have had malaria before, the fever pattern may not be regular or typical. Certain types of malaria parasite (P.vivax and P. malariae) may cause relapses of malaria if not treated fully.

Is there any other way in which malaria can be transmitted ?

Yes, through infected blood transfusion which has malaria parasites. If the blood of person suffering from malaria is injected into another person, the recipient of the blood can also get malaria.

What are the bad effects of Malaria

Anaemia, weakness and enlargement of spleen and liver.

The malaria patient becomes weak and anaemic, (Fig.10) because the malaria parasites destroy the red blood cells (RBC) in the body. The spleen also gets affected. The spleen is an organ (on the left upper part of the abdomen) which helps to clear the blood of dead red blood cells. When there are too many dead RBC, the spleen becomes large and tender. (Fig. 11) In chronic malaria, there are repeated attacks of fever due to parasites surviving in the liver. Therefore both spleen and liver are enlarged. In untreated malaria, whenever the number of parasites in the blood increase, fever starts again. Each attack of malaria fever leaves the patient very weak and anaemic.

Is Malaria dangerous ?

Yes, malaria can be dangerous if the malaria parasites affect the brain, kidneys and liver.

Cerebral Malaria

One type of malaria namely falciparum malaria affects the brain and causes cerebral malaria. This occurs when a patient remains untreated

for malaria. The patient's condition deteriorates rapidly. With increasing headache, drowsiness, difficult and noisy breathing, delirium and coma. Very high fever and convulsions may develop. The patient should be taken to the hospital as quickly as possible for proper treatment. Most of the deaths in malaria are due to cerebral malaria. (Fig. 12 & 13)

Fig. 10

Fig. 11

Fig. 12

Fig. 13
Cerebral malaria in a child

Acute renal failure

The kidneys do not function properly and there is less urine. A watch therefore should be kept on urinary output in severely ill malaria patients.

Liver damage

Due to liver damage, there may be jaundice. The liver becomes enlarged and tender.

Is Malaria dangerous for children ?

Yes, malaria has more severe effects on children than on adults. They may get convulsions with high fever. Cerebral malaria is more serious and fatal in children. Children who get malaria frequently will suffer from anaemia, enlarged spleen, weakness and slow growth. Kidney complications are also more in children below the age of five years.

What are dangers of malaria in women ?

Malaria parasites destroy red blood cells which cause anaemia (pale look), and weakness. Many women are already anaemic because of their poor diet and repeated pregnancies etc. malaria adds to their problem. (Fig. 14)

Malaria of any form may precipitate miscarriage or abortion and may complicate pregnancy by causing severe anaemia. Pregnancy also appears to impair immunity to malaria and thus in whom the disease has been latent a relapse may develop-during pregnancy. Malaria during pregnancy may also cause death of the foetus in the women.

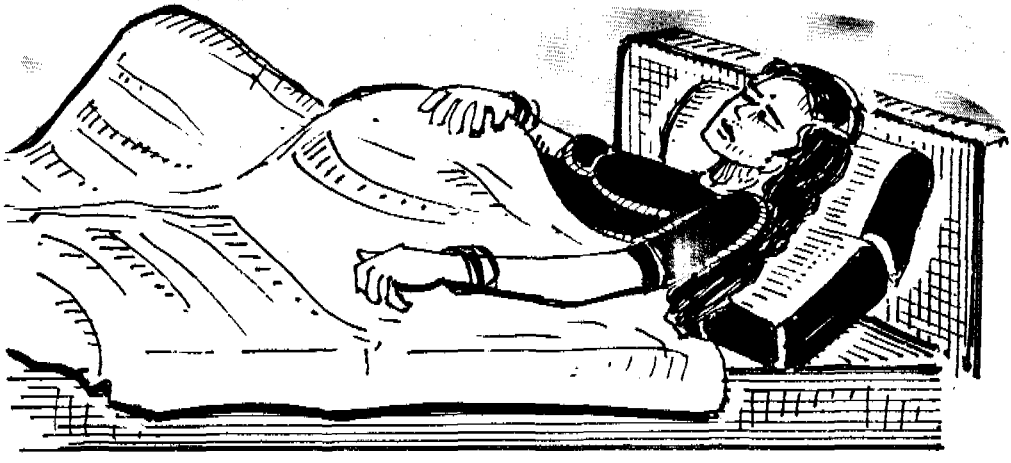


Fig. 14

Can malaria harm the unborn child ?

Yes, if the pregnant women has malaria, it can affect the pregnancy. This can cause abortion or still birth or premature labour. Malaria can also cause low birth weight, which makes it more difficult for the new born baby to survive.

Sometime the baby may be born with the malaria parasites in its blood. This can lead to its also getting malaria and anaemia.

Can a person get malaria more than once ?

Yes, people can get malaria more than once if:

- they do not take full treatment which will kill all the malaria parasites.
- they do not protect themselves from being bitten by mosquitoes.

Where do the malaria mosquitoes breed ?

It breeds freely in stagnant clean water and slow moving streams. Commonly seen mosquito breeding sites are :

i. Inside and around the houses wherever water collects such as :

Earthern pots;

Broken or discarded tins/pots etc. (Fig. 15)

Water coolers (particularly in towns)

Water collection near tap or handpumps; (Fig. 16)

Water collection on the roof; overhead uncovered tanks, courtyard; Blocked drains;

Water tank, unused wells; cattle troughs;

Stagnant water in kitchen garden.

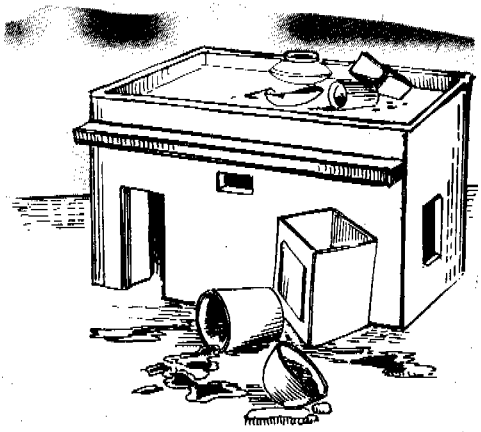


Fig. 15

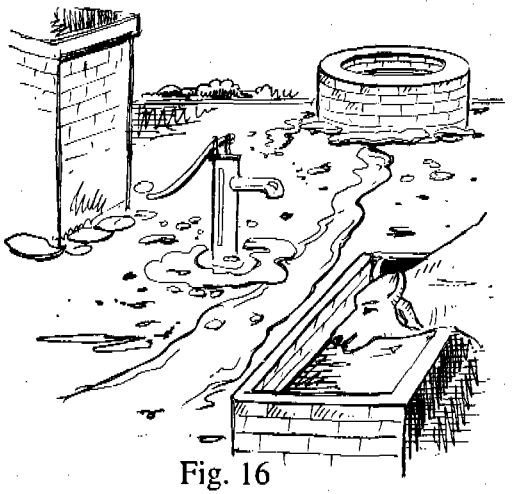


Fig. 16

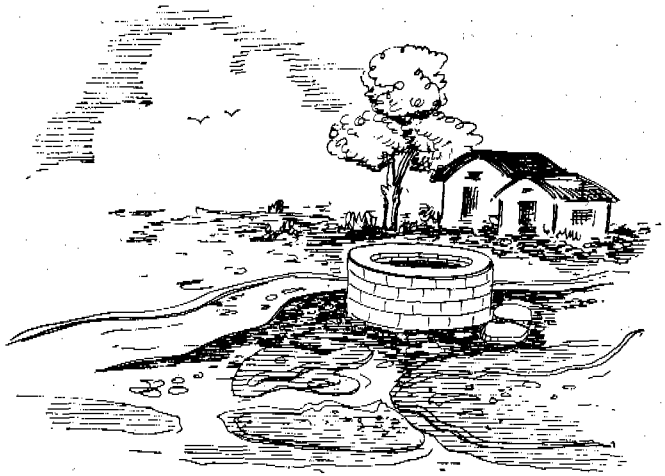


Fig. 17

Breeding places (continued)

ii. In the villages in areas:

Drains or ditches	Paddy fields;
Puddles (Fig. 17)	Unused wells;
Rain water pools;	Cart wheel ruts
Culverts;	Hoof prints;
Road side ditches	Tyre marks on kutcha road
On the edges of ponds;	Seepage water collection from canal or stream;
Channels;	Discarded tyres; (Fig. 18)
Small canals;	Riverbed pools;
Tree holes;	Dead end canals;
Low lying areas.	Irrigation channels, burrow pits.

Malaria *mosquitoes do not breed in stagnant polluted bad smelling water.*

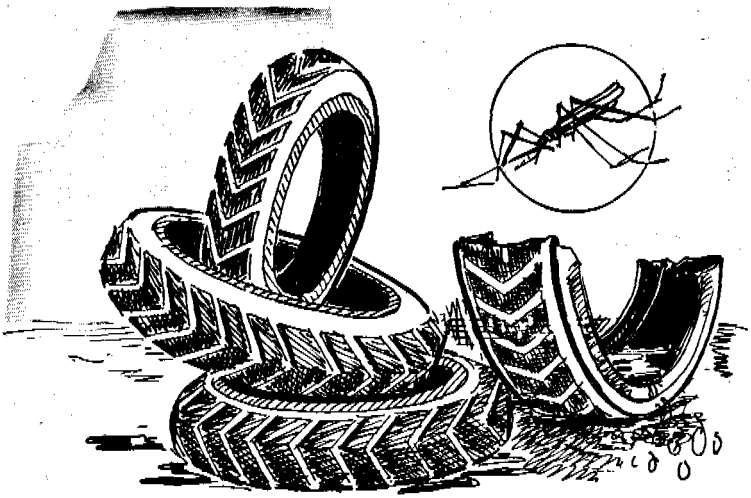


Fig. 18

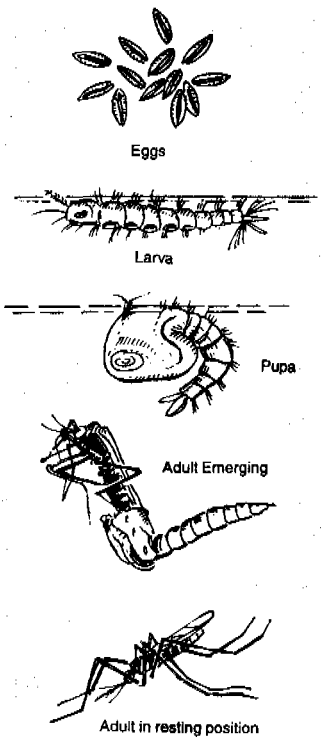
What are the Development stages of malaria mosquito ?

It develops from egg to larva, to pupa, to adult in water in about 8 to 10 days. The adult malaria mosquito rests with the body sloping forward inclined at an angel of 45 degree as if resting on its head. There are three main tribes of mosquitoes, each one is a carrier of different diseases. Malaria is caused by Anopheles mosquito. The life history of the Anopheles mosquitoes is shown below:

What are the feeding and resting habits of malaria mosquito ?

- The female malaria mosquito usually bites at night or at dusk.
- When the mosquito feeds on a person who has malaria, it becomes infected and remains so far the rest of its life. there are no bad affects on the mosquito itself.
- The mosquito may rest inside the house or outside the house depending on the species of mosquito. However, it prefers dark shady places to rest.

- It can fly from 1 to 3 km. from its breeding place in search of blood meal, but the winds may carry it even further.
- Before and after sucking blood it likes to rest a while on a nearby place.
- It rest with the body sloping forward as though resting on its head.



Life History of Anopheles Mosquito

Fig. 19

How can we control mosquito breeding ?

We can control mosquito breeding by eliminating/reducing their breeding places as much as possible, for example :

- Empty water from all utensils/pots (Fig. 20) and tins/cans, room coolers, (Fig. 21) once a week, By doing this the larval stages of mosquitoes are destroyed.

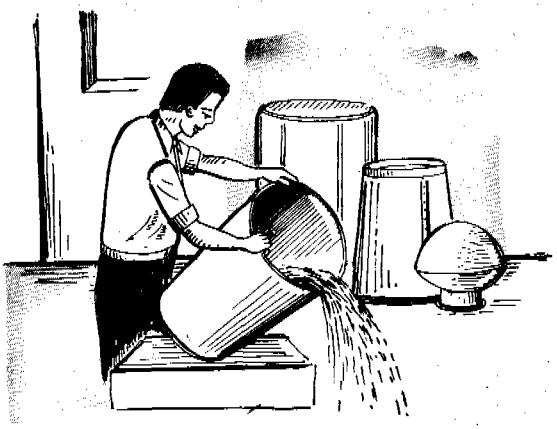


Fig. 20

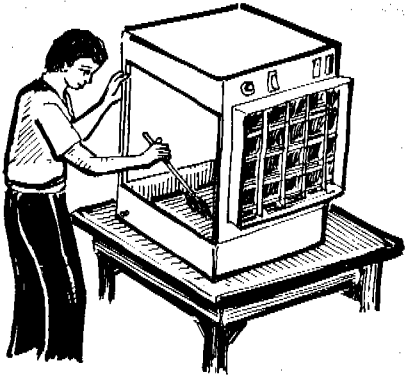


Fig. 21

- Do not allow rain water to collect in empty pots, tins and unused tyres, etc.
- Drain troughs, barrels and water collections near hand pumps, taps etc. (Fig. 22)
- Fill and level depressions in kitchen garden/courtyard, roof and around the houses. (Fig. 23)
- Level or pave roads to avoid hoof or cart wheel ruts, fill ditches by the side of roads, canals.

Fig. 22

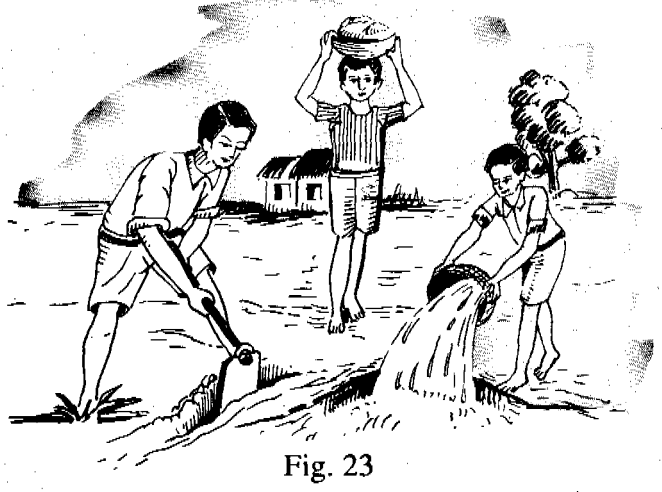


Fig. 23

- Close all water containers with tight fitting lids such as over head tanks, drums, etc.
- Introduce mosquito eating fishes (larvivorous fish) in small ponds/tanks. (Fig. 24)
- Improve the drainage of water by constructing permanent drains for house-hold water and storm water drains for rainy water.
- Spreading kerosene oil or malariol on water surfaces which can not be drained. This prevents larvae from breathing and they die. (Fig. 25)

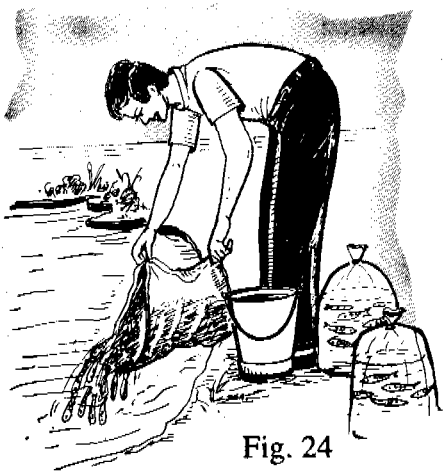


Fig. 24

Fig. 25

How to kill malaria - carrying mosquitoes ?

The mosquitoes are killed by spraying houses with chemicals which kill insects, therefore called insecticides e.g. D.D.T. The mosquitoes after biting human being become lazy and rest on the walls in the house.

Thus one method of getting rid of them is to have all the rooms including store, kitchen, bathroom etc. (cattle shed in villages) sprayed with insecticides. The insecticides used have long lasting effect upto 2 to 2½ month. Therefore if the surface where the mosquitoe sits has been sprayed with insecticides they will be killed and thus further spread of malaria can be prevented.

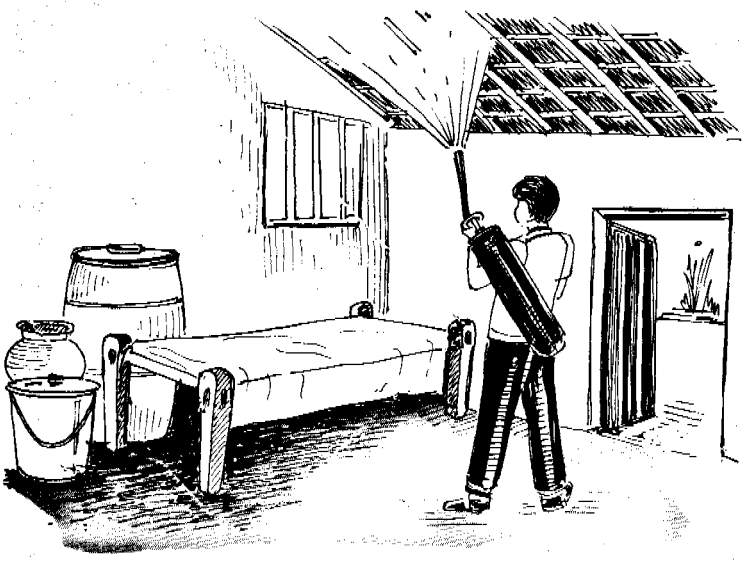


Fig. 26

What precautions should be taken before and after insecticide (DDT) spray in the house ?

Sometime people do not allow the spraying team to spray their houses/all the rooms including kitchen of their houses because they do not like the smell of the insecticide (which is temporary) or don't like the spots of the spray on the wall. We should cooperate with the spray team to protect the whole community from malaria. Female anopheles mosquito rest on the wall after biting a person, when it comes in contact with the DDT mosquito is killed, thus it cannot spread malaria.

Before the spray, all foods, drinking water, and foodgrains in the house should be covered properly or removed, so that these are not contaminated by insecticides. Children should also be kept outside while the spraying is going on. After the spray the sprayed surface of the walls should not be plastered with mud, cowdung or whitewashed etc. because by doing this the insecticide will not work.

How can we protect ourselves from mosquito bites.

We can protect ourselves from mosquito bites by :

- Using mosquito bed nets at night (Fig. 27)

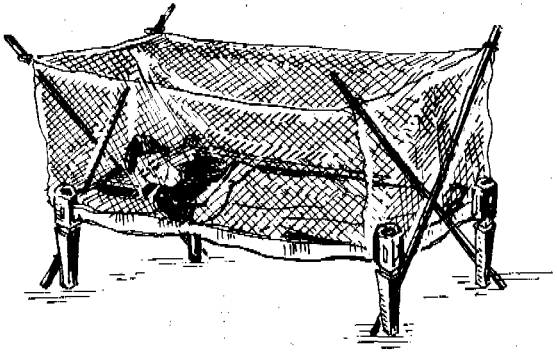


Fig. 27

- Using mosquito repellant, coiles, electrically operated chemically treated mats etc. (Fig. 28)

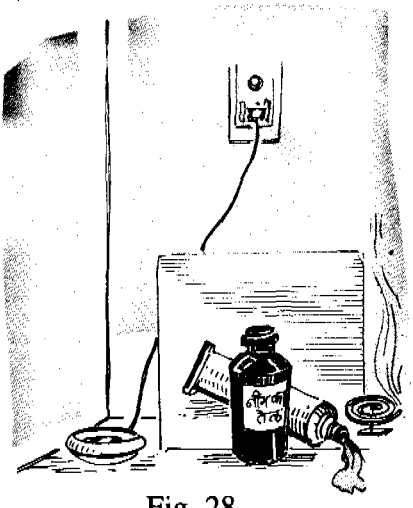


Fig. 28

– By burning neem leaves or other locally known incense whose smoke drives away mosquitoes. (Fig. 29) By using repellant ointment or oils (Neem oil, citronella oil) on exposed surface of the body.

Fig. 29

- By screening doors and windows of the houses (Fig. 30)
- By using insecticide impregna-ted bed nets wherever available.

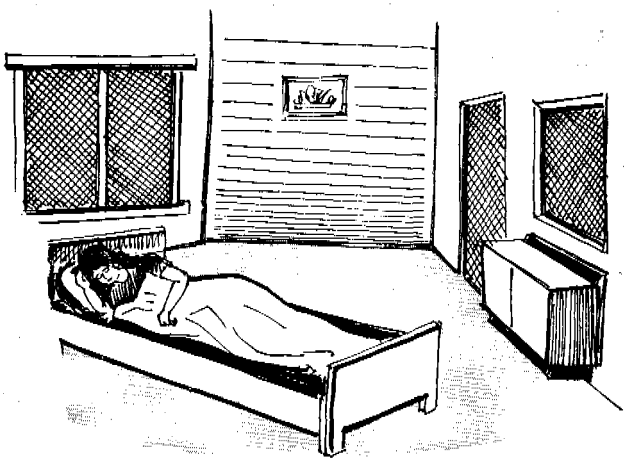


Fig. 30

What are the disadvantages of Insecticides ?

Too much of insecticides cause contamination of environment and food chain.

- They can adversely affect the health of human beings and animals
- Constant spraying of insecticide has made mosquitoes resistant. Therefore spraying should be done only when technically essential.

How to diagnose a case of Malaria?

This is done in two steps.

1. A blood smear is made from all fever cases.
2. The blood smear is examined under the microscope for detection of malaria parasite.

Why it is necessary to collect blood smear from all fever cases?

(i) If the symptoms are mild, one may not suspect malaria, therefore to arrive at the diagnosis, blood smear examination is essential.

(ii) Fever due to clinically diagnosed malaria should be confirmed as matter of course.

(iii) Flare-up of old malaria may occur due to various causes such as after child birth, surgery, accidents etc. blood examination clears doubts about malaria.

(iv) Only method to confirm malaria is through blood examination.

How to prepare a thick and thin blood smears for malaria microscopy?

A. The following equipments are required :

- Clean glass slides
- Pricking needle/Hagedon Triangular No. 12 or disposable lancet.
- Specimen tube with cork for fixing pricking needle.
- Spirit or savlon solution in small bottle with cork/cap.
- Cotton
- Clean handkerchief
- Slide box for 25 or 50 slides
- Using mosquito bed nets at night
- Lead pencil
- Register and forms for recording information
- Ball point pen
- Antimalarials for giving pre-sumptive treatment

B. Method for preparation of thick and thin blood smear on the same slide.

1.- Holding the patient's left hand, palm upwards, select the third finger of the left hand. (The big toe can be used with adults. The thumb should never be used for adults or children).

- Clean the finger with a piece of cotton swab lightly soaked in spirit or savlon solution, using firm strokes to remove dirt and grease from the ball of the finger.
- Allow the finger to dry. (Figure 31)

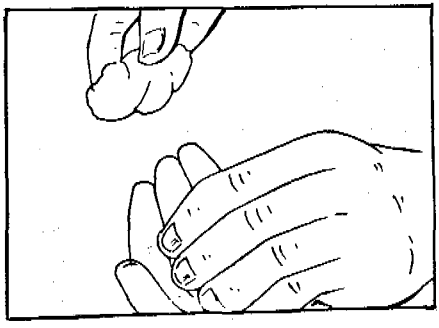


Fig. 31

2. - Holding the sterile pricking needle/lancet in right hand, prick the ball of the finger.

- Allow blood drop to ooze out (Figure 32)

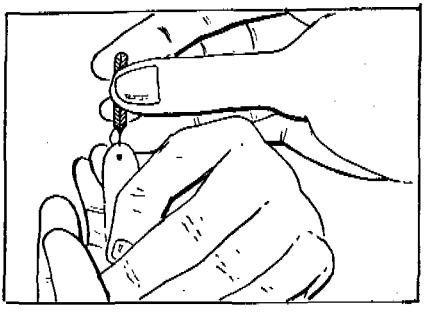


Fig. 32

3. - Working quickly and handling clean slides only by the edges, collect the blood as follows:

- Apply gentle pressure to the finger and collect 3 drops of blood 1 cm from the edge of the glass slide.
- Take another drop of blood one cm from the first drop of blood (Figure 33)

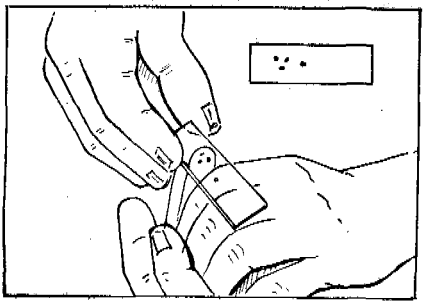


Fig. 33

- Wipe the remaining blood away from the finger with a piece of cotton swab.

4. **Thin Smear** Using a second clean slide with smooth edges as a "spreader" and, with the slide with the blood rops resting on a flat, firm surface, touch the single drop with the spreader and allow the blood to run along its edge. Firmly push the spreader along the slide, keeping the spreader at an angel of 45. Make sure that the spreader is in even contact with the surface of the slide all the time the blood is being spread. (Figure 34).

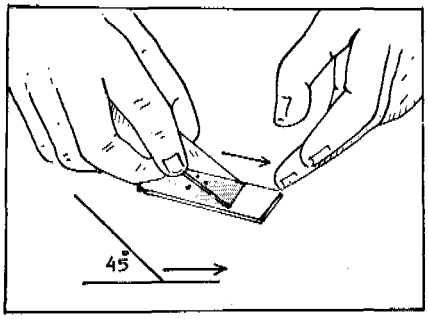


Fig. 34

5. **Thick Smear** Always handle slides by the edges or by a corner to make the thick smear as follows :

   using the corner of the spreader, quickly join the drops of blood and spread them to make an even, thick smear. The blood can be spread in circular form, the circular thick smear should be about 1 cm in diameter. (Figure 35).

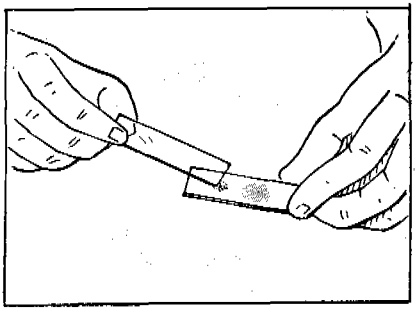


Fig. 35

6. Put the slide number and date by writing across the thicker portion of the thin smear with lead pencil. (Figure 36).

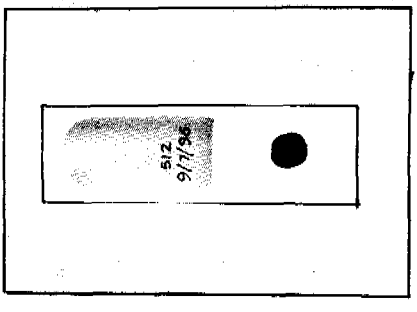


Fig. 36

7. Wrap the dry slide in the patient's record form and dispatch it to the laboratory as soon as possible.

8. The second slide used for spreading the blood smears may now be used for the next patient and another clean slide from the pack will be used as a spreader.

How to sterilise the pricking needles and what precautions should be taken by the health personnel during the preparation to the blood smear?

The following guidelines should be adopted.

1. A Hegedorn needle or a straight cutting surgical needle should be used as pricking needle. Needles for injections should never be used as pricking needle.

2. Either presterlised disposable needles should be used (one needle for one patient) or needles should be properly sterilised by one of the following methods.

   (a) Inflame the tip of the pricking needle (about 2 to 3 mm of tip), cool it and prick the cleaned finger for blood smear collection immediately. For this method every worker should be provided with a spirit lamp.

   (b) Needles should be boiled for atleast 30 minutes. Every worker going for house visits should carry sufficient number of sterilised needles required for the day. **One sterilised needle must be used for one patient.** The worker will keep the sterilised needles in one sterilised specimen tube, properly labelled and another specimen tube for the used needles.

3. Soon after taking the blood smear, the needle must be wiped of blood by the worker with cotton swab soaked in one of the chemicals like 70% ethanol or savlon (propanol).

4. One cotton swab soaked in 70% ethanol/savlon should be used for cleaning the finger of each patient before and after pricking.

5. The worker should collect the used cotton swab in a specimen tube and the used cotton swabs should be burnt after the day's work. Care may be taken to sterilise the container.

6. The workers should take adequate precaution to avoid contact with patient's blood if they have a cut or wound or a bruise on their fingers.

What treatment do we give to fever cases?

Presumptive Treatment for malaria fever

- To all fever cases or cases with history of fever during past 15 days after taking blood film where - ever possible and even where no blood smears are collected.
- To all persons irrespective of age & sex including infants and pregnant women.
- This is done to destroy the malaria parasites in the blood and give relief to the malaria case.

A) In low risk area - by all agencies

- Single dose of Chloroquine phosphate @ 10 mg/kg. Body Weight (b.w.) ie 600 mg adult dose (4 tablets)

Age - wise dosage

Age in Years	mg. base	No. of Tablets
< - 1	75	½
1 - 4	150	1
5 - 8	300	2
9 - 14	450	3
15 & above	600	4

Caution : Anti malarial drugs should not be taken in empty stomach.

B. 1) In High Risk Areas - by medical doctor/under supervision

- 25 mg/kg.bw of Chloroquine base over three days (10 mg/kg.bw each on first and second days and 5 mg/kg.b.w. on third day) along with single dose of Primaquine 0.75 mg/kg.b.w. on first day.

Age - wise dosage

Age in Yrs.	First Day		Second Day	Third Day
	Chloroquine (mg. base)	Primaquine (mg. base)	Chloroquine (mg. base)	Chloroquine (mg. base)
< - 1	75	–	75	37.5
1 - 4	150	7.5	150	75.0
5 - 8	300	15.0	300	150.0
9 - 14	450	30.0	450	225.0
15 & above	600	45.0	600	300.00

Note : Pregnant women and infants are not to be given Primaquine

B. 2) Health workers will administer Chloroquine base @ 10 mg/ kg.b.w. in a single dose without Primaquine.

What treatment do we give to malaria positive cases?

Radical Treatment (R.T.) :- Complete treatment as following :

We give Radical Treatment

- All microscopically +ve cases to be given Primaquine for gametocytocidal and anti-relapse action.
- **Radical Treatment should be given by a doctor/under the supervision of a doctor.**

A) For *P. vivax, P. malariae,* mixed infection.

Adult Dose : Single dose of 600 mg. Chloroquine + 15 mg. Primaquine on the 1st day followed by 15 mg. Primaquine daily for another 4 days.

Age - wise dosage

Age in Yrs.	Tablet Chloroquine (150 mg. base)		Tablet Primaquine (2.5 mg. base)	
	Single Dose	No. Tabs	Daily dose for 5 days	No. Tabs
< - 1	75	½	–	–
1 - 4	150	1	2.5	1
5 - 8	300	2	5.0	2
9 - 14	450	3	10.0	4
15 & Above	600	4	15.0	6

Note : Infants and pregnant women are not to be given Primaquine

B) R.T. for *P. falciparum* infection - by a doctor/under supervision

Adult Dose : 1500 mg. Chloroquine in three divided daily doses (i.e. 600 mg. each on 1st day & 2nd day and 300 mg. on 3rd day) + single dose of 45 mg. Primaquine on 1st day. Doses are suitably adjusted for other age groups as mentioned earlier.

The fever cases given three days presumptive treatment i.e 1500 mg Chloroquine and 45 mg Primaquine (adult dose), and later found positive for **P. falciparum** need not be given radical treatment.

(Source : Revised Drug Policy 1995 - NMEP Directorate)

Note : The Presumptive and radical treatments of cases in Chloroquine resistant strains areas for **P.faciparum** are not given, being outside the scope of this book.

How to maintain records of fever cases from whom blood is collected?

Maintenance of records is essential for :

- completing treatment of positive cases.
- follow up of treated cases.
- finding out gravity of malaria in the area so that proper control measures are taken.

The essential information to be recorded is :

- Name in full
- Age
- Sex
- Address
- Serial number of the patient and blood slide with date of collection.
- Number of antimalarials given for presumptive treatment.

The proforma for recording the information is given in the Annexure. The Health worker should keep the records of blood smears collected and patient given antimalarials. This proforma should be forwarded to laboratory technician along with blood smears collected, who will send the results to the doctor/supervisor for Radical Treatment to positive cases.

What are the likely toxic symptoms of Chloroquine Phosphate?

The toxicity is nil/minimal at the recommended dose under the National Malaria Eradication Programme.

Toxicity : Gastric irritation; nausea, vomiting, headache, pruritus, blurring of vision.

Chronic Toxicity : Prolonged use of large dosage of Chloroquine for weeks or months causes

- Ocular damage like neuro-retinitis.
- Pigmentation of skin, nail-bed and palate.
- Neutropenia specially in long continued use.
- Skin rash.

Remedy : The above symptoms usually disappear soon after discontinuation of the drug.

Caution : Drug should not be administered on empty stomach.

What are the likely toxic manifestation of Primaquine?

At the recommended dosage, no symptoms of toxicity are likely to occur.

Toxicity :

- Anorexia (loss of appetite), nausea, vomiting, epigastric stress, abdominal pain and cramps.
- Passage of dark urine, dyspnoea (difficulty in breathing).
- Methaemoglobinaemia manifested by cyanosis (blue colouration) of nail-beds, lips, earlobes, tips of nose and tongue.

In addition, there may be bone marrow depression after prolonged use or in cases sensitive to this drug causing Anaemia, leukopenia (decrease in White Blood Corpuscles).

The haemolytic action of Primaquine related to the presence of certain hereditary enzyme deficiencies, particularly that of Glucose-6-Phosphate Dehydrogenase (G-6-PD) - may lead to haemoglobinuria (blood in the urine), renal failure.

Remedy : On the appearance of any of the toxic manifestations, the drug should be stopped. The symptoms usually disappear after discontinuation of the drug.

Caution : Primaquine should not be given to pregnant women and infants. It should not be administered empty stomach.

It should be administered either by a medical doctor or under his/her supervision.

Annexure

Proforma for Reporting of Blood Smears by Health Worker/Supervisor

Name of Centre : _____

Name of PHC : _____

Village	No. of the house	Name of Head of family	Name of patient/ person	Age & Sex	Sr. No. of blood smear	Treatment No. of tablets given (4-amino)	Date of Collection	P.f.		Results			If positive Radical Treatment	
								R	RG	P.v	P.m.	Mixed indicate Stage	From	To
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

* Note : This Proforma should be forwarded to Laboratory Technician along with blood smears collected who will send the results to the doctor/supervisor for Radical Treatment to positive cases.

Signature of Microscopist **Date of examination by the Microscopist** **Name of the Health Worker/Supervisor**

P.f. = P. falcifarum, R = Ring stage, R.G. = Ring & Gametocyte P.v. = P. vivax P.m. = P. malariae

LIST OF STATE MALARIOLOGISTS

1. **ANDHRA PRADESH**
   Additional Director of Medical
   & Health Services (Mal. & Fil.),
   Andhra Pradesh, Sultan Bazar,
   Hyderabad - 500 001.

2. **ARUNACHAL PRADESH**
   Dy. Director of Health
   Services (NMEP),
   Arunachal Pradesh,
   Naharlagun - 791 110.

3. **ASSAM**
   Joint Director of Health
   Services (Malaria), Assam,
   Hengrabari, Guwahati - 781 006

4. **BIHAR**
   Chief Malaria Officer,
   NMEP, Sultanganj,
   Swasth Bhawan, Bihar,
   Patna - 800 002

5. **DELHI ADMINISTRATION**
   Director of Health Services,
   Govt. of NCT OF Delhi,
   Saraswati Bhawan, E-Block,
   Connaught Place, New Delhi - 110 001.

6. **DELHI M.C.D.**
   Municipal Health Officer,
   Municipal Corporation of Delhi,
   Town Hall, Chandni Chowk,
   Delhi - 110 006.

Dy. Municipal Health Officer
(Malaria), Municipal Corporation
of Delhi, Town Hall, Chandni Chowk,
Delhi - 110 006.

7. **N.D.M.C. NEW DELHI**
Medical Officer of Health,
Palika Bhawan, Parliament Street,
New Delhi - 110 001.

8. **GUJARAT**
Joint Director of Health
Services (Mal. & Fil.),
Dr. Jivraj Mehta Bhawan,
Block No. 5, Gandhinagar.

9. **HARYANA**
Director Malaria,
SCO-50-51, Sector - 17A,
Haryana, Chandigarh.

10. **HIMACHAL PRADESH**
State Malariologist,
Swasth Sadan, Kusumpati,
Shimla - 171 009.

11. **KARNATAKA**
Joint Director (Mal. & Fil.),
Directorate of Health & FW
Services, Ananda Rao Circle,
Karnataka, Bangalore - 560 009.

12. **KERALA**
Dy. Director of Health Services
(Malaria), Directorate of Health
Services, Kerala, Trivandrum - 695 031.

13. **MADHYA PRADESH**
Joint Director of Health
Services (Malaria),
Satpura Bhawan, 6th Floor,
Madhya Pradesh, Bhopal.

14. **MIZORAM**
Deputy Director (Malaria),
Mizoram, Aizwal - 796 001.

15. **MEGHALAYA**
Deputy Director of Health
Services (Malaria), Upper Lachumiera,
Shillong - 793 003

16. **MANIPUR**
Asstt. Director of Health
Services (Malaria),
R.M.C. Complex, Lamphalpet,
Imphal - 795 004

17. **MAHARASHTRA**
Joint Director of Health
Services (Mal. & Fil.),
Connaught House,
Near Sadhu Vaswani Chowk,
Poona - 411 001.

18. **NAGALAND**
Deputy Director of Health
Services (Malaria),
P.R. Hills, Kohima.

19. **ORISSA**
Jt. Director of Health
Services (Mal. & Fil.),
Head of Deptt. Building,
Orissa, Bhubaneswar - 751 001.

20. **PUNJAB**
Deputy Director (Malaria),
Punjab, Parivar Kalyan Bhawan,
Sector - 34 (A), Chandigarh.

21. **RAJASTHAN**
Additional Director (R.H.),
Directorate of Medical & Health
Services, Tilak Marg, 'C' Scheme,
Jaipur - 302 001.

22. **TAMILNADU**
Additional Director (Malaria),
Directorate of Public Health &
Preventive Medicine,
Madras - 600 006.

23. **TRIPURA**
Dy. Director of Health
Services (NMEP),
Govt. of Tripura,
C/o. Health Directorate,
Gorkhabasti, P.O. Kunjaban,
Agartala, West Tripura.
Pin - 799 006.

24. **UTTAR PRADESH**
Additional Director (Mal. & CD),
Jawahar Bhawan, Fourth Floor,
Uttar Pradesh, Lucknow.

25. **WEST BENGAL**
Dy. Director of Health Services
(Malaria), West Bengal,
20-Chandney Chowk Street,
1st Floor, Calcutta - 700 072.

Do's

1. Report to the nearest Doctor, Health Centre, in case of any fever.
2. Get blood tested for malaria parasite.
3. Take Chloroquine tablets in full prescribed dose at one time but not in empty stomach.
4. If found positive for malaria, take complete treatment as advised by the Health Worker or the Doctor.
5. Use mosquito net while sleeping, specially for pregnant women and children.
6. Peridomestic water reservoirs, containers coolers should be drained every week to prevent mosquito breeding.
7. Insecticidal spray is recommended under the programme in some areas. Cooperate with the spray teams and get sprayed the interior walls of all the houses in the locality.
8. In case of fever with altered conciousness, rush the patient to the nearest hospital immediately.

Dont's

1. Do not neglect any fever, it may be due to malaria.
2. Do not sleep outdoor without using mosquito net.
3. Do not take self prescribed medicine for malaria in inappropriate dosage.
4. Do not create new water collection site near your house to prevent mosquito breeding.
5. Do not mudplaster or whitewash your house at least 2 months after the spray.

Voluntary Health Association of India (VHAI) is a [illegible] registered society formed by the federation of Voluntary Association at the level of States and Union Territories. VHAI links over 3000 grassroot-level organisations and community health programmes spread across the country.

VHAI's primary objectives are to promote community health, social justice and human rights related to the provision and distribution of health services in India.

VHAI fulfils these objectives through campaign, policy research and press and parliament advocacy; through need-based training and information and documentation services; and through production and distribution of innovative health education materials and packages, in the form of print and audiovisuals for a wide spectrum of users - both urban and rural.

VHAI tries to ensure that a people-oriented health policy is formulated and effectively implemented. It also endeavours to sensitise the large public towards a scientific attitude to health, without ignoring India's natural traditions and resources.

VOLUNTARY HEALTH ASSOCIATION OF INDIA
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