

## GUIDELINES FOR ITNS AND LLINS

### PREAMBLE

Malaria and certain other diseases are transmitted by the bite of mosquitoes. Pregnant women, babies and young children are at the greatest risk of dying of malaria. Sleeping under a bed net reduces the risk of man-vector contact as mosquitoes bite at night and is thus an effective preventive measure. But ordinary mosquito nets provide limited physical barrier between mosquito and man and protection as they may still bite through the net or get inside the net following improper use. The Insecticide Treated Bednets (ITNs) or Long Lasting Impregnated Bednets (LLINs) provide better and effective protection by keeping away mosquitoes as well as killing them. ITNs and LLINs also kills or keeps away other nuisance insects – cockroaches, bedbugs, houseflies, fleas, etc.

### INSECTICIDE TREATED BED NETS (ITNS)

Insecticide treatment is recommended for synthetic nets (nylon, polyester), as treatment of cotton nets is not cost-effective and effect of insecticide is not long lasting. Insecticides used for mosquito nets are not harmful to people, if used correctly. Direct skin contact with the insecticide on a still wet net may cause a tingling sensation on the skin. This is not harmful, even for small children. After treatment, the net may smell of insecticide. This will go away in a few days and is not harmful to people who sleep under the net.

### HOW TO TREAT THE NET – 10 EASY STEPS FOR MASS TREATMENT

#### **Step 1: Collect the necessary equipment**

The necessary equipment consists of mosquito nets, insecticide, basin, measuring container, rubber gloves and soap. Make sure the net is washed / cleaned before treatment. The nets should preferably be treated outdoors in the shade. If treatment is to be carried out indoors, a room with open windows should be used. Use basin and gloves that are not used for any other purpose.

#### **Step 2: Put on protective gloves before treating nets**

#### **Step 3: Measure the correct amount of water**

The amount of water needed depends on the net material. Regardless of the size and shape of net, the amount of water required for one synthetic net (nylon, polyester) is ½ litre (if the net is very large, more water may be needed). If a measuring container comes with insecticide, use it to measure water. Otherwise, use any measuring container that is not used for food, drinks or medicines.

#### **Step 4: Measure the correct amount of insecticide**

The amount of insecticide or “dose” needed to treat a net depends on the type of insecticide used. Follow instructions on the container / sachet / packet. Generally, 10-15 ml of insecticide

is required to treat one single net. The leftover insecticide should be stored in its original container, in the dark and away from children.

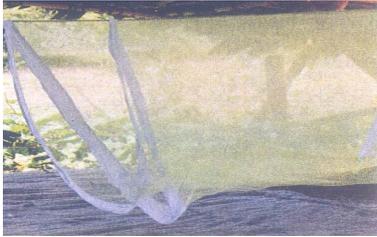
**Step 5: Mix the water and insecticide thoroughly by gloved hands in basin**

**Step 6: Treatment of nets**

<ul style="list-style-type: none"> <li>• Always impregnate one net at a time</li> <li>• Put the net in the basin containing water and insecticide</li> <li>• Soak the net long enough to ensure that all parts of the nets are impregnated</li> <li>• Take out the nets and allow excess liquid to drip back by squeezing it gently, but do not wring it.</li> </ul>	 <p><b>Treatment of bed net</b></p>
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**Step 7: Drying the nets**

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

	
<p><b>First phase of drying – On non-absorbent flat surface under shade</b></p>	<p><b>Second phase of drying- Semi-dry nets under shade</b></p>

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

- Following the treatment of all available nets, the leftover mixture of water and insecticide, if any, may be used to treat curtains.
- Otherwise, dispose the liquid in the toilet or a hole away from habitation, animal shelters, drinking water sources, ponds, rivers and streams.

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

### **Step 9: Washing and cleaning of hands and equipments**

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

### **Step 10: Washing and re-treatment of nets**

- Washing removes the insecticide from the net. So, wash the nets as seldom as possible and gently with soap and cold water and dry flat on plastic sheet in shade.
- Do not wash/rinse treated net in or near drinking water sources, ponds, lakes, rivers, streams. Dispose of water for washing/rinsing in the toilet or in a hole away from habitation, animal shelters, drinking water sources, ponds, rivers and streams.
- Nets must be re-treated again after it has been washed three times; or, at least once a year even if it is not washed, preferably just before the rainy season. Nets may be treated twice a year in areas that have a lot of mosquitoes all year long.

## **LONG LASTING INSECTICIDAL NETS (LLINS)**

LLINs are mosquito nets which have the insecticide incorporated in their fibre, so that it is not removed by as many as 20 washes. Because these nets have an even and quality controlled insecticide application, they are generally more effective than conventional ITNs. Furthermore the LLIN is more cost-effective (as it can be used for 3-5 years) than distribution of conventional bed nets and treating them with insecticide once or twice a year. Conventional ITNs are therefore only a rational option in areas, where the population already has so many nets that at least 50% of people sleep under one.

### **CHARACTERISTICS AND LOGISTICS OF LLINs**

LLINs have different weight and volume characteristics as given in the table below:

#### **Characteristics of LLINs relevant to logistics**

<b>Characteristics</b>	<b>Multifilament polyester LLIN (deltamethrin-coated)</b>	<b>Monofilament polyethylene LLIN (permethrin-incorporated)</b>
Weight per LLIN	440 g	625 g

LLINs per bale	100	40
Weight per bale	42 kg	29 kg
Volume per bale	0.1727 –0.1894 m <sup>3</sup>	0.127 m <sup>3</sup>
LLINs per 40-ft container	36,900	16,800

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

### **STORAGE**

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

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

The tightly packed and tied bales can be stacked several layers high (up to a height of 5 m) without any damage to the bottom layers. In theory, 5.8 bales of polyester LLINs occupy a volume of 1 m<sup>3</sup>; in practice, 4 bales / m<sup>3</sup> is a reasonable working figure. Thus, if a warehouse space is 10 m x 20 m with storage height of 3 m, available volume is 600 m<sup>3</sup>, which would accommodate 600 x 4 = 2,400 bales or a total of 240,000 polyester LLINs.

Monofilament polyethylene LLINs can be stored at 6 bales / m<sup>3</sup>, so that the same warehouse volume of 600 m<sup>3</sup> would accommodate 3,600 bales or 144,000 LLINs of this type.

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

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

### **TRANSPORT**

Although LLINs are usually individually wrapped and bales robustly packaged, every transport vehicle must be equipped with minimum of a tarpaulin for the protection of its loads.

As for storage, the principal consideration in the transport of LLINs is one of volume rather than weight. Travelling on good roads, a typical 25-ton semi-trailer truck can carry the equivalent of the contents of a 40-foot container; correctly loaded, an 8-ton truck can carry 140 bales.

Onward transport of LLINs from district level storage to health facilities could be done, if needed, by the vehicles normally used to carry medicines, vaccines and other supplies within the district – most often bicycles and motorcycles. Initial experiences in some countries indicate that it is possible to transport 4–6 LLINs on a bicycle and 10 on a motorcycle, in addition to a vaccine carrier. Weight of one LLIN is approximately 650 g.

Assumptions for carrying capacity:

- One person with bicycle and vaccine carrier can carry 4–6 LLINs weighing 2.6–4.0 kg depending on various factors.
- One person with motorcycle and vaccine carrier can carry 10 LLINs weighing 6.5 kg
- One 4 x 4 vehicle with mobile team members and vaccines and equipment can carry 150 LLINs weighing 97.5 kg.

### **DISTRIBUTION OF LLINs**

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

Unless data to the contrary is available, it can be assumed that an average household has 5 members (2 adults and 3 children). It is then possible for one LLIN to cover on average 2.5 persons (2 adults or 3 children or 1 adult plus 1-2 children). Thus, for a given village the number of LLINs to be provided is usually equal to the number of households multiplied by 2 or the total population divided by 2.5. However, some villages may have many large households, which will need additional nets. It is therefore prudent to add 20%, i.e. plan:

► Number of LLINs = Number of households x 2.4.

This will normally ensure a sufficient quantity for the following schedule:

1-2 persons: 1 LLIN

3-5 persons: 2 LLINs

6-7 persons: 3 LLINs

8-10 persons: 4 LLINs

Sometimes, villagers may complain that the number of nets assessed by the above schedule is not sufficient, because all the household members sleep apart. They should receive the reply that the public sector is not able to take such variations in account; such families may buy additional LLINs or bednets from the market.

In areas where it is a local practice for men to move to the fields/ forests for purpose of cultivation and malaria is therefore, acquired outside the houses, provision of additional nets

should be made if feasible, or the community should be informed on the importance of carrying nets to the field or forests.

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

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

### **CHOOSING BETWEEN CONVENTIONAL ITNS AND LLINs**

Despite the advantages of LLINs, re-impregnation of bed nets, which have been distributed in the past or acquired by the population through commercial or social marketing, may still be cost-effective. It should be done in areas, where significant proportion of the community is using bed nets (e.g. where at least 30 % of the population would answer 'yes' to the question: "did you sleep under a mosquito net last night?" during the transmission season). It is then assumed that people will be encouraged by re-impregnation operations and BCC to acquire more nets, so that over time, coverage can approach 100%.

In other areas belonging to the ITN target population, LLINs should be provided. As a general rule, if a village is targeted for LLINs, enough should be provided to cover the whole population of the village, even if some people own conventional bed nets. It is expected that LLINs will become the main malaria vector control intervention in high-risk areas over the coming 5-10 years.