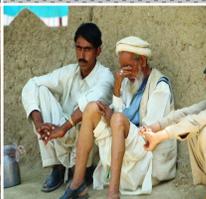


2009

GUIDELINES FOR ANTI-VECTOR INTERVENTIONS IN COMPLEX EMERGENCIES/IDPs



[ABSTRACT: A complex emergency is a situation that affects large proportion of civilian populations due to war or civil strife, food shortages and population displacement, resulting in excess mortality and morbidity. Most complex emergencies follow disasters of human cause. Populations affected by complex emergencies may be driven from their homes to another part of their own country to become internally displaced. These settings are often characterized by breakdown of social and physical infrastructure, including health care systems and this population are particularly vulnerable to malnutrition and diseases of public health importance. Malaria is the 2nd most prevalent and devastating disease and has been a major cause of morbidity and continues to be a major threat to the health of millions of people in Pakistan. More than 90% of disease burden in the country is shared by districts Balochistan, FATA, NWFP located close to western border of country and costal areas of Sindh. Since 2006/07 in FATA and some areas of Malakand Division of NWFP there is military operation against some militant groups. During early 2009 there is a massive movement of peoples and 1.7 million people become Internally Displaced Population (IDP) from FATA and Malakand division. Currently these IDPs have been settled in 23 camps in 7 districts accommodating more than 25,000 families. This document mainly deals with prevention of vector mosquitoes of public health importance under complex emergencies/IDPs to interrupt the disease transmission. These guidelines mainly focuses the adaptation of personal protection measures by using repellents, cloth treatments and use of LLINs. Fogging has also been recommended as one of the best choice for control of mosquitoes followed by residual spraying and larviciding. These guidelines have been prepared in the light of best practices available in the world for vector control under **complex emergencies or among displaced (both internally or internationally)**. These guidelines are also very effective for the **armed forces** when they deployed in a new area, particularly in forests. This is an approach that aims at strengthening provincial/district level capacities in malaria vector control particularly and overall malaria generally as well as the promotion of functional mechanisms for inter-sectoral coordination for cost-effective and sustainability of vector control interventions under complex emergencies depending on local settings]

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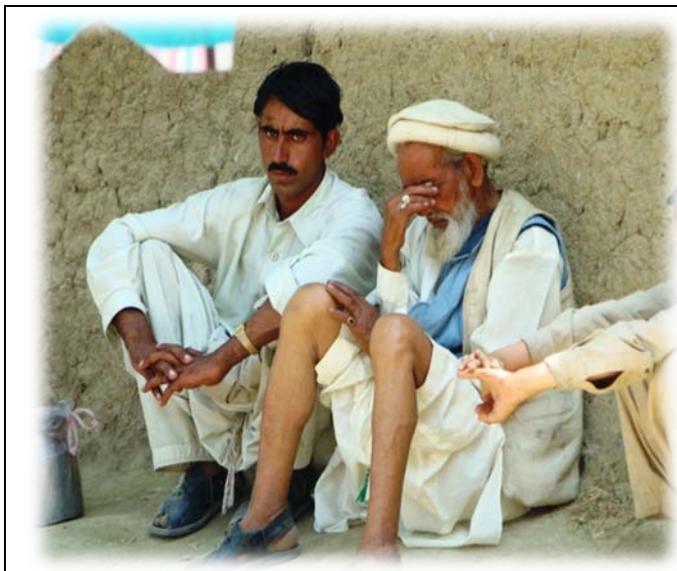
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GUIDELINES FOR ANTI VECTOR INTERVENTIONS IN COMPLEX EMERGENCIES/IDPs



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Background

This document will explain;

- What is meant by a complex emergency and the different phases of an emergency
- Discusses the impact of complex emergencies
- Malaria transmission and populations at risk, and why malaria is significant in emergency situations
- Recommendation for an effective preventive measure (emergency response) for Internally Displaced Population (IDP).

Complex emergencies

A complex emergency is a situation that affects large proportion of the populations caused by war between states, internal conflict, food shortages, political persecution of ethnic groups resulting in population displacement and excess mortality and morbidity. Complex emergencies can have multiple causes, requiring responses specifically designed for the needs of those affected population. In complex emergencies communities commonly leave their own homes setting in new areas and unable to access assistance. These settings are often characterized by breakdown of social and physical infrastructure, including health care systems.

Complex emergencies are not stable, and the situation can change rapidly and unpredictably. Most complex emergencies continue to shift between different phases for many years, until the causes of the original conflict are resolved and order is restored. There are many different descriptions of the various phases of an emergency which have been described in following table.

The main phases of emergencies and their characteristics

	Phases	Status	Period	Characteristics
	Acute phase	Immediate	0-4 weeks	<ul style="list-style-type: none">• Mortality rates usually high (>1/10 000 population per day).• Access of affected population to health care is poor (infrastructure may be damaged, inadequate or non-existent).• Appropriate response is beyond local or national capacity.• Normal coordination mechanisms may have broken down.
		Stabilization	4-10 weeks	
	Chronic phase	Recovery	several months	
		Settlement/repatriation	Months/years	

The impact of complex emergencies on displaced populations

It is important to understand how people are affected during different phases of emergencies, and to be aware that complex emergencies have an impact on

resident or host populations as well as refugee and internally displaced populations (IDPs). The plan for emergency response must be adapted to the needs of different populations, as they change over time. Populations affected by complex emergencies may be driven from their homes to another part of the country and become Internally Displaced People (IDPs). During acute phase of an emergency, the populations are particularly vulnerable to malnutrition and disease. Camps of IDPs planned as “temporary” settlements during the acute phase may ultimately become relatively stable communities. When displaced populations cannot return to their homes for many years, camps may become long-term settlements and control strategy has to be revised. The settlements of IDPs among local communities are a common feature of many complex situations. Often, such displaced people are not registered by national or UN authorities and may not receive assistance in the same way as those living in official camps or settlements. Consequently, because they have no access to basic health care or other services, they may be particularly vulnerable and are major challenge for authorities, particularly when they migrated from endemic areas.

Complex emergencies often result in high rates of death and illness, especially during the acute phase. Certain population groups, such as young children and pregnant women (PW) are more vulnerable to the affects of malnutrition and disease. During complex emergencies mostly only a small proportion of total deaths have been directly related to war trauma, conflict but most have been caused by diarrheal diseases, malaria, pneumonia, measles and malnutrition, all of which are preventable.

Priorities adjustment

The priority in the acute phase of complex emergencies should be set to establish effective life-saving interventions within the first few days. Interventions should be based on the best available evidence – both from existing information and from rapid assessment of the situation. Such information is essential, not only to plan appropriate interventions but also to lobby donor organizations for adequate funds.

Emergency responses need to be tailored to the urgency of the situation, and unsustainable approaches are justified in the short-term approaches until situation is brought under control. Once the situation is stable, more sustainable approaches should be introduced, as the chronic phase of an emergency may go on for years. It is important to remember that there are significant constraints in delivering even basic interventions. Within these constraints, however, every effort should be made to implement best practice. Poor quality interventions are never acceptable resulting prolong suffering and unacceptable loss of resources. The international community should support rapid responses by providing trained staff and augmenting existing health infrastructure with temporary parallel facilities – such as mobile clinics and therapeutic feeding centers.

Malaria in complex emergencies and effective malaria control responses

Malaria is also associated with conflict or the aftermath of conflict, as it is a disease that flourishes in conditions of crisis and population displacement. More than 80% of current complex emergencies are in malaria-endemic areas. In addition

to the population groups generally at risk i.e. pregnant women and children <5 may be at increased risk of developing severe malaria during complex emergencies.

Knowledge of the epidemiology of malaria in the area affected by an emergency is essential to design an appropriate and sustainable curative and prevention strategies. In areas of intense malaria transmission the population is fully to semi-immune after childhood. People in these areas may carry malaria parasites in their blood without showing clinical symptoms of disease, thus the presence of parasites in a patient's blood is indication of an increased risk of developing severe malaria during coming days (rainy season). In areas of unstable malaria transmission, the whole population may have low levels of immunity and outbreaks of malaria may affect all age and population groups. The presence of parasites in a patient's blood in these areas indicates that malaria is highly likely to be the cause of the presenting illness. In complex emergencies, the factors that contribute to the malaria burden include;

- breakdown of health services and of Malaria Control Programmes
- ongoing conflict limiting access to effective curative and preventive services
- resistance of the malaria parasites to commonly available drugs
- lack of immunity in local population to malaria; movements of non-immune people or concentration of people in high risk areas for malaria
- weakened nutritional state of the displaced population
- exposure due to poor or absent housing
- environmental deterioration that encourages vector breeding
- population and parasite movement
- poor knowledge among health agencies.
- problems of supply of food and medicine and difficulty of access

Some groups are particularly vulnerable, especially in the acute phase of a complex emergency, because they are given less priority in the distribution of limited resources, are marginalized socially or politically, or have greater difficulty in accessing treatment and care. Depending on the situation, these may include minority ethnic groups, older people, people with disabilities, and infants and children who are already weak or sick.

Effective emergency response

Effective malaria control in complex emergencies requires flexibility and innovation to maximize the impact of available resources. Large-scale funding made available in emergencies may not be sustained beyond 6–12 months, and approaches used in the acute phase may not be feasible in the longer term. Programme design and strategies will need to be adapted through regular monitoring and review, in response to the changing situation. Once situation is under control, less intensive support may be required. Planning for changes in programme should be achieved through a careful process of reassessment and evaluation. There are following basic principles of an effective response to complex emergencies, which apply to both overall and to specific interventions for malaria control;

1. Coordination

1.1 Organizational framework among agencies

During a complex emergency, effective partnerships among organizations are very essential for planning and implementing an emergency response. Ideally one emergency partner should normally take responsibility for coordination to ensure standardized protocols for the utilization of general health agencies or specialized services. The overall objective of to maximize overall capacities, promotes linkages and complementary activities, and to avoids duplication of resources. In principle to ensure the sustainability the leading role should be with Ministry of Health. Existing health facilities and national staff should also play leading role in emergency response and with international support to deliver best emergency health care services. Local NGOs and community groups are also important partners in the emergency response, usually after the acute phase, although they sometimes play a significant role early on. Local faith-based organizations should also play a vital role in health care delivery in complex emergencies/IDPs. Coordination and information sharing always help in;

- improve planning
- improve implementation and management
- improve efficiency
- reduce security risk
- prevent duplication of activities
- provide common logistic systems
- mediate or improve agency negotiating power with authorities or factions
- better acceptance of intervention to IDPs

Malaria control is a specialist activity that should be implemented through the general health services. General health agencies (MOH, UN or NGOs) should coordinate with an agency specializing in laboratory training services who has taken on the responsibility for ensuring the quality of diagnosis and treatment in NGO clinics. Another agency specializing in disease control should take responsibility for malaria prevention, and provide technical assistance, commodities, or training to Ministry of Health to implement vector control interventions in their specific area of operation.

It is of vital importance that coordination among all actors of complex emergencies must be maintained at all levels of implementation of interventions (planning up to monitoring and evaluation).

2. Development of plan

In order to implement appropriate and effective malaria control interventions during complex emergencies, it is essential to develop a plan before any action. The elements of a good plan are;

- Situation analysis
- Gaps identification
- Define objectives for malaria control interventions based on;
 - ▶ the severity of the problem,
 - ▶ availability of resources in term of human/material,
 - ▶ level of control of disease
 - ▶ community social and cultural norms

- ▶ Seasonality of disease
- ▶ the expected future movements of population
- Selection of appropriate strategies
- Decision on activities
- Development of a work plan with responsible officer (focal person), objectives, methodology and targets
- Sharing and consensus of other stakeholders on organizational framework
- Develop indicators for monitoring and evaluation, and mechanism of measurement of agreed indicators
- Development of a budget

3. Timely situation analysis

During complex emergencies an initial assessment of the situation is essential in order to;

- ▶ plan the appropriate and timely response
- ▶ priorities adjustment
- ▶ assigning of responsibilities keeping in view the areas of expertise of partners
- ▶ to decide upon the most effective situation specific interventions
- ▶ and to avoid costly or life threatening mistakes.

An assessment team of experienced and qualified people with a mix of complementary skills in disease control and operations should be mobilized to assess the underlying causes and establish objectives and priorities. It is also important to assess the displaced community itself, to determine human resources available and methods to ensure their involvement in disease specific interventions. Specifically information should be collected on;

- **Environment**
 - geographical factors, water/irrigation, agriculture(cropping pattern)
 - seasonal variation in rainfall and temperature
 - site selection
- **Population**
 - density, age, sex
 - on going population movements
 - Caseload per 1,000 population per day
 - population at risk of malaria and emergency factors increasing vulnerability to malaria
 - ethnic structure
 - urban and rural
 - displaced & host, settlement patterns
- **Epidemiology and entomology**
 - disease endemicity
 - transmission period
 - identifying at risk communities
 - mapping of high risk areas

- types of vectors
- resting and breeding sites
- resistance level both in vector and parasites
- **Security**
 - military & other authorities
 - access to vulnerable
- **Available resources and logistics**
 - human
 - health facilities (both diagnosis and treatment)
 - insecticides
 - Bed nets
 - Antimalaria drugs, etc
 - Fog machines and chemical
 - funds
 - logistics, import practices
 - legal, registration policy

WHO Assessment guidelines exist already and should be used, but specifically malaria information must be added such as local drug resistance, government health policy, and pre-emergency situation, national malaria control guidelines, emergency guidelines (if available). Team members should be drawn from local health professionals, operational NGOs and from other agencies that can provide skills in epidemiology, vector control, antimalarials/insecticides and organization. The situation should be re-assessed when the acute phase is over since different strategies will be needed.

4. Accurate need assessment

In an emergency situation, basic information about local malaria parasites, vectors, endemicity and transmission is desirable for the planning and implementation of appropriate and effective disease specific interventions. Helping toolkits for many of the countries affected by emergencies can be found on the WHO/RBM web site www.who.int/malaria/epidemicsandemergencies.html.

Assessment

In a complex emergency, a general assessment is essential to;

- Identify current health priorities and potential health threats
- assess the capacity and resources available to respond to the situation
- Collect baseline information for monitoring and evaluation of the effectiveness of planned interventions.

More specifically, it is important to determine the extent to which malaria is, or is likely to become, a major problem. Important questions to consider include;

- Is malaria a major health problem in the affected populations?
- Is the area prone to malaria outbreaks?
- Is there local transmission?

- Is malaria a major problem in the area from which the population has been displaced?
- Who is most at risk of malaria infection, illness and death?

Guiding principles for assessment, planning and selection of appropriate malaria control interventions

- Maximize the use of existing information
- Carry out rapid surveys if existing information is inadequate or inaccessible
- As far as possible, match malaria control interventions to current effective national guidelines and policies
- Use available local expertise
- Involve affected populations in decision-making and action

On the basis of informations collected on population/houses (tents), disease burden/caseload of local area (s), total affect area during situation analysis, quantities of following commodities should be calculated;

- **Diagnosis**
 - Number of RDTs
 - Number of slides & prickers
 - Number of mobile squids for ACD
 - Number of microscopes (in case of nearest microscopy center)
 - Amount of antimalarial drugs
- **Prevention**
 - Insecticides
 - Larvicides
 - Bednets (LLINs)
 - Fogging machines
 - Fogging chemical
 - Spray pumps
- **Human and logistics support**
 - Trained microscopists
 - Trained spray men
 - health facilities (both diagnosis and treatment)
 - funds
 - logistics, import practices
 - legal, registration policy

Initial assessment of the situation should complete as soon as possible (within a week), although this will depend on security, transport and communication. When conducting community malaria surveys or assessments at health facilities, it is essential to document both the presence of parasites (by RDT or microscopy) and clinical symptoms (actual or reported fever). These data will provide useful information on both the proportion of symptomatic and asymptomatic malaria cases, and the proportion of febrile individuals without malaria. After this exercise of need assessment, there should be a meeting for sharing of these informations with

other international and national emergency partners. This meeting will be of vital importance to;

- contribute to the overall assessment both of the health situation and of wider humanitarian needs
- ensure the avoidance of duplication of resources and activities
- Help the emergency partners to prepare their plan of activities and contribution

Ministry of Health should take leading role in this coordination meeting at central level.

5. Site Planning

When displaced population is to be adjusted in temporary camps, local authorities should select an area where there are (surroundings 1 km) no permanent mosquito breeding sites which will reduce or prevent malaria. It is vital that the assessment is made as early as possible to lobby against potentially malarious sites that might support vector breeding and enhances transmission.

6. Disease management

Diagnosis

Malaria diagnosis is essential particularly when;

- population with low immunity (unstable malaria affected areas) displaces in high transmission area (stable malaria)
- population displaces from high transmission area (stable malaria) to low transmission areas (unstable malaria affected areas). In this case many individuals will be carriers (reservoirs) of parasites and there will be a threat of outbreak among IDPs particularly when vector (s) will be already established.

Generally microscopic diagnosis may not be possible in the acute phase of an emergency or where there is a very weak health system. Where no microscopy is possible diagnosis mainly depends on clinical symptoms and knowledge of the risk of malaria, recognizing that this is not very accurate. However at implementation stage Rapid diagnostic test kits (RDTs) will be ideal solution for screening large numbers of patients. It is also important in limiting unnecessary use of antimalarial drugs.

Treatment

The provision of treatment should be based on knowledge of drug resistance patterns in the area. This is particularly important as displaced populations are especially vulnerable due to low immunity (from malnutrition or lack of previous exposure to malaria) and to risk of being unable to seek retreatment if treatment fails. Local up to date information on drug resistance is essential for developing appropriate treatment policy. Local health authorities who may have the information already and operational agencies should collaborate on obtaining the information. Other causes of treatment failure, such as non-compliance, vomiting and poor quality drugs should always be monitored. Combinations of artemisinin

derivatives and various other antimalarials are currently being used against “confirmed” uncomplicated falciparum malaria in country due to the spread of chloroquine resistance. Management of severe malaria should be according to the national treatment protocols/ WHO recommendations and guidelines.

7. Monitoring and evaluation

Implementation of interventions including overall management and disease indicators should be set from the outset and monitored throughout to ensure programme quality, progress, coverage, and to guide strategic direction. The number of indicators needs to be rationalized and should be selected on the basis of strength of existing and developing surveillance system while the operational indicators will depend on intervention selected. Periodic, systematic evaluation of the programme (needs, plans, implementation, and impact) provides evidence of progress or need for reorientation of implementation strategies. Evaluation of epidemiological impact may be impossible during the acute phase but should be considered during the post-acute phase when the population settles and diagnostic and preventive services becomes available. Confirmation of disease control will justify continued implementation and helps to secure further financial support.

8. Prevention

Acute phase

While the first priorities in the acute phase of an emergency are prompt and effective diagnosis and treatment of people with malaria, prevention can make an important contribution to reducing the risk of infection. Malaria prevention strategies include vector control and personal protection against mosquito bites, in addition to intermittent preventive treatment during pregnancy to avert severe anaemia and low birth weight. In emergency situations where there is a risk of malaria, the most important initial questions related to prevention are:

- Is malaria prevention likely to be useful?
- Is malaria prevention feasible?

The choice of intervention for disease prevention in the acute phase is not prescriptive and will vary according to effectiveness, feasibility, availability, cost and speed of supply. The key local factors influencing choice should be;

- Type of shelter available
 - ▶ permanent housing, tents, plastic sheeting
- Human behavior
 - ▶ culture, sleeping practices, mobility
- Vector behavior
 - ▶ biting cycle, indoor or outdoor resting

Some promising new methods of prevention are as under;

- (Insecticide treated tents, cloth treatment) have been implemented as one of the best choice of vector mosquito control around the globe.

- Long Lasting Insecticidal nets (LLINs) are suitable if nets were previously used by the population, and if living in structures that allow mosquito nets to be supported or hung
- Permethrin treated (chaddars) blankets and other materials are a promising initial option for those under temporary shelters or where correct use of LLINs is in doubt.
- Permethrin treated outer clothing worn in the evening or in bed have already shown promising effectiveness in south Asia
- Insecticide sprayed tents for “transit” buildings, temporary treatment facilities, and family shelters have also shown significant reduction in malaria transmission.
- Indoor spraying of residual insecticide (“house spraying”) has been the method of control most often used in chronic refugee situations. It is suitable for refugee populations who have built or are occupying mud huts or houses. However treatment of canvas tents has also shown effectiveness when displaced population live in such tents. However tent spraying is effective when sprayed at the beginning of the transmission season and has to be repeated at 3-6 month intervals in stable endemic areas.
- Environmental control may be difficult during the acute phase except on a local scale, and impact is often limited. To reduce the number of vector breeding sites following important steps should be taken;
 - ▶ drain clean water around water tap stands & rain water drains
 - ▶ use of larvicides in/on breeding sites if these are limited in number
 - ▶ used mobil oils should be spread on disused ponds
 - ▶ drain ponds, but may not be acceptable if used for washing

9. Malaria Surveillance

Malaria surveillance is the continual and systematic collection, analysis and interpretation of data essential for planning, implementation and evaluation of control interventions. Overall surveillance is very essential measuring tool to assess the impact of interventions on disease burden among the displaced population in a complex emergency. Malaria surveillance should be integrated into an overall surveillance system of all the main causes of mortality, which is usually based on the network of health facilities in an area. The purpose of malaria surveillance is to;

- Monitoring the disease trends (are malaria cases increasing or decreasing)
 - ▶ migration of non-immune groups into areas with current malaria transmission
 - ▶ migration of infected groups into malaria-free areas which are
 - ▶ capable of supporting
 - ▶ renewed transmission
 - ▶ movement of infected groups into an area with established malaria transmission but of a different strain

Is this due to new arrivals or the displacement of the population?

- Provision of an early warning of an outbreak

- Monitor the effectiveness of malaria control interventions and, if necessary, redefine priorities, for example:
 - ▶ Do sick people have access to health care?
 - ▶ How effective is detection and treatment of malaria cases?

If no surveillance system is in place or the existing system is inadequate, it is essential to establish a system first– but this must be done in a coordinated way.

Overall epidemiological information systems are essential in all malaria control programmes to assess the country's malaria situation, allow the forecasting of epidemics, define risk groups, and monitor programme progress. Although data collection is difficult in the acute phase of an emergency, minimal information is required in order to assess the impact of malaria and to prepare a response. During an emergency population size may be difficult to estimate. Slide positivity rate as a measure of parasite prevalence is a very useful malariometric index in unstable malaria areas, since it is independent of population size and may show a sudden increase during an epidemic. Its interpretation depends, however, on the criteria used for taking slides.

10. Important Strategic Directions and steps for vector control interventions among IDPs

Complete prevention of an epidemic only by vector control is not always feasible. Therefore vector control interventions should be supplemented by drug-based interventions. The implementation of vector control interventions require adequate preparation and planning and follow up. Ideally vector control interventions must be implemented at an early stage of emergency or epidemics – in many or most cases it is done *TOO LATE*. Moreover a good understanding of the vector (s) habits like where they breed, biting time (Diurnal, nocturnal, dawn & dusk etc) and rest places (endophilic, exophilic) and the duration of transmission (short or prolonged) is crucial in determining which intervention is appropriate and cost-effective and timings of intervention. A successful operation must therefore rely on these informations to decide time and type of intervention and its mechanism of implementation. The appropriateness of vector control interventions for malaria and other vector borne diseases varies under different epidemiological situation including complex emergencies or displaced population as shown in following table;

Diseases	SIRS ¹	LLINs	Personal protection			Larval control		Space spraying	
			Repelents	Cloth treatment	Screening	Chemical	Source reduction	Indoor	Outdoor
Routine	++	+++	+	+	+++	++	+	+++	+
CE/IDPs	+++	++	++++	+++	++	++++	++++	++++	++++

Need of the document

This document mainly deals with *prevention of vectors* of public health importance during complex emergencies or among displaced population. Presently prevention is the major activity of National Malaria Control Program (NMCP) to *interrupt the disease transmission by the reducing of densities of the vector mosquitoes*. For sustainable results and ensuring minimizing wasteful use of resources these measures should be well planned.

These guidelines have been prepared in the light of best practices available in the world for vector control under **complex emergencies or among displaced (both internally or internationally)**. These guidelines are also very effective for the **armed forces** when they deployed in a new area, particularly in forests. This is an approach that aims at strengthening provincial/district level capacities in malaria vector control particularly and overall malaria generally as well as the promotion of functional mechanisms for inter-sectoral coordination for cost-effective and sustainability of vector control interventions under emergencies depending on local settings.

The routine preventive measures of NMCP includes;

- Selective Residual Insecticide Spaying (SRIS).
- Larviciding (both liquids and granules)
- Use of insecticides treated Bed Nets (LLIN's & ITNs)
- Personal protection through use repellants, protecting cloths, screening of houses
- Source reduction (Environmental management)
- Space spraying/Fogging (only during epidemics)

¹ Selective Indoor Residual Spraying

- Biological control

Under complex emergencies these preventive measure have been prioritized as under;

1. Personal protection
 - *Repellants*
 - *Treatment of cloths*
 - *Protective cloths*
 - *Screening of houses*
2. Use of insecticides treated bed nets (LLINs)
3. Space spraying (thermal fogging)
4. Selective indoor residual spraying (SIRS)
5. Larviciding
6. Source reduction (Environmental management)
7. Health education

1. PERSONAL PROTECTION

During the complex emergencies personal protection is one of the best recommended interventions for mosquito (both nuisance and vector) control. This intervention is also equally important for armed forces (particularly when they deployed in forests). However their efficiency depends on their acceptance and proper usage by affected population. Following are the main methods of personal protection;

► Use of repellents

The repellents containing N, N-Diethyl-m-toluamide (DEET), ICARIDINE (odorless and advance form of repellants) etc are highly recommended.

- The repellants should be applied to exposed part of body to prevent mosquito bites particularly during evening timings.
- Children <5 and pregnant women should use cream, lotion and other repellent at time of sleeping, particularly when sleeping outdoors. During emergencies when population displaced in thick vegetation areas these replants should also be used for PW even when they are not sleeping. However prolong use of more than 2 months should be consulted with doctor.
- In case of children <5 years these repellents should when they are not sleeping. However in this case repellents should not be applied to their hand and/or faces.
- The repellents (DEET) containing concentration above 30-40% should be avoided.
- The repellent which gives at least 8 hrs protection are strongly recommended during complex emergencies.
- For acceptance to community a repellent should not cause any irritation on skin.

- Clothing can also be treated with DEET, ICARIDINE etc to repel mosquitoes.
- Natural repellants like Garlic, onion, neem, Cedar, Eucalyptus spp, cloves oils, can also be used during complex emergencies.
- In case of ten, burn (**smoke only**) the leaves of neem, Eucalyptus spp inside and close the entrance for at least 15 minutes. This practice should be done at least 1-2 hours before sleeping.
- In case of open air, burn (smoke) the leaves of neem, Eucalyptus spp close to sleeping place at the time of sleeping however any fire or burning item should be kept supervised for fire safety. It is recommended that such fogging is undertaken at least 1 hr before the sleeping time and stopped before sleeping for avoiding health hazards.

► Cloth treatment

Some mosquitoes particularly *Culex* (most common nuisance mosquito) can also bite through cloths particularly when they are skin tight. However, the treatment of cloths with quick-acting insecticides of *pyrethroid* group such as "permethrin" can be the best choice to prevent the mosquito bites during complex emergencies or among displaced population. These latter compounds don't repel the mosquitoes but allow them to make contact with fabric and irritate or kill them before they manage to feed. The application of repellants to cloths is prefer to application on skin because of reduction of likelihood allergic reaction on skin. . However if the clothing treated with non-repellent pyrethroids, flying insects including mosquitoes can bite on uncovered skin, necessitating the application of repellant to skin. Some of the other pyrethroids like "*cyfluthrin*" can also be effective however degrade quickly in sunlight. Synthetic insecticides should generally preferred to volatile repellents for clothing treatment because;

- They are most feasible and effective during complex emergencies/displaced population or during natural disaster.
- Act quickly and repel or kill mosquitoes quickly.
- They are long lasting and to some extent withstand weathering, sunlight and washing with cold water.
- Also best choice for armed forces.
- They are more pleasant to use (no odor, color or greasiness).
- The recommended dose of permethrin is 1.25 mg/m². The Chaddar (Doupatta) of female (pregnant women) can also be treated with this insecticide at same dose.
- They are long lasting up to several weeks depending upon washing and exposure to rain and sun.
- Effective up to 10-12 washes in cold water. However, washing in hot water should be avoided.
- To avoid any irritation on skin, it should be applied at right dose mentioned above.

- They are cheaper than repellents.

Since these synthetic pyrethroids are non-volatile in nature, therefore there is risk of attack of mosquitoes to bare part of body. Therefore during complex emergencies or displaced population the volatile repellents should be preferred one. They remain effective on cloths up to a week. Treated cloths also provides protection against biting midges, fleas, sand flies, and body lice.

How to treat clothing

The clothing can be treated with permethrin by spraying the insecticides from a pressurized can or by soaking in an aqueous emulsion. The recommended dose for long sleeve shirt (*Kameez*) is 1.25mg/m².

► Protective cloths

During complex emergencies or among displaced population protective cloths can offer one of the best protections from mosquito bite when they are thick and loose.

- Wear long sleeves while sleeping particularly during day time
- Wear the sock and also cover other exposed body parts
- Full trousers
- Loose fittings
- light color clothings

These cares are particularly recommended for displaced population particularly for children <5 years of age. All these measures are very effective for personal protection from mosquito biting and should be promoted through health education campaign.

► Screening of tents/houses.

- If displaced population has been temporally settled in buildings (house, school, other community settings), mosquito-proof screens on doors and windows should be promoted to prevent the entry of mosquitoes.
- Screen of mesh size 150-170/ inch² or 25-30/cm² should be used.
- In case of tent net with same mesh size should be hanged at entrance.

2. Use Of Insecticides Treated Bed Nets (LLINs)

During complex emergencies or among displaced population the use of Long Lasting Insecticides Treated mosquito nets (LLINs) is also one of the best choices for the control of vectors of public health importance. However if the displace population living in small size tents, then its use become limited. If population displaced in area of stable malaria, all pregnant women and children <5 must be provided LLINs and if population displaced in unstable malaria (as present is case) whole population at risk will be provided LLINs. Following are the major instruction for better use of LLINs under complex emergencies as per national guidelines;

- **ONLY** WHOPEs recommended bednets (PermaNet, Olyset, Interceptor, NetProtect, and DuraNet) will be distributed among the affected population.
- Whole displaced population must be provided LLINs.

- All patients (vivax and falciparum malaria) must sleep under LLINs till its recovery to interrupt further spread of disease.
- In case of tents of larger size 45-50 sq. meter LLINs can easily fix inside the tent. If the size of tent is small, LLIN can be fixed at lower height 4-5 feet above ground level.
- In case of complex emergencies when displaced population living in tents conical shape LLINs should be provided and promoted which are very easy to install in/out tent.
- While sleeping make sure that the hanging edges of bed net are under mattress or properly touching ground.
- After opening of packet, bed net should be spread under shade for 1 hrs before use.
- During day time when net is not in use it should not be folded rather hang it in corner of tent. This gives maximum mortality of mosquitoes as mosquitoes prefer to rest on hanging cloths.
- LLINs can also be hang at entrance (inside of tent) to act as mechanical barrier against entrance of mosquito to tent. However impregnated curtain will give better results.
- Avoid the washing of bed net during emergency situation or when population is displaced.
- Bednets should be washed after at least 4 months.
- If there is any hole in bed net it must be replaced when with new one. However, if new one is not available it must be repaired immediately.

3. Space Spraying

The space spraying is not recommended for routine vector control operations in Pakistan at present.

- Space spraying should be considered as epidemic contingency measure particularly during complex emergencies.
- This intervention must be conducted at the time of peak activity of adult mosquitoes in and around camps.
- Space spraying is usually designed to provide a rapid knock-down effect on exophilic vector mosquito particularly during complex emergency.
- In camps of displaced population fogging should be done (preferable at dawn) on alternate days during first week of settlement of population and later on 3rd day for a month. During second month the operation will be conducted on weekly basis.
- This operation must be continued for at least 3 months after the emergency situation.
- It should be implemented in a compact community and should be within 1000 meter radius of affected population/areas.

- For endophilic vector mosquito control during emergencies situation, space spraying should also be an important component of vector control. However, it should be concentrated inside tent with the help of hand carrying fog machines (Inside thermal fogging).
- After indoor fogging tent should be closed for 10-15 minutes.
- **For out door fogging**, first prepare plan with respect to layout of tents and wind directions.
- Fogging should be done perpendicular to the wind direction.
- While using vehicle mounted fog machine, maintain speed of vehicle 5-10 km/hr.
- In case of outdoor fogging, the operation should not be carried out when;
 - ▶ wind speed is > 8-10 km/h.
 - ▶ wind speed is less than 2-3 km/h
 - ▶ Relative humidity is >90% (during/immediately after rains)
- One day before the operation make announcement in the area about operation.
- Follow the dose criteria of manufacturer mentioned on label.

N.B: *Blood cholinesterase must be monitored on regular basis, if organophosphates compounds are used.*

4. Selective Indoor Residual Spraying (SIRS)

During complex emergencies Indoor Residual spray should only be adopted when necessary infrastructure to be sprayed exists (stable house structures, tents, barracks etc.). Generally, SIRS is a valuable option for malaria control, particularly when applied in right circumstances, with full coverage and with proper application method and other precautions.

- IRS is generally not highly recommended intervention during outbreak of disease. However, during complex emergencies it should mainly focus on buildings being used by displaced population (schools, hospitals and other shelters) and all sleeping places rooms and stores room should be sprayed thoroughly.
- Special mobile squads (Entomologists, Assistant Entomologists, Malaria Superintendent, M. Supervisors, district government staff etc) should be raised to carry out vector density surveys in epidemic prone areas by involving district government staff and logistics.
- Tents should also be treated thoroughly from inside and spray should be done during morning or evening. After spraying, close the tent for at least half hour.
- Don't dust wall of tents after spraying and don't touch (preferably keep the children away from tents) till its dryness.
- Don't leave any food item inside tent during spraying and always transfer food item insides at least after one hour of spray.

- Hang a black cloth sheet (CHADDAR) in tent (preferably in corners) and spray it thoroughly. This will give maximum mortality of vector mosquitoes resting inside.
- No need of spraying in open air or on debris/garbage.

5. Larviciding:

During complex emergencies the best and most effective method of vector-borne diseases is to control the vector (s) at larval (young) stage. In routine operations larval control includes use of chemical, environmental management, biological, etc. However during emergencies the use of chemical has always been given top most priority. Larvicides are used in breeding sites that cannot be drained, filled or where other larval control methods are too expensive or impossible to use. Larviciding is very effective tools when carried out during dry months (May-June). Following points should be considered while applying larvicides;

- Larviciding should be carried out very carefully after proper breeding sites assessment surveys and mapping in and around (within 2 km radius) of camps of displaced population.
- Larviciding should be focused only to those water bodies which are close to displaced human population (with 1-2 kilometer radius).
- Larviciding should be focused in water bodies less than 100 sq. meters of size.
- In case of very large water bodies >100 sq. meters, larviciding (if very necessary) should be confined to areas where there are emergent vegetations along margin.
- Granulars (Fenthion 2g) should be sprinkled along the 2-3 feet from margin.
- Liquids larvicides (Temephos 500E) should be sprayed along margin up to 3-4 feet.
- Direct mixing of liquid larvicides (Temephos) to breeding site is strictly prohibited.
- No larviciding should be done in the center of water bodies.
- In case of polluted water granular larvicides should be preferred while in case of clean water bodies liquid larvicides should be preferred.
- Ideally larviciding should be carried out at 1st to 3rd instars/stage of development of mosquitoes.
- Larviciding in flowing water should also be avoided.
- In case of unserviceable water bodies (even for animal use), used mobil oil should be used.
- For most efficient larviciding program, treatments must be repeated at fairly short cycles which may vary from 10-15 days depending upon larval density and availability of resources (2-3 cycles per month).

- Larviciding operation should be carried out for at least 2 months of emergency till the situation is under control.
- In areas with very strong wind movements larviciding should be confined only along the margin downwind.

6. Environmental management

EM refers to any modification in the environment which deprives the vector population of its requirements for survival (mainly breeding, resting and feeding), thus reducing human-vector contact and transmission risks. Though during emergencies or epidemics EM does not work very effectively, however when a displaced population or armed forces move or are deployed to some areas there will be some construction activities which ultimately result in the creation of some breeding sites.

Following are important points to be considered for EM for the control of mosquitoes:

- Remove the stagnant water by;
 - ▶ Fill the ditches with soil
 - ▶ Drain out water in nearby water course/channel.
- Use used Mobil oil to cover unusable water bodies.
- Remove the emerging vegetation and other floating debris from open drinking water bodies.
- Cover the water storage tanks properly.

7. Health Education

During complex emergencies, the organization dealing with the situation must focus on health awareness campaigns among the displaced population for better acceptance of interventions. Therefore, health education campaigns through public participation should be the top priority/activity to:

- Change the behaviour of people for improved hygiene practices
- Recognize the symptoms of disease for prompt treatment-seeking behavior
- Promote self-protection practices (use of bed nets, creams, oils, coils and other repellents)
- Cleanliness of the surroundings
- Draining out of stagnant water
- Treat the stagnant water with used motor oil and chemicals (larvicides) where necessary for nuisance mosquitoes.
- The best approach in our context is to involve local leaders, Imams, teachers, and LHWs in imparting health education messages.
- The extensive distribution of posters and pamphlets should also be one of the key strategies for the success of such campaigns.

Protection from Mosquitoes Prevention from Malaria and dengue