

**Federal Democratic Republic of
Ethiopia**

Ministry of Health

*Malaria Prevention and control
Extension Package*

**September 2003,
Addis Ababa**

Table of Contents

<u>Title</u>	<u>Page</u>
1. Introduction	2
2. General Objective	2
2.1 Specific Objectives	2
3. Strategies	4
4. Activities	5
4.1 Data Collection	5
4.2 Health Education	8
4.3 Malaria Vector Control Methods	8
4.3.1. Environmental Management	10
4.3.2. Larva cides	13
4.3.3. Indoor Residual House Spraying	22
4.3.4. Insecticide Treated Mosquito Nets	27
4.4 Malaria Diagnosis and Treatment	30
4.5 Malaria Epidemic Prevention and Control	37
4.6 Contributions by Individuals or Groups in Malaria Prevention and Control	39
4.7 Demonstration	40
5. Expected Outputs/Results	41
6. Information, Communication Methods for Malaria Prevention and Control	43
7. Monitoring and Evaluation	43
7.1 Monitoring	44
7.2 Evaluation	45
8. Annexes	46
Annex 1: Training of Spraymen	52
Annex 2: Treatment Schedule for Sulfa-doxine-pyrimethamine	53
Annex 3: Treatment Schedule of Chloroquine Tablets and Syrup	54
Annex 4: Form for the Registration of Patients and Distribution of Drugs.	55
Annex 5: Health Extension Worker Malaria Control Activity Report Form	57
Annex 6: List of Supplies, Drugs and Chemicals	58
Bibliography	59

1. Introduction

Malaria in Ethiopia has different names in different languages. This obviously indicates the extent of the spread of the dreadful disease that had long lived with people. In the past, the cause of the disease was associated with merely lack of awareness and/or ignorance. Historically, the Italians had associated the disease with water in ponds and swampy/marshy areas and offensive smell. As a result, they gave the disease the name malaria which meant “bad air.”

Malaria is an old and long standing disease in Ethiopia. However, the intensity and distribution of the disease was firmly established by studies conducted during the Italian invasion of 1935.

In Ethiopia generally low land and temperate areas below 2000 meters altitude are considered Malarious. Occasionally, malaria transmission also occurs in previously non-malarious areas including areas having above 2500 meters altitude when micro-climate and weather conditions favorable for the breeding of mosquitos prevail. As a result, short lived severe epidemics occur. Malaria epidemics generally occur immediately after the long rains in September to November and in some places also after the short-lived shower rains in April to may.

75% of the land area of the country is considered to be either malarious or potentially malarious, and about 65% of the population in these areas are at risk of infection. Due to the diversity of topography and variation of climate of the country the nature of the malaria transmission in most parts of Ethiopia is unstable. Hence, rampant malaria epidemics that result in huge morbidity and high mortality often occur. Furthermore, the transmission of the disease generally occur during the peak cultivating and harvesting period of the year and has a tremendous impact on the

agriculture productivity. The adverse consequences of the malaria epidemics do not only result in mortality and morbidity, but also severely affect the income of households and the economy of the country at large.

The country had experienced the worst malaria epidemics in 1958 with an estimated three million malaria cases and 150,000 deaths. Hence, the Malaria Eradication Programme was established and made operational in 1966. There after notable malaria epidemics that caused severe damages had occurred in 1965/66; 1972/1973; 1980/81; 1987/88 and in 1992.

To date, the malaria prevention and control activities were mostly executed by health institutions which are often inaccessible due to many reasons. As a result, the majority of the rural population is not benefiting much from the services. In order to improve and expand malaria prevention and control services, Roll Back Malaria (RBM) has been designed. RBM entails the active participation of communities and all organizations. To this effect, activities that raise the awareness of communities are being implemented so as to directly engage communities in the malaria prevention and control activities and decision making to enhance the programme. The Malaria Extension Package has been developed taking into account the situation briefly presented in the above paragraphs.

Figure 1: Malaria distribution in Ethiopia.

Picture

2. General Objective

The overall objective is to improve the health of communities by reducing the overall burden of malaria (morbidity and mortality).

2.1 Specific objectives:-

2.1.1 Increase the awareness of communities on malaria transmission, prevention and control measures to enable them actively participate in the malaria prevention and control activities;

2.1.2 Reduce the number of malaria cases and deaths.

2.1.3 Provide malaria treatment at home and enhance the participation of communities in the malaria control efforts to curtail and promptly suppress malaria epidemics; and

2.1.4 Educate households to utilize health services before they get seriously sick from malaria.

3. Strategies:

3.1 Conducting malaria epidemiology base-line studies (surveys);

3.2 Providing rigorous and sustained education about the transmission and control methods of malaria to households to enable them fully participate in the programme;

3.3 Strengthening the participation of households in the malaria prevention and control activities;

3.4 Undertaking continuous implementation of selective vector control interventions;

3.5 Providing early diagnosis and prompt basic treatment;

3.6 Undertaking relevant measures to prevent malaria epidemics as well as control emerging ones;

3.7 Creating mechanisms for inter-sectoral collaboration of organizations (civil societies governmental, NGOs etc) in the

kebele to contribute to the malaria prevention and control activities in the area; and

3.8 Promoting and strengthening the participation of communities through practical demonstration of the malaria prevention and control measures and techniques.

4. Activities:-

- Collecting basic data useful for the malaria prevention and control activities;
- Educate communities on malaria, modes of malaria transmission consequences of malaria, and prevention methods/measures in a continuous manner;
- Methods/measures of malaria vector control:
 - Identify mosquito breeding places in the kebele and mobilize the communities to participate in malaria vector control;
 - Identify permanent mosquito breeding places that cannot be avoided by environmental vector control and prevent malaria by spray the sites with larvacides;
 - Undertake indoor insecticide spraying on all residences/ houses in the kebele; and
 - Promote the use of insecticide treated mosquito nets (ITNs) by house holds;
- Dispense malaria treatment drugs for sick household members based on the treatment guidelines;
- If Malaria epidemics occur in malaria prone localities, submit report to the woreda health office describing the precipitating factors and measures to be taken and resources and support needed to control the epidemics;
- mobilize and coordinate house hold members to contribute their individual and collective efforts to control Malaria; and

- Mobilize each household member to participate in the prevention and control of malaria epidemics after fully understanding the measures to be applied through demonstrations.

All most all the developed strategies for the prevention and control of malaria focus on interrupting breeding life cycle of mosquitoes, and breaking the chain of transmission between human and mosquitos. In line with this principle, the various malaria prevention and control methods are presented in details below.

4.1 Data Collection:

The health extension worker will collect the necessary basic information about the kebele such as:

- Name of villages; altitude in meters (above sea level);
- Number of houses and average size in square meters;
- Number of kebele population categorized in sex and age;
- Number of community health agents in the kebele;
- In and out movement of population;
- The number of water sources in the kebele and their yield;
- Number of government, NGOs, private health institutions; educational institutions; and civil organizations; and
- Number of house hold members sleeping out door.

4.2. Health Education:

4.2.1 What is Malaria?

Malaria is a disease caused by a parasite known as plasmodium that live and feed on red blood and liver cells. The parasites are identified by microscope. There are four types of malaria plasmodium species that develop and proliferate in human body and cause the disease. These are:-

- Plasmodium falciparum;
- Plasmodium vivax;

- Plasmodium malariae; and
- Plasmodium ovale.

The above different malaria plasmodium species have different physical shapes, development processes and life cycles, life span, level of severity, specific nature of frequency of relapses of the disease varied level of effectiveness of anti-malaria drugs and the degree of disability they cause. Plasmodium falciparum and plasmodium vivax are the dominant species in Ethiopia.

The consequences of malaria are massive destruction of red blood cells, mental retardation severe damage to the liver, kidneys and brain, and eventually ends in debility or death. In addition, malaria causes high morbidity and mortality in pregnant women, mothers and children and also exposes them to other infectious diseases.

Symptoms and signs:

- Chilliness;
- Shivering;
- Fever and sweating;
- Poor appetite and vomiting;
- severe headache and thirst; and
- Back pain and pains in the joints of extremities.

The development of the above signs and symptoms is associated with the development of the plasmodium species in red blood cells and eventually invade the blood system to continue attacking other healthy red blood cells. If malaria is not promptly treated, relapse occur in two to three days depending on the type of the malaria plasmodium. In addition to the above symptoms and signs other signs or complications associated with severe reduction of red blood cells emerge. These include:-

- Low hemoglobin;

- Severe anemia;
- Loss of weight; and
- Swelling or tenderness of the spleen.

Modes of Malaria transmission:

In some of parts Ethiopia people believe that malaria catches by eating the corn maize and its stems. The truth in this is that mosquito larvae feed on the corn maize flower and as a result the larvae grow and the mosquito population increases.

Malaria is transmitted from man to man only through the bite of female anopheles mosquito. The female anopheles mosquito needs blood for the development of its eggs. When the female anopheles mosquito bites a malaria sick person it draws blood and with it the malaria plasmodium species. These species develop and mature in its stomach in 10 – 12 days.

Again when the mosquito bites a healthy person while searching for blood meal it first spits out its saliva to prevent the coagulation of the blood. Malaria parasites mixed with the saliva enter the body of the victim to cause the disease. However, the healthy person does not immediately fall with malaria. Without feeling any changes, the person continues to do his normal work for 10 to 14 days. During this period the parasites lodge in the victim's liver and continue to develop. After getting matured the parasites leave the liver and enter the blood system and start to invade the red blood cells. This process has peculiar development steps/behavior and duration of time for the four individual plasmodium species.

The Malaria mosquito often breeds and develops after the rainy seasons in stagnant waters in ponds, ditches and small water collections on the ground. The larvae hatch from the eggs and after completing the various development

stages, the larvae change into adult mosquitos which immediately leave the water and fly. The malaria mosquito has the capacity to fly about two kilometers distance from its breeding place to bite human beings. Malaria mosquito flies in the nights in search of its blood meals.

Figure 2: Life cycle:

Picture

4.3. Malaria Vector Control Methods:

4.3.1 Environmental Management:-

Water is essential for the breeding of malaria mosquitos. To ensure the prevention and control of malaria, it is important that all temporary or permanent breeding sites with water are identified and eliminated through active participation of communities.

This malaria control strategy becomes resultant only when the mosquitos are effectively interrupted from breeding and/or their population is substantially decreased. This can be achieved in areas where only limited number and fully identified breeding sites exist. These usually low lands, malarious towns, development areas and others. In low land temperate and high land rural areas mosquito breeding sites exist widely distributed and in abundance in winter. During this period, it is virtually impossible to identify the exact number of breeding sites and employ control measures. Therefore, planning environmental management for vector control at this

time will be a futile attempt and results in the wastage of human resources, finance and materials.

In Ethiopia, malaria mosquito prefers for breeding mainly water collections from rains. However, the mosquito breeds also in intermittent rivers and streams, around ponds, swampy and marshy areas, slowly running shallow irrigation waters and around shallow dams. Therefore, the following measures can be implemented in potential mosquito breeding sites to prevent and control malaria.

- Clearing of water bodies, filling and leveling burrows and pits, abandoning undesired materials that contain water are some of the activities that are performed to reduce natural or man made breeding sites;
- Breeding sites in swampy and marshy areas can be dried up by making drainage ditch and planting trees such as eucalyptus, which can consume large amount of ground water;
- In dry seasons intermittent rivers and streams that form stream beds, pools and side water pockets have to be filled or drained or connected to the main course of water;
- Intermittent irrigation of paddy fields with flooding and drying periods at least once every week and grading of paddies and ditches for rapid dewatering and vegetation are among the measures that reduce suitable mosquito breeding sites;
- Water containers used for storage of water and available inside and outside the house holds such as pots, wells, barrels etc. should be covered; and
- Remove or destroy all materials (broken items, old types etc). which hold water and available in and out side the house hold.

Priority actions that help implementation of environmental management vector control:-

1. Identify the number and distribution of mosquito breeding sites;
2. The number of manpower needed should be determined ;
3. Identify working tools by type and number:
 - Spade;
 - Pick-axe;
 - Sickle; and
 - Cutting knife
 - Sack, wheel-burrow.
4. Time required to complete the implementation of the environmental vector control measures ;
5. Type of vector control activities:
 - Leveling and filling;
 - drainage;
 - Cleaning and clearing ditches; and
 - Clearing grass or weeds in irrigation ditches;
6. Coordinating and managing the environmental control Programme on the scheduled day and place; and
7. Keeping record of the accomplished work.

The aforementioned environmental management vector control measures require large number of human resource and their successful implementation can only be assured by active participation of communities. The vector control measures should be run at least once every week. The health extension workers should educate and mobilize the communities to participate in the identification of the mosquito breeding sites and the measures to be undertaken. Furthermore, the health extension workers are expected to provide technical support when deemed necessary.

4.3.2. Larvicides:

Water collections that cannot be managed by environmental control measures can be dealt with larvicides. Like environmental control measures, the success of larvicides will depend on the identification of all mosquito breeding sites and their distribution in the entire potential area and followed by sustained weekly spray of chemicals. Larvicides control measures should be applied in conjunction with environmental control measures.

The most common water soluble chemical used in our country is temephos (Abate). Temephos is safe for human and therefore it can also be applied to drinking water.

Considering the expensiveness of the chemical, the need of spray equipment and human resource it should be applied only for small breeding sites and only if control measures are inapplicable in places such as cities, low lands and agriculture development with irrigation system.

Preparation for spraying Abate:

1. Identify in square meters the size of the breeding sites positive for anopheles larvae but being used by humans and animals;
2. Prepare one cc of abate in one liter of water for use in 40 square meters area;
3. Prepare the solution in the spray pump;
4. Pump by hand 60 times to produce the necessary level of air pressure in the sprayer;
5. Use experienced spray men; and
6. Keep record of the accomplished activities.

when do you not spray Abate?

It is not advisable to spray Abate in the rainy seasons or when rains come because the chemical will be washed-away.

Preparation for the use of used motor oil:

1. Identify in square meters the size of breeding sites positive for anopheles larvae but unused by human and animals;
2. Remove and/or destroy any sort of plants or weeds in the breeding sites;
3. If leaves from near by trees are dropping into the breeding sites, trim the trees in order to protect the oil that has been applied to cover the water surface from breaking;
4. Apply a small amount of the used motor oil to cover the water surface and prevent the mosquito larvae to access air;
5. Keep record of the accomplished activities.

When do you not apply used motor oil?

- If the breeding site is exposed to windy direction, don't use the motor oil because it will be gathered to one place only to be ineffective; and
- If the rains come during the application of the used motor oil it is adviseable to stop the application because the rains will break the oil film which is over the surface of the water.

When compared with other larvae, the anopheles larvae floats directly facing the water.

Figure 3. The difference between anopheles and other mosquitos:

Picture

4.3.3. Indoor Residual House Spraying;

Indoor residual house spraying is the most widely and commonly used chemical method for vector control in anti malaria programmes. The aim of the residual house spraying is to spray the sprayable surface of all individual houses (eg. walls, floors etc). When the mosquitos rest on the sprayed walls, the chemical enters their body through the surface of their legs and intoxicate them, thereby drastically shortening their longevity. This way the mosquitos will not be able to live long in frequently sprayed walls to transmit the malaria parasites to human beings. The chemical spraying operation can be conducted once or more times in a year depending on the seriousness of the malaria epidemics; the intensity of the transmission and the period; the length of the lasting period of the effect of the chemical etc. Indoor residual house spraying is conducted in many parts of Ethiopia before the small and big rains usually in February and June. The rationale for selecting these periods is to prevent potential malaria epidemics that can occur immediately after the rains as it is likely that a wide spread and numerous suitable mosquito breeding sites will exist.

Criteria to select villages for chemical /insecticide spray

1. Identify and stratify the altitude of localities in meters (use altimeter or GPS);
 - below 1000 meters
 - 1001 - 1500 meters
 - 1501 - 1800 meters
 - 1801 - 2000 meters
 - 2000 and above meters
2. Topography (gorge and steepness);
3. Rainy season;
 - Once a year
 - Twice a year
4. Existence of water collections;
 - Temporary and permanent water collections
 - Irrigation schemes
5. Relevant epidemiological information /data; and
 - Reports on epidemics
 - Reports on malaria cases
 - Reports on entomologic studies.
6. Mobility of people
 - In search of grazing land
 - For development work

Based on the above criteria and the availability of human resource, finance and materials the residual house spraying will be conducted for the prioritized localities.

Preparation for insecticide residual house spraying:

1. The number, size and types of houses to be sprayed in the selected localities should be determined;
2. Decide on the number of houses to be sprayed in a day by a sprayman
3. Identify by type the required number of personnel
 - technician
 - assistant technician
 - spray men
 - water carriers
4. Determine the total number of days required for the spray operation;

Total No. of houses

No. of houses sprayed per day x no. of spray-men

5. Determine the total amount of chemical needed for the spray operation in kilograms;

No. of houses x average area of houses in square meters x gm/sq. m

1000 x 75% WDP (water dispersible powder)

6. Materials and supplies required for the spray operation:
 - spray pumps
 - protective eye-glasses
 - Buckets
 - Honey bee house covering plastics
 - screened filler funnel
 - 45 cm. long stirring wooden stick
 - Bag to hold the chemical
 - Broad brimmed hat
 - Working gown
 - gloves

- mouth and nose protecting masks
- 1000 cc graduated cylinder
- pliers
- 10 inches wrench
- spinner
- spray-pump spare parts
- marker.

Figure 4. Chemical spraying in pump:

Picture

Preparedness of chemicals for residual house spraying: Insecticides for residual House Spraying in Ethiopia:-

- DDT 75% 535 gms. in eight litres of water for one time use;
- DDT 100% 400 gms. in eight litres of kerosene for one time use; and
- Malathion 50% 400 gms. in eight litres of water for one time use.

Table 1: Amounts of solution and active ingredient of insecticide per sq. meter

type of insecticide	amount of solution per sq. meter in grams	amount of active ingredient per sq. meter in grams	length of effective period in months
DDT 75%	2.67	2	6
DDT 100%	2	2	6
Malathion	2	2	2-3

Training of spray men: The content of the basic training:

- Recruit and/or employ spray men as contribution of communities or salaried employees;
- Train the spray men in nine swaths of spraying using 6.35 by 3 meters wall;
- Conduct the spray on 75 sq. cm. surface by holding the spray nozzle 45 cm. from the sprayable surface and by moving back and forth.
- The practice should aim at completing the nine swaths in one minute; and
- Train the spray men to always allow an over-laps of not more than 5 cm. between swaths of spraying.

Swath is the chemical solution that comes out from the spray pump and covers 75 cm. of the surface (area) of wall.

N.B: Please refer to annex 1 training of spray men.

Figure 5: Training of Chemical spray techniques:

Picture

Storage and safety precautions of insecticides:

1. Spray men should always wear broad brimmed hats to protect their heads from the toxic chemicals;
2. In preparing insecticide solutions the spray men should always use paddle or wooden stirring or mixing stick and never with the bare hands;
3. Take always the necessary precaution to avoid liquid suspensions or solutions to splash on to extremities (arms, legs etc) and any other parts of the body;
4. The spraymen should thoroughly wash their hands with soap and water before eating, drinking and smoking;
5. Always advise the spray man to tighten loose parts of the spray pump to avoid leakage of the insecticide suspension or solution on any parts of his body;
6. Keep spraying pumps and chemicals in safe place and away from children;
7. Substances used to clean the spray pumps and left over chemical solutions should be disposed and/or buried in places out of reach of children and animals, instruct or train spraymen to take the necessary precautions; and
8. Take precautions during the cleaning and/or washing the spray equipment as there is the likelihood that the toxic chemical /substance contaminate water sources and become risk to humans and animals.

Actions to be taken by a spray man before launching insecticide house spraying:

1. The spray man should politely introduce himself/herself, greet the household members and explain that he/she has come to spray the house;
2. Request the household to provide him eight litres of water to prepare the insecticide solution;
3. Advise the household to bring out from the house all food stuff, cooking and other materials and cover all other immovable belongings; and
4. Advise all members of the household to stay outside while the house is being sprayed with the chemical.

Preparedness for insecticide residual house spray

1. Put the weighed insecticide /chemical in a marked bucket;
2. Mix the chemical with one litre of water in the bucket;
3. Mix the chemical and water in the bucket with a paddle or wooden stirring stick ready for this purpose;
4. Pour water into the bucket until it is full up to the mark of eight litres; and
5. Mix the suspension or solution by stirring with wooden stick;
6. Put the suspension or solution into the spray pump using screened filler funnel and close it;
7. Pump by hand sixty times to produce the necessary level of air (psi) pressure in the sprayer; and
8. Carry the spraying pump with canvas belt on your left shoulder and always shake it 2 – 3 times to prevent settling of the insecticide.

Indoor residual House spraying Technique:

- 1) Make sure that the house is ready for spray;
 - 2) First, spray the surface of the outside of the front door and all the surfaces from the out side;
 - 3) Enter the house, close the door and spray it from the inside including all the frames of the door;
 - 4) Then, start spraying from the bottom corner of the wall to the right of the door and proceed to the left;
 - 5) Spray all other rooms following the above procedures;
 - 6) Posts are sprayed by holding the lance at a slight angle to reduce wastage of the chemical;
 - 7) the backs, undersides and interiors of all keyboards, calendars, pictures, tables, beds, stools etc. are sprayed;
 - 8) The ceiling is sprayed after finishing all other interior surfaces;
 - 9) After the spraying of the interior parts of the house is completed, the under part of the eaves is sprayed from left to right by holding the lance at a slight angle;
 - 10) The outer wall of a house with large eaves, which may be used as a mosquito resting place, should also be sprayed;
 - 11) When the spraying of the eaves is finished, the furniture which is outside the house is sprayed inside the house;
 - 12) Other structures such as kitchen, stoves, stable, toilet etc. should be sprayed;
 - 13) If there are beehives inside or hanging out side, these should be carefully covered with plastic shuts;
 - 14) Grain storage bins, their eaves and under parts are sprayed;
 - 15) Temporary houses such as crop huts, watch huts, pastoralist tents should be sprayed and registered as other structures.
- Lance is part of the end of the spraying pumps from which the suspensions or solutions come.

After completion of the house spraying, spraymen should tell each household the following important points:

1. Not to enter the house within 30 minutes of spray;
2. That the members of the household can clean the floor, bury or burn the dirt 30 minutes after the spray is completed;
3. Not to replaster the house for six months;
4. That spraying is to control malaria vector species not bed bugs, fleas, cocroches etc;
5. The sprayed chemical temporarily disturbs, bed bugs, fleas etc. and the communities should be made aware that it is not because of increased population of these insects;
6. The sprayed chemical is effective at least for six months. Therefore, the household should be made aware that the walls must not be cleaned, plastered or covered; and
7. In the months of December and May malaria transmission is low. Therefore, houses can be plastered, washed and roofs and ceilings repaired.

Problems /constraints that delay spray activities:

1. Houses /structures exist far from each other;
2. Water to prepare the suspension or solution of the insecticide is not easily found;
3. The Poor participation of households to prepare their houses for the spray;
4. Sometimes weather conditions (rains, flood etc.) become an obstacle to the spray operation; and
5. Shortage of resources and inadequate preparation.

Solutions to the above problems/constraints

1. Prepare action plans that take into consideration the distance between houses. Structures;
2. Inform in advance each and every household to make water ready for the spray programme;
3. Provide health education to the communities to raise their awareness and prepare them for active participation in the spraying programme;
4. The spray days interrupted by weather conditions should be compensated by working during holidays; and
5. Prepare and secure the required resources for the planned spray-operation ahead of time.

4.3.4. Insecticide Treated Mosquito Nets (ITNs)

Many countries have recently introduced insecticide treated mosquito nets (ITNs) as malaria prevention and control measure. It has been found to be very effective in the reduction of malaria morbidity and mortality in several of these countries.

The INTs protect from mosquito bites through repellent and knocking down effect of the insecticide used to impregnate the nets. In Ethiopia this method of control is new and there is limited experience and know how in the utilization of ITNs, but promotive efforts are being made to create the necessary awareness in communities to use ITNs. Consequently, ITNs and impregnating chemicals are in the markets for sale. ITNs are available (e.g. size, shape, colour, quality etc.) in different types.

Shape /structures:

Commonly used ITNs are rectangular and conical. The rectangular ITNs are commonly used in Ethiopia. This is preferred because of the following reasons:

- The nets are pooled and fixed on four sides to prevent contact with different parts of the human body;
- It is easy to fix and use the ITN by those who prefer to sleep out door; and
- The cost of ITNs with four angles is relatively cheaper than the conical ITNs.

Size of the ITNs:

Different sizes of nets are commercially available as shown in table 2.

Table 2: Different sizes of nets

Type of the net	Width in cm.	Length in cm.	Height in cm.
Single	70	180	150
Double	100	180	150
Family	130	180	150
x-Family	190	180	150

The nets should have adequate width to cover the bed or mattress other wise if the width is small, there will be a contact of the net with body hence the user will be at risk for mosquito bite. On the other hand, if the width of the net is too big, the width of the net will surpass the width of the bed and or the mattress and will be inconvenient to use.

Colours:

The choice of the colour of nets depends on the culture and washing practice of communities. Green, blue, white nets are commonly available in the markets. However, communities prefer green and blue nets which show less dirt than others. On the other hand, white nets are not preferred because they show dirt more than coloured nets and require frequent washing and thus reduce the length of effectiveness of the impregnation chemical.

Materials used for making nets:

Many types of materials are being used for making nets which include cotton, nylon, polyester and synthetic materials. However, nets made from polyesters are preferred because:

- Polyester is more cheap than cotton;
- Polyester absorbs less insecticide solution than cotton;
- It is more durable; and
- Allow more aeration to the net users.

The strength of the thread and width mesh:

- The strength of the thread is expressed by denier and increase in the denier means increase in strength.;
- A thread less than 70 deniers is easily breakable. So, 100 denier thread is prepared for nets; and
- The width of the mesh shows the number of holes per square inch. The 156 mesh is considered a standard for mosquito nets.

The use of ITNs:

1. ITNs protect from mosquito bites. If the ITN is broken, it is still repellent and kills the mosquitoes when they rest on the net;

2. Reduces contact between person and mosquitos, the population mosquitos and their life span;
3. ITNs reduce the number of other insects as well as kill them;
4. Malaria epidemics decrease if ITNs are widely used; and
5. Simple practical orientation on impregnation of nets with chemicals will help individuals to impregnate nets at home and use them.

Disadvantage of non-impregnated nets:

- Nets are less protective when they are torn or have holes, not fixed properly, not put under the mattresses, mats, and blankets; and
- Contact with the net during sleeping allows mosquitos to feed on individuals sleeping under it.

Impregnation insecticides for Mosquito nets.

The choice of impregnation insecticide depends on the vector susceptibility, efficacy, availability, cost and affordability. The insecticides should also be registered in the country. In Ethiopia, the preferred insecticides permethrin and Deltamethrin and so far, Deltamethrin is the only registered insecticide.

Criteria for the selection of insecticides:

- Availability
- Cost
- Registered for use
- Packed and accompanied with utilization guide line
- Has rapid knock-down and killing effect.

Nets treating insecticides are available in suspensions and tablets. In Ethiopia, only KOTAB is used.

Impregnation of nets:-

Nets can be treated with insecticide in single or in bunch. The process of treating nets can be conducted at home by an individual or mobile team. Temporarily, place can be organized for insecticide treatment of mosquito nets at house hold or in school.

Materials required to treat nets by insecticides:

- Washed and dried net :
- Plastic bowl:
- Plastic large cup /container to measure water:
- Gloves: and
- KOTAB and plastic net.

Guideline on insecticide treatment of mosquito nets:

1. Wear gloves:
2. Put half-liter of water in a plastic container:
3. Collect the tablet from the packed container and put in the water:
4. Shake until the tablet is fully dissolved:
5. Sock the net in the bowl;
6. Keep the net in the bowl for two minutes to ensure complete soaking;
7. Prepare the plastic mat/sheet for the drying of the net;
8. Pick the net and let the suspension or solution drops collect in the bowl;
9. Spread the net on the plastic mat/sheet to dry under a shade;
10. Bury the left over suspension or solution;
11. wash hands with soap and water; and

12. The insecticide treated mosquito net will serve for one year and can be washed three times during this one year period.

Precautions:-

Precautions to be carefully under taken during the process of treating mosquito nets with insecticide include:-

- An individual engaged in the treatment of mosquito nets with insecticide should not eat, drink and smoke while working;
- If the suspension or solution pours on any part of the body, wash thoroughly with plenty of water;
- Ensure that the net is properly dried and properly aerated;
- Ensure that containers that are used for storage of water are not contaminated;
- Ensure that water sources are not contaminated by the suspension or solution and affect or kill fishes;
- Keep the insecticide away from humans and animals; and
- If you are suddenly intoxicated by the chemical refer to your first aid package.

Figure 6: Sequence of treating mosquito nets with chemicals:

Picture

4.4 Malaria Diagnosis and Treatment:-

4.4.1. Diagnosis

At this level, diagnosis is based on the patient's symptoms, signs and a simple history. In malarious area, a patient with fever or a history of fever at least within the past two days is assumed to have clinical malaria.

In a non – malarious area, a patient with fever or history of fever at least with in the past two days and with a history of travel to malarious area within the last two weeks is assumed to have clinical malaria. However, other common causes of fever such as measles, pneumonia, meningitis, upper respiratory tract infections etc. should also looked for.

4.4.2. Treatment:

4.4.2.1. Drug therapy:

As described in 4.4.1 all suspected malaria cases are treated with sulfadoxine – pyrimethamine as a first line treatment for uncomplicated malaria. For the detailed treatment procedures refer to annex 2.

- Give the drug under supervision and advise the patient to remain closeby for about one hour;
- If vomiting occurs within three minutes after a dose, give an additional half dose;
- If vomiting persists, refer the patient to the nearest health center /health post or health station; and
- In addition tell the patient
 - He/she has malaria and is treated for;
 - Malaria is transmitted by mosquitos;
 - Malaria can be prevented by eliminating mosquito breeding places and by using insecticide treated mosquito nets;

- Early treatment is important to prevent severe illness and death due to malaria; and
- Return to the health extension worker for advice if fever persists or he/she is still sick after seventy two hours after a dose of sulfadoxine pyrimethamine.

4.4.2.2. Supportive treatment:

A patient with uncomplicated malaria may require additional treatment to correct conditions such as dehydration, high fever and anemia:

- In case of high fever give paracetamol;
- To bring down the high fever advise the patient to take warm shower or receive tepid sponging and fanning; and
- For patients with moderate dehydration; give oral rehydration salt (ORS). Refer to the first aid package about the procedure. Also, advise the patient to take increased amount of clean water or other fluids. In the case of under one month old infants, encourage, mothers to provide extra breast-feeding.

4.4.3. Follow - up

- If fever persists for more than 72 hours (3 days) in a patient treated with sulfa doxine – pyremethamine;
- If he/she doesn't have fever from other illnesses;
- If still assumed that it is malaria:
- Give full dose of choroquine;
- Advise the patient to return and report to the health extension worker if the fever persists for two days after the patient received the choroquine dose;
- If the high fever does not subside in 2 days refer the patient to the nearby health center /health post/ health station; and
- Refer to annex 3 for the cloroquine treatment procedure.

4.4.4 Referral:

A patient with one or more of the following conditions, should be referred immediately to the nearest health center or hospital.

- Altered consciousness (e.g. confusion, sleepy, drowsy, coma etc.)
- Not able to drink or feed;
- Frequent vomiting;
- Convulsion or recent history of convulsion;
- Unable to sit or stand up;
- No urine output in the last 24 hours;
- Bleeding;
- Jaundice;
- Difficult in breathing; and
- Other conditions that cannot be managed at this level.

As a routine measure the following should be done before referring of the patient.

- If the patient is conscious and can swallow the drug, give full dose of sulfadoxine – pyrimethamine before referral;
- To reduce fever use tepid sponging and fanning and if patient can swallow give paracetamol;
- If the patient can swallow, give fluids such as ORS; and
- Indicate all the findings and drugs given on the referral paper.

4.5. Malaria Epidemic Prevention and Control:-

An Epidemic is the occurrence of cases in excess of the number expected in a given place and time period.

The transmission of malaria commonly shows variation in time:

- Season:- determined by rainfall;
- Periodic: cycles of several (after 8-10) years usually determined by rainfall (and also temperature) and amplified by loss of immunity in periods of low transmission; and
- Secular: long-term periods.

Malaria Epidemic Precipitating Factors:

1. Climatic change:-

Rain fall:

When there is abnormal rain fall in the form of excess or deficit, mosquito breeding sites are created in abundance. Similarly, when the numbers of rainy days in a specified period becomes few and also in dry seasons water on rivers and streams decrease and creates small intermittent pools of stagnant water ideal for mosquito breeding sites.

Temperature:

When there is increase of air temperature in high and temperate areas the life cycle of mosquitos and malaria parasites within the mosquito host is shortened. This phenomena will lead to high mosquito density within short periods of time and leading, of course, to high malaria transmission.

Humidity:

1. Humidity affects transmission by increasing the longevity of adult vectors;
2. Water resource development: the development of dams, and irrigation; programmes create conducive situations for malaria epidemic;
3. Reduced or weakened vector control activities;
4. Development of insecticide resistance;

5. Death of cattle due to disease and drought makes mosquitos exclusively feed on humans.
6. Migration of non-immune people from high to low land and vice versa; and
7. Resistance to anti malaria drugs.

Epidemic Monitoring and Surveillance system:

Methods of epidemic forecast and detection:-

There are three levels of epidemic monitoring and surveillance system. These are:-

Level 1: Meteorological information;

Level 2: Entomological information; and

Level 3: Morbidity information.

These methods will be used for forecasting and detection of epidemics in levels one to three respectively. The accuracy of epidemic forecasting increases from the first level to the third, but timeliness of detection is usually compromised as one goes along the three levels.

Level 1: Meteorological information:

1.1 Rainfall:

Rainfall affects malaria transmission in the following ways:-

- When there is a continuous and heavy rainfall, most water collections are disturbed and thus mosquito breeding is unlikely during the rainy period. However, as soon as the frequency and intensity of rainfall decreases, it is likely that numerous favorable mosquito-breeding sites will be created as a result.

Heavy rainfall in the high lands may also cause floods in the low lands, which creates pools of stagnant water ideal for mosquito breeding;

- When the number of rainy days in a specific period becomes few (and there is intermittent rainfall which is not so high) most of the rain pools become favorable breeding sites;
- If the amount of rain is much below normal or if there is drought, water bodies such as streams and rivers will create small intermittent pools in river bed which are also favorable for mosquito breeding. Especially when such phenomena are coupled by high air temperature, unusual epidemics may occur in high land or high land-fringe areas; and
- Apart from creating mosquito breeding sites, rainfall also affects malaria transmission through increasing humidity, which in turn will help to increase the longevity of the adult vectors.

1.2. Air temperature:

Temperature affects transmission in four major ways;-

1. High temperature speeds up the development of the life cycle of a mosquito;
2. High temperature affects and accelerates the length of the development of the life cycle of malaria parasite with in the mosquito host;
3. An average daily temperature of about 30⁰c is lethal to the saprogenic stages of the parasite within the mosquito vector; and
4. Extremely high temperature (above 30⁰c) is also unfavorable to the vectors, as adult longevity may be reduced especially in arid environment.

1.3. Humidity:-

Humidity affects transmission by increasing the longevity of adult vectors. Usually, anophelens prefer relative humidity exceeding 60%.

Level 2 :- Entomological Information

Routine regular monitoring of entomological data in all epidemic prone areas may be costly, but investigations such as monitoring the larval densities in selected area can be undertaken with minimum cost and staff. Identification of anophelines from other larvae is simple and has advantage in early detection of epidemics. Usually, a high density of *An. gambiae* larvae and adults in an area is a very good indication that there is a likelihood of a malaria epidemic.

Level 3:- Morbidity Information:-

Health service based data must be used to monitor the trend of morbidity. A five year and above morbidity data can be collected, compiled and organized in weekly and monthly to serve as indicators for malaria situation in malarious areas.

- 1) In each locality /kebele the weekly number of malaria cases should be compiled in weekly and monthly periods for five years using the following format.

Table 3: Weekly, Monthly and Yearly Distribution of Malaria Cases of Five-Years Period.

Year E.C	Hamle/July				Nehassie/August				Sene/June			
	1-7	8-15	16-22	23-30								
1990	12	21										
1991	34	39										
1992	45	48										
1993	30	40										
1994	26	33										
Largest No. of Cases	45	48										
2 nd largest No. of cases.	34	40										

Among the data for the five years, determine the largest number of cases, and the 2nd largest number of cases for each week. In the above example, for the week Hamle 1-7, the largest number of cases is 45, the 2nd largest number is 34. For the week 8-15 Hamle, the largest number of cases is 48, and the 2nd largest number of cases is 40.

- Using the above table, plot a line graph for the 2nd largest number of cases against each week. This line graph will serve as a reference for comparing data for subsequent years. The line represents the upper normal limit of number of cases seen at each locality /kebele.
- During subsequent years, plot (with pencil or marker with different colors) the weekly number of malaria cases on the reference graph as follows.

Graph with two reference lines

The data collected weekly and monthly from reports of malaria cases guide to indicate the emergence of epidemics when compared with normal by occurring number of malaria cases. After detecting the epidemic, the extension health worker should undertake controlling measures. However, in order to take relevant controlling measures, rapid assessment of the situation has to be immediately conducted. The objectives of the rapid assessment are:-

1. To confirm that an epidemic exists or is threatening;
2. To establish the cause of the epidemic;
3. To estimate its geographical distribution;
4. To estimate its health impact; and
5. To identify local capacity to control transmission and reduce morbidity.

Measures for the control of epidemics should be selected on the basis of epidemiological situations of the area, characteristics of the epidemics, and availability of resources. The epidemic control measures include mass treatment, fever treatment of all febrile cases and focal spraying of residual insecticides. In addition, environmental vector control and larvae control activities can be also undertaken in some areas together with one or both of the above measures. Usually, mass treatment is the first emergency measure that is undertaken in most epidemic situation.

- Mass treatment or fever treatment will depend on the proportion of cases in the population;

- Starting from one randomly selected household in the highly affected part of the area, take twenty houses in sequence and register the house hold members for action;
- If the total number of sick people among the total household members in the twenty houses is greater than thirty percent, give mass treatment for the entire population of the locality. If this percentage is less than or equal to 30%, use fever treatment;
- The next step would be to establish whether the epidemic is ongoing or at its final stage by considering the next points;
 - the existence of large number of breeding sites;
 - If the villagers confirm that there is large population of mosquitos in the night;
 - If 30% of the house hold members are sick; then indoor – residual house spraying may be required in addition to the mass treatment.

4.6. Contribution by individuals and groups in Malaria Prevention and Control Programme:

4.6.1. Individual and household:

It is possible to protect oneself and family from the bites of mosquitos. The protective measures are:

- Carefully cover your body to reduce areas exposed to mosquito bites in the night;
- Apply to your skin repellent creams;
- Use insecticide treated mosquito nets;
- Protect windows and doors with wire mesh or made of local material; (e.g. sisal; grass etc);
- Spray in the night mosquito killer insecticide (Aerosol).
- Mosquitos more in the night, hence don't often open doors; and

- Keep domestic animals in stable outside the house to reduce mosquito movement into the house.

4.6.2. Community, government organizations and NGOs:

Community:-

- It is possible to control malaria by carefully identifying places for human dwelling. As the flight range of mosquito is limited to 2 km., it is advisable to locate human dwellings at least 2 km. away from the breeding location. In addition, houses must be built against the wind direction so that mosquito will not reach the houses with the push of the wind;
- Participate and demonstrate in action, education provided on malaria prevention and control measures; and
- Communities should participate in vector control activities in terms of labor and materials; and
- Communities should participate in residual house spraying by selecting spray men and providing them the necessary support.

Government Organization:

- When water collections in ponds and other structures are under way, it is essential to see that no mosquito breeding sites are created in the surrounding;
- Organizations engaged in road construction should see that ditches and dugged areas are filled and leveled to eliminate water collections;
- Development organizations employ a large number of daily laborers during harvest seasons, but the organizations should select places that are not highly exposed to malaria

risks and should always apply control measures in collaboration with the health extension worker.

Non governmental Organizations:-

- NGOs and other international organizations are expected to participate and collaborate in the national and local malaria prevention and control efforts in terms of training, materials and finance.

4.7. Demonstration:

4.7.1. Using insecticide treated mosquito nets around sleeping bed and covering sleeping mats is effective to protect individual and families. Specially in hot areas where people usually sleep out door, it is a high risk to malaria to sleep without ITNs.

Fixing ITNs:

Materials required to fix ITNs:

- String
- Long wooden poles (2 meters)

Fixing ITNs over and around the bed;

- Fix the sticks with the four legs of the bed (if it is out door plant the poles on the ground);
- Use string and the rings in the four angles of the net to fix the net stretched between the four poles;
- Insert the down posts of the net under the mattress or mat; and
- Sleep inside the net.

Figure 7.1: fixing ITN over locally made bed

Figure 7.2: out door utilization of ITN

Figure 7.3: Mother and child inside ITN

Picture
ITNs Demonstration

4.7.2. Establishing stable of domestic animals between dwelling areas and mosquito breeding sites:

Mosquitos feed on blood. In order to reduce mosquitos contact with human, one of the control measures practiced is to establish stables for domestic animals located between dwelling house and mosquito breeding sites. This approach will make the mosquito feed on the animals' blood and reduces the risk of malaria to human beings.

Figure 8: The position of a stable, dwelling houses and mosquito breeding sites in a village:

Picture
Demonstration of stable, dwelling
houses and mosquito breeding sites.

5. Expected outputs /Results

The outputs are compared to base-line information that existed during the year the program started:

- 5.1. Increased awareness of the community on malaria and its modes of transmission;
- 5.2. Increased number of people participating in malaria prevention and control activities;
- 5.3. Increased number of patients that seek treatment in 24 hours after the on set of the disease;
- 5.4. Reduced number of people who are sick and die from malaria;
- 5.5. Reduced number of epidemic episodes, affected villages and people;
- 5.6. Percent increase of houses sprayed with residual insecticides in the selected villages; and
- 5.7. Increased number of people using ITNs;

6. Information, Communication Methods for Malaria Prevention and control:

The major tool to enhance community participation for malaria prevention and control is widely providing health education to communities using different communication modalities.

Although there are numerous information communication ways, on the other hand health extension worker should focus only on few of them.

Main Information Communication Methods:

1. One to one information communication:

- This is an interaction /dialogue made between two persons; and
- When the health extension worker visits households, he/she should discuss about malaria prevention and control with individual. This

approach serves to promote the participation of individuals in malaria activities.

2. Group discussion:

- Conduct peer groups education and exchange of experience between persons drawn from same village.
- In addition to exchange of experience the peer groups should discuss on clearing rain water collection materials such as broken pots, glasses, tins etc. to prevent malaria;
- Educate the group to close and screen doors to prevent mosquitos from entering houses in the night;
- Educate the group to smoke the inside of houses to drive away mosquitos; and
- Educate the group to carefully cover their bodies specially in the nights to protect themselves from mosquito bites and thereby malaria.

3. Providing education in large meetings or conferences:

- Provide education using education materials from the woreda health office such as leaflets, magazines, posters etc;
- The Topic chosen by the health extension worker for education in a large meeting should be interesting and sensitizing to the majority of the audience;
- Discuss on water collection places that can easily be avoided by active participation of the discussants;
- Discuss on the participation and support of communities for insecticide residual house spraying;
- Educate people that malaria can be prevented and controlled by using ITNs;
- Educate people to go immediately to the nearest health facility incase of malaria illness;

- Provide education on comprehensive malaria prevention and control activities on Africa “Malaria Day” and “Malaria week” in Ethiopia;
- Provide education on religious holidays
- The information communicator /educator using any communication methods:
 - He/she should prepare the lecture notes in advance;
 - He/she should assess the audience;
 - Ensure that the audience is properly seated;
 - Ensure that the time chosen for the education is convenient to the majority of the audience; and
 - Start the lecture once you have assured that the audience has comfortably seated.

7. Monitoring and Evaluation:

7.1 Monitoring : is a continuous process of following up planned activities to ensure that they are implemented according to plan, allocated and approved resources and time frame. The monitoring component of the malaria control health extension package is designed to follow up the detailed activities executed by the health extension worker to ensure his/her planned activities are implemented and resources efficiently utilized.

Prioritized monitoring frame work:

- Reassess the plan;
- Compare activity outputs with the utilized resources;
- If the activity outputs are reasonably comparable to the utilized resources continue the programme implementation in the same manner;

- If the achievement is found to be greater than the expected outputs, you should know about the reasons and some of the reasons can be;
 - Planning under capacity;
 - Flow of additional resources; and
 - Others.
- If the performance of the planned activities is much less than expected outputs, the following can be assumed as causes:
 - It could be an ambitious plan that did not consider implementation capacity;
 - If support from partners or stakeholders was not properly mobilized or considered; and
 - Available resources and /or capacity were under utilized.

7.2. Evaluation: is a process that assess achievements gained compared to the specific objectives set in any programme. Evaluation can be conducted by an individual or a group. Evaluation focuses on:

- Achievements of the past years and the plan of the next year;
- Details of reports and achievements; and
- Strategies.

Indicators of the Progress of Malaria Control Activities:

- 1) Number of people educated on Malaria prevention and control
- 2) Number of people who participated in clearing mosquito breeding sites;
- 3) Number of houses replastered and/or painted after insecticide residual house spraying operation;
- 4) Number of persons who purchased ITNs;
- 5) Number of persons who purchased ITNs and are utilizing them;

- 6) Number of malaria patients who received treatment;
- 7) Number of malaria epidemics /outbreaks in the kebele;
- 8) Number of people who received treatment during epidemics /outbreaks;
- 9) Number of villages that had epidemics /out breaks; and
- 10) Number of patients referred to health facilities.

Annex 1: Training of Spraymen (six days)

The standard six days training curriculum for spray men is outlined below.

The major areas of focus during the training are:

- To prevent the settling of chemical, the suspension/solution with 45 cm. Paddle;
- When filling the spray pump use screened filter funnel;
- Fill the spray pump properly up to the mark of eight liters level;
- Maintain the pressure of the sprayer by pumping 60 full strokes;
- Spraying correctly and consistently by holding the spray nozzle 45 cm. from the sprayable surface;
- Allow an over-lap of not more than 5 cm between swaths of spraying;
- Shake the spraypumps to avoid the settling of the suspensions or solution;
- Take out from the house food staff, feeding and cooking utensiles, pictures on walls, chairs, tables, children and animals to start spraying;
- Cover bee hives with plastic sheet or any other material;
- Keep in order the properties of the owners of the house;
- Clean the spray pump immediately after work;
- When the nozzle of the spray pump is closed, clean it with glass, air or water and never use iron;
- Use the right tools to clean, maintain and/or repair; and
- Approach politely the owners of the houses.

First day

- Explain job, conditions of work and payment
- What is expected of the spraymen?
- Why do we spray? Reasons and objectives.
- Areas to be treated and methods used.
- Demonstrate:
 - . spray tank and equipment
 - . Packets or charges of DDT.
 - . Funnel, paddle, bucket.
- Show suspension line marked inside the bucket.
- Issue each sprayman a spray tank.
- How to carry a spray pump.
- Adjusting the strap.
- Handling lance when in use.
- Placement of lance when sprayer is not in use.
- How to open and close cover assembly.
- How to fill sprayer using fill funnel.
- How to release pump sprayer pressure (shut-off lever).
- How to release pressure in the sprayer (valve pin assembly)
- How to handle operating lever
- How to agitate the sprayer

Second Day

- Operation of sprayer, how the sprayer operates under pressure
- Detach pump assembly: explain function and parts
- Explain functions of:
 - . air cushion
 - . dip tube
 - . pressure gauge
 - . pressure release valve

- dismantle the discharges line; show various parts and tell their function
- What causes a nozzle tip to block; and how is this prevented?
- How to clean a blocked nozzle tip (compressed air, washing, a piece of grass).
- Discuss the care for nozzle tips and why they are so important.
- Demonstrate how to clean the sprayer.
- Distance and speed:
 - . Show proper distance (45 cms.); explain significance.
 - . Show trainees the forearm distance of about 45 cms.
 - . Explain speed or rhythm.
 - . 19m² to be covered in one minute (3.0 x 6.3 m).
 - . Nine swaths to be sprayed in one minute (effective swath of 70 cms.)
 - . One meter swath should be covered in 2.33 seconds
 - . Each swath 3 meters high must be covered in 7 seconds
- Review sprayer parts
- Let each sprayman clean his spray task.
- Attach wooden guide (45 cm) to the lances.
- Demonstrate stance facing the training wall.
- Demonstrate practice spraying with wooden lance.
- Allow spraymen to practice in front of wall (correct stance timing distance)
- To assist spraymen in acquiring proper speed have them count “one thousand one, one six” they should have sprayed one 3 meter swath.
- Trainees to practice raising and lowering the lance at the correct speed and distanced while at the training wall.
- Spraymen will hold operating lever when practicing
- Spraymen will raise and lower the lance keeping the wooden guide almost touching the surface.

- Spraymen will lean forward for reaching above 3 meters and step back for close surfaces;
- Spraymen will shake their sprayers from time to time while glancing at the pressure gauge.

Third Day

- To mix the suspension using a 45 cm paddle so that there are no lumps
- To use the screened filler funnel.
- To fill the sprayer to the correct level.
- To keep the nozzle tip 45 cm. From the surface to be sprayed
- To spray at the correct speed.
- To allow an over-lap of not more than 5 cms.
- To shake the sprayer from time to time to avoid settling of the insecticide.
- To maintain the proper pressure in the sprayer.
- To use extension rod or bamboo for high walls and ceilings.
- To assist householders in clearing the house for spraying (remove articles from walls, remove furniture to outside, remove or cover foodstuffs).
- To remove children, chickens and other animals from the house before spraying
- To cover bee-hives before spraying.
- To treat property of the householder with respect.
- To wash and clean the spray pump after the completion of each day's work.
- To clean locked nozzle tips with grass and/or air pressure, never with a pin or wire.
- To use the correct size tools to open sprayer for cleaning and repair.
- To always be courteous and polite to house owners.

Fourth day

- Spraymen test:
 - . Each sprayman to fill his sprayer to 8 litres with water (using bucket and filler funnel).
 - . Each sprayman will be tested over the 19m² which should be covered in 60 seconds (58-62 sec. Limits).
 - . Make sure that each sprayman carries out the correct procedures emphasized on the 3rd day.
 - . Repeat this test until all trainees successfully pass the test.

- Special cases:
 - . Explain “special cases” where spraymen must perform additional duties aside from general house spraying.
 - . these include such things as the following:
 - . What to do if chairs, boxes or other obstacles prevent access to a room.
 - . What to do when bottles, pictures, harnesses, ploughs are hanging on the walls.
 - . How to treat large pieces of furniture, skins, other containers which are in the way
 - . How to spray tables, beds.
 - . How to spray in confined places
 - . How to cover beehives before spraying
 - . Equipment and method of spraying high ceilings and walls
 - . How to spray doors and window which open in the inside
 - . How to spray eaves.

- Show DDT WDP as a dust
- Show DDT WDP mixed in a glass beaker
- Explain that, when undisturbed, it settles to the bottom
- Explain the need, therefore, to shake the sprayer frequently

- Take pail (bucket),funnel and paddle.
- Show the marked line on the inside of the pail which indicates the 8-litre mark.
- Add 535 grams DDT 75% WDP to pail
- Show trainees how to mix by adding a small quantity of water to the powder to make a paste. When the powder is thoroughly mixed into a paste using the paddle, add water through the filler funnel to the 8 litre mark.
- Allow some of the spraymen to mix a packet (or a charge) of DDT 75% WDP Emphasize that poor mixing causes lumps and blocked nozzle tips.
- Emphasize the necessity of obtaining fro each householder sufficient water to spray his own house.

Fifth Day

- Public relations:
 - o Importance of public relations; need to have good relations with local population, especially with locality leaders, elders, religious leaders and government official, etc.
 - o How to approach the people
 - o How much advice to give the people and how to warn them of the hazards of the insecticide.
 - o What assistance the squad requires from the community.
 - o What goods are to be removed from the house.
 - o What assistance the sprayman may give.
 - o The need to obtain water from the people to spray each house.
- Discuss the sequence of spraying a house. Start at the door and proceed from left to right.
- Review again the spraying procedures

- Explain some of the various defects of spraying, what to look for.
- Demonstrate, using suspension, the correct spraying techniques (proper speed, distance agitation, stance).
- Special measures to be taken to see that all infants. Chickens and other animals are removed from the house prior to actual spraying.
- How to place spray equipment and supplies out of reach of children and animals.
- Do not spill insecticide powder or suspension near houses; don not contaminate water sources.
- Review duties of a sprayman:
 - . Responsibility in case of damage or lose of materials and personal issues.
 - . Explain what is expected of a sprayman.
 - . Explain conditions of work and pay.
 - . Explain that they will be expected to walk long distances each day.
 - . the need for respect and care of the householder's property.
 - . Indicate the surface area of a house in m², and the number of charges, of insecticide which should be sprayed on average each day.
 - . Orders and instructions from respective squad chefs and technicians must be obeyed.
 - . Need for cleanliness.
 - . Regulations about smoking
 - . Need for wash daily, before eating and at the end of the day's work.
- Spraying practice.
- Spraying test.

Sixth Day

- Final practical spraying
- Examination
- Selection of the spraymen
- Payment
- Preparation for spraying operations.

Annex 2 : Treatment Schedule for Sulfa doxine – pyrimethamine

Weight (kg.)	Age (years)	Number of tablets
5-6	2-3 months	–
7-10	4-11 months	–
11-14	1-2	–
15-18	3-4	1
19-29	5-9	1 _
30-39	10-11	2
40-49	12-13	2 _
50 +	14 +	3

Side effects:

- Nausea, and vomiting
- Skin rashes

Contra indication:

- Malaria prophylaxis either alone or in combination;
- persons with previous history of skin rash after using any form of sulfa drugs;
- Infants less than two months; and
- Persons with hepatic or renal days dysfunction.

Annex 3: Treatment Schedule of Chloroquine Tablets of 150 mg base or Syrup 50 mg base per 5 ml.

Weight (kg)	Age (years)	Daily dose administered		
		1 st day	2 nd day	3 rd day
5-6	< 4 months tablets syrup	5 ml.	5 ml.	2.5 ml.
7-10	4-11 months tablets syrup	7.5 ml.	7.5 ml.	5 ml.
11-14	1-2 years Tablets syrups	1 12.5 ml.	1 12.5 ml.	7.5 ml.
15-18	3-4 years 3-5 tablets 3-6 syrup	1 15 ml.	1 15 ml.	1 15 ml.
19-24	4 – 7 years 5 Tablets 6 syrup	1 20 ml.	1 20 ml.	1 15 ml.
25-35	8-10 years	2	2	1
36-50	11-13 years	3	3	2
50+	14 + years	4	4	2

Side effect:

- Dizziness, skeletal muscles weakness, mild gastrointestinal disturbances (nausea, vomiting, abdominal discomfort and diarrhea) and prurities.

Contra indications:

- Persons with known hypersensitivity ;
- Persons with a history of epilepsy; and
- Persons suffering from psoriasis.

Annex 4: Form for the Registration of Patients and Distribution of Drugs.

Ser No	Date	Name of patient	Sex	Age	Address			Type of Drug		
					Kebele	Village	H.No.	Fansidar	Chloroquine Tablet	Chloroquine Syrup.

Annex 5: Health Extension Worker Malaria Control Activity Paper Form.

Name of Extension Station /Health post _____

Woreda _____ Month _____ Year _____

I. Morbidity report:

1. Number of patients treated for malaria during the month _____
2. Number of patients who received malaria drugs _____
3. Number of patients referred _____
4. Number of cured patients _____

- In patients treated in hospital or health center due to malaria _____
- Number of malaria inpatients who died in hospital or health center _____
- Number of patients who died before reaching hospital or health center _____

II. Environmental Management:

- Number of campaigns conducted during the month _____
- Number of persons who participated in the campaign _____
- Area of water collection sites leveled and drained in sq. meters _____
- Areas treated with used motor oil in sq. meters _____

III. Vector control:

- Number of insecticide sprayed villages _____ number of houses _____
- Number of people living in insecticide sprayed houses _____
- Number of people who purchased INTs during the month _____
- Total number of house holds using ITNs _____
- Number of persons living in a house with ITN _____

IV. Malaria epidemic control:

- Number of villages with malaria epidemics _____
- Number of people living in villages affected by malaria epidemics _____
- Number of patient with fever and who received drugs _____

Describe activities performed by community participation related to epidemics _____

V. Health Education:-

- Number of health education sessions conducted _____
- Number of people who received health education individually or in groups _____

Name and signature of the reporting person _____

Date of submission of the report _____

Annex 6: List of supplies, drugs and chemicals:-

1. GPS/altimeter
2. Meter
3. Dipper
4. Abate chemical
5. Spray pump
6. Spray pump spare parts
7. Bucket
8. Marker
9. Eye-glasses
10. Plastic sheet to cover beehives
11. Screened filler funnel
12. Bag for carrying drugs
13. Hat
14. Gown
15. Gloves
16. Mask – made of cloth
17. 1000 cc cylinder
18. Plier
19. Wrench
20. Spanner
21. 75% DDT
22. 100% DDT
23. 50% Malathion
24. KOTAB
25. Plastic cup
26. plastic bowl
27. Register
28. Fansidar
29. Chloroquine tablets
30. Chloroquine syrup

Bibliography

1. Malaria and other Vector Borne Control Team /FMOH. Malaria Prevention and Control Methods and Strategies (Amharic version) Addis Ababa: 1980 (Eth. Cal.)
2. Ministry of Health Malaria and other Vector Borne Diseases Control Unit. Guideline for Malaria Epidemic Prevention and Control. Addis Ababa, July 1999.
3. Malaria and Other Vector-Borne Control Team. Malaria Diagnosis and Treatment for Kebele Health Agents and Health post (Amharic Version). Addis Ababa: Hamle 1991 (Eth.Cal).
4. Disease Prevention and Control Department /Ministry of Health and UNICEF. Guide for Program Managers on the Use for Insecticide Treated Nets in Ethiopia. Addis Ababa : July 2002.
5. Malaria and other Vector Borne Diseases Control Unit Ministry of Health. Residual Insecticide House spraying. Addis Ababa: Revised November 1995.
6. Malaria and other Vector Borne Diseases Control Unit /Ministry of Health. Guideline for malaria Vector Control in Ethiopia. Addis Ababa: March 2002.
7. Malaria Control Programme Ministry of Health. Guidelines to Malaria Control Program in Ethiopia. Addis Ababa: September 1983.