

PREVENTION AND CONTROL OF MALARIA OUTBREAKS IN FLOOD-AFFECTED DISTRICTS OF PAKISTAN

Strategic elements for a national response plan

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BACKGROUND

Malaria in Pakistan is of low to moderate prevalence with pronounced seasonal transmission and prone to epidemics in certain geographical areas¹. It is a major cause of morbidity and it figures high on the list of health priorities with outbreaks occurring at intervals of 8-10 years. The major transmission season is post monsoon (September-November), however, along the coastal areas and along the Western border, the disease prevails throughout the year.

Malaria mainly affects the poorest districts that benefit from sub-optimal quality health care service delivery. Most cases occur along the international borders with Iran and Afghanistan.

With an estimated burden of 1.6 million clinical cases annually, malaria is the second most frequently reported diseases from public sector health facilities after Acute Respiratory Infection (ARI). The National Health Management Information System (HMIS) reported 4.5 million suspected cases of malaria in Pakistan in 2008, comprising 6% of all outpatient attendances at Primary Health Care health facilities. Confirmed cases of malaria in 2009 were 198,649, 39% of which caused by *P.falciparum*. The rest were caused by *P. vivax*. Usually, most of the affected districts are located in the Balochistan, FATA, Khyber Pakhtunkhwa and Sindh provinces.

Currently, Pakistan is suffering from the aftermath of the worst flood in its history since 1929. According to the estimates, 70 of the 136 districts of the Country have been affected. Khyber Pakhtunkhwa (KPK), Punjab and Sindh are the most affected areas. The floods have destroyed infrastructure, modes of communications and health facilities. About 20 million people have been affected, many have lost their homes, personal belongings and means of livelihood.



Among vector born diseases endemic in Pakistan, the floods are expected to have the greatest impact on malaria risk. The presence of stagnant waters creates a favourable habitat for mosquito breeding and consequently an increase in the density of vectors is expected. At the same time, the infrastructural

damage has left the affected population highly exposed to vectors and this, if combined with warm temperatures, may notably enhance the malariogenic potential in flood affected districts and especially in Punjab and Sindh. This is due to the fact that malaria transmission is expected to end in November in the KP province while it is expected to persist, albeit at lower levels, during the winter in the South.

Increases in morbidity can also be expected due to a spill-over effect in neighboring districts, if population movement from low to highly endemic areas is relevant and living conditions remain poor.

Destruction and damage to health facilities providing malaria preventive and curative services will impact on malaria control. Unfortunately a large number of long lasting insecticide impregnated nets (LLIN) that were provided pre-crisis through the Global Fund were lost during the floods, thus increasing the vulnerability of the population.

FLOOD-AFFECTED DISTRICTS WITH RISK OF MALARIA OUTBREAKS IN PAKISTAN AND ESTIMATED MALARIA BURDEN



The devastating floods might lead to increases in the incidence of malaria in areas where malaria was known to be of low endemicity such as in the affected districts of the Punjab province.

Forty seven districts are to be considered at risk of malaria of which 19 are in Sindh, 6 in Punjab, 12 in KPK, 7 in Baluchistan, 1 in FATA and 1 AJK.

The total population in those districts is 56 million, of which 36 million in rural areas and therefore at higher risk of contracting malaria. This is the population that is to be targeted for preventive measures.

It is estimated that clinical malaria cases in the flood affected areas might increase to over 4 million up to the end of 2010. Confirmed cases are expected to be slightly less than one million, of whom 50% should be seeking care in MoH facilities. Based on this figure the needs were calculated but they need to be adjusted according to the monitoring of the situation.

RECOMMENDED STRATEGIC ELEMENTS FOR EMERGENCY RESPONSE TO MALARIA IN FLOOD AFFECTED AREAS

- 1. Prompt and effective case management**
 - a. Provision of rapid diagnostic tools for parasitological confirmation of suspected cases suited for use in emergency situations (RDTs).
 - b. Provision of effective antimalarial drugs (first and second line).
 - c. Prevention of mortality from malaria by strengthening the referral system, and management of severe malaria in referral facilities
- 2. Appropriate vector control and personal protection methods**
- 3. Early detection of malaria outbreaks and timely response through strengthened surveillance linked with other communicable diseases**
- 4. Community Involvement, mobilization and awareness**
- 5. Capacity building and logistic support**
- 6. Technical support, guidance and coordination**

MALARIA CASE MANAGEMENT

When large numbers of people are displaced within malaria endemic areas, there is a risk of severe malaria epidemics (especially when people living in an area with little or no malaria transmission move to an endemic area). The lack of protective immunity, concentration of people in exposed settings, breakdown of the public health system and loss of its preventive activities, poor access to effective treatment, concomitant infections and malnutrition all render populations vulnerable to epidemic malaria. Such circumstances are also ideal for the development resistance to antimalarials.



For these reasons, particular efforts must be made to deliver, free-of-charge, effective malaria treatment to the populations at risk. The principles below are generally applicable to epidemics and to complex emergencies occurring in areas with malaria risk, where appropriate case management should be the key.

LABORATORY DIAGNOSIS OF MALARIA

Parasite-based diagnosis is needed to: diagnose that malaria is the cause of a fever febrile illness, monitor the epidemic curves and confirm the end of epidemics, follow clinical progress in infants, pregnant women, severe malaria cases, the severely malnourished and suspected treatment failures.

Treatment based solely on the clinical history (mass fever treatment), may be needed in epidemics for a proportion of patients. However this approach should only be adopted when it has been proved that the epidemic is due to malaria and not to some other infectious disease

Diagnosis by Rapid Diagnostic Tests²

In the acute phase of epidemics and complex emergency situations, facilities for laboratory diagnosis are usually either unavailable, destroyed, or overwhelmed by the caseload. For this reason Rapid Diagnostic Tests (RDTs) have been introduced with the advantage of being quick to perform with less need for skilled

laboratory technicians. Current experience with RDTs indicates that they are useful for confirming the cause and end-point of malaria epidemics, and to monitor them. However, heat stability may be a problem leading to false-negative results. For this reason it is necessary to protect RDTs from exposure to high temperatures through refrigeration. No cold chain is needed.

Use of microscopy

Notwithstanding the use RDTs, microscopy is still needed for field quality control of rapid diagnostic tests and to monitor parasitaemia density during the treatment of severe cases. It is therefore necessary to maintain malaria microscopy diagnosis this capacities.

MASS FEVER TREATMENT

Mass fever treatment is the treatment of suspected malaria cases on clinical grounds without laboratory confirmation for each patient. If considered, it should be temporary and restricted to operational necessity in epidemics in complex emergency situations to compensate for the health staff overload and only in case of a confirmed malaria epidemic. Whenever this strategy is adopted, a full treatment course should always be given. Mass fever treatment must not be confused with mass drug administration.

MANAGEMENT OF UNCOMPLICATED P.FALCIPARUM MALARIA³

Rather than relying on patients to come to a fixed clinic, an active search should be made for febrile patients to ensure that as many of them as possible receive adequate treatment. *The antimalarials to be used for treatment must be highly effective (>95% cure rates), safe and well tolerated so that adherence to treatment is high. Complete courses of treatment should always be given in all circumstances.*

Although artemeter+lumefantrine is the default ACT in the Interagency Emergency Health Kit, the national policy of Pakistan is to use artesunate+ sulfadoxine-pyrimethamine (SP).

Treatment failures occurring within 14 days (1 month in low transmission areas) of the onset of disease, should be treated with second line treatment as they are more likely due to drug resistance. The second line treatments of choice are: artesunate plus tetracycline or doxycycline or clindamycin (given for a total of 7 days) or in alternative quinine plus tetracycline or doxycycline or clindamycin (given for a total of 7 days).

MANAGEMENT OF *P.VIVAX* MALARIA

Chloroquine is the recommended drug once *P. vivax* is confirmed. Chloroquine as a schizonticidal drug is administered in a dose of 10mg/kg in the first and second day and then 5mg/kg in the third day.

Anti-relapse therapy for *P.vivax* malaria with Primaquine is not recommended for pregnant women, young children, and patients with Glucose-6-phosphate dehydrogenase deficiency (G6PD). Primaquine is administered in this setting at the dosage of 0.25 mg base/kg body weight for 14 days (the adult dosage is 15 mg). In situations where primaquine is given without supervision, adherence should be encouraged.

MANAGEMENT OF SEVERE *P.FALCIPARUM* MALARIA

Severe malaria is a medical emergency. In temporary clinics or in situations in which there are staff shortages and high workloads, intensive case monitoring is difficult. Drug treatment should, therefore, be as simple and safe as possible, with manageable dosing schedules and minimal need for monitoring.

Recommended treatment in adults is artesunate 2.4 mg/kg bw IV or IM. Quinine IV or IM can be an alternative should artesunate vials not be available. Only if neither artesunate nor quinine are available, intramuscular artemether should be used as the absorption of the drug can be irregular.

Parasitaemia density should be monitored with the use of microscopy.






















	vivax	ovale	malariae	falciparum
Ring Stage				
Trophozoite				
Schizont				
Segmenter				
Gametocytes				
				

Figure 1 – Different types of plasmodium as seen in thin smear preparations⁴

PREVENTION OF MALARIA AND OTHER VECTOR BORNE DISEASES THROUGH EFFECTIVE VECTOR CONTROL ⁵

Although the main interventions are geared towards malaria vector control, it is acknowledged that some of the flood-affected areas are also at risk of other vector-borne diseases – notably dengue and leishmaniasis. The control of these diseases will also benefit from the interventions mentioned in this document.

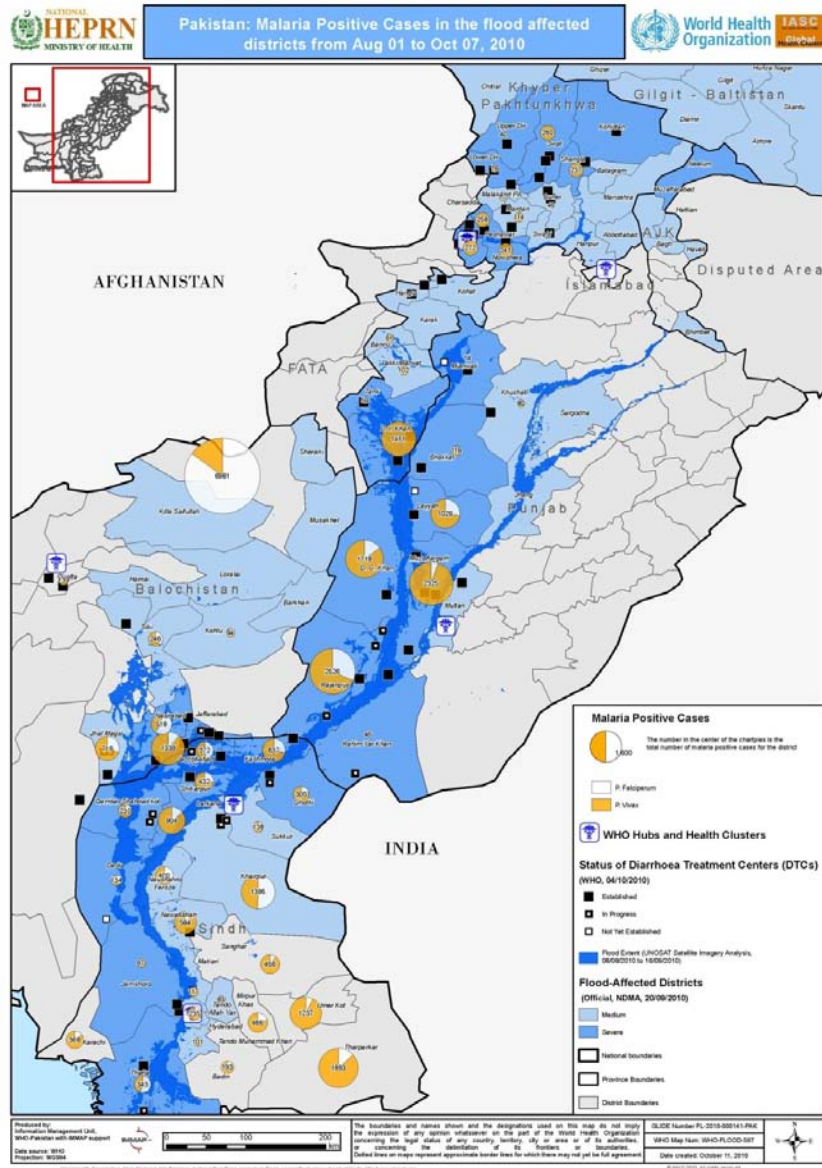


Figure 2 Malaria Parasite Incidence (API) in Pakistan by District

LONG LASTING INSECTICIDE TREATED NETS (LLINS) IN AREAS AT HIGH RISK OF MALARIA

Whereas provision of LLINs as a first-line preventive measure is seen as a costly intervention and perhaps unwarranted, in the Pakistani situation this is not the case as the transmission of malaria is expected to extend and last in time.

Small water pools are the ideal habitat for mosquito breeding. Therefore vector concentration can be assumed to rise initially in areas neighbouring flooded districts due to a more favourable environment. When waters recede, creating smaller water pools, mosquito concentration can be expected to increase also in currently flooded areas leading to an extended transmission season.

LLINs which provide protection for 2-4 years (depending on the type of LLIN procured) are therefore a worthwhile investment – an intervention ideal even when there is no proper shelter. Provision of LLINs beyond the acute phase of the emergency must be seen as part of the rehabilitation process, especially as 65% of the total population from the affected targeted provinces is from rural areas.

Three of the affected provinces are currently implementing space spraying, larviciding and indoor residual spraying (IRS) activities from their provincial resources. The inherent limitation of some of these interventions and the lack of resources to repeatedly apply and sustain them, make LLINs a viable option.

One LLIN will be needed at least for every family unit. In order to cater for 36 million people, about 13,000,000 LLINs will be necessary. Through appropriate health education and awareness, the use of LLINs will address malaria, possibly dengue and could aid in protecting against other insects that can contaminate food and are indirectly responsible for other diseases.

Given that some affected populations still live in tents and others outdoors, conical nets would be ideal for use. It is therefore recommended that 50% of nets procured are conical and the remaining rectangular – the maximum size. Whereas dark/colored LLINs are preferred by the communities, these may take longer to deliver compared to standard white nets.

INDOOR RESIDUAL SPRAYING (IRS) IN LOW MALARIA TRANSMISSION AREAS AND OTHER AREAS AS NEEDED

In the Punjab districts the use of LLINs are not recommended because it is a low risk area for malaria transmission and the use of IRS in rural areas is more appropriate. Among a total population of 4,217,108 people, only 10% will be targeted for IRS (421,710 people).

Based on the assumption that there are 7 people in each family, the estimated number of households to target are 60,244. For each household it is estimated that there are about three house structures that will need to be sprayed with a pyrethroid insecticide giving a total of 180,733 households. Total amounts of insecticide needed will also depend on the insecticide chosen.

LARVICIDING WITH TEMEPHOS (EC50%) FOR DENGUE PREVENTION

Whereas previously most of the mosquito breeding was taking place in water storage containers, the availability of water pools near human settlements will increase the densities of mosquitoes and therefore transmission. Although source reduction (control/removal of breeding sites) by communities is the most cost-effective method, the difficulty of instituting this intervention calls for the need to consider larviciding with Temephos (EC 50%) bi-weekly.

Urban areas are targeted for this intervention and in both rural and urban areas awareness campaigns for affected communities are needed.

SPACE SPRAYING FOR CONTROL OF MOSQUITOES AND FLIES

In addition to mosquitoes, pests – including flies - are expected to become a major problem, due to the lack of appropriate sanitation and disposal facilities especially in camps/settlements.

The use of both vehicle-mounted (where available) and hand-operated fogging machines is highly recommended. This intervention will be ideal in urban areas as well as in rural areas where affected people live in crowded conditions.

TECHNICAL GUIDANCE AND COORDINATION

To ensure that available expertise in the country is used to support the implementation of the proposed response plan for malaria and other vector-borne diseases, it is recommended that a national committee



for emergency and response to Malaria and other Vector-borne Diseases in Pakistan is established. The committee will report directly to the WHO Representative.

COMPOSITION OF MEMBERS

1. Chairperson – with broad understanding of control and prevention of malaria and other vector-borne diseases,
2. Programme Manager for NMCP,
3. Expert in case management for malaria,
4. Expert in epidemiology of other vector-borne diseases (dengue and leishmaniasis),
5. Provincial representatives from Punjab, Sindh, FATA, Baluchistan and KPK,
6. Experts from other relevant agencies and NGOs,
7. Health Cluster Coordinator,
8. Any other member at the discretion of the WHO Representative.

TERMS OF REFERENCE OF THE COMMITTEE ARE TO:

- Provide overall technical guidance on the implementation of the response to malaria and other vector-borne diseases

- Monitor and evaluate the implementation of the response to malaria and other vector-borne diseases
- Present a monthly progress report and recommendations on the implementation of relevant response activities
- Coordinate the implementation of the response plan against malaria and other vector-borne diseases among different partners and at across administrative levels
- Participate, support and coordinate resource mobilization efforts for the implementation of relevant response activities

STRENGTHEN CAPACITIES AT FEDERAL AND PROVINCIAL LEVEL:

In addition to the establishment of the national committee for emergency and response to malaria and vector-borne diseases to strengthen national capacity in providing the needed support.

It is therefore necessary to:

1. Assign an international malaria expert for 6 - 12 months to be based in Islamabad. The person must have a long experience in the implementation of malaria/vector-borne disease programmes as well as an understanding of complex emergencies. Abilities to coordinate different partners and in mobilizing resources will be an asset. The person will be supported by periodic visits of regional Office staff.
2. Assign four national staff to be based in each of the provincial hubs (Peshawar, Multan, Sukkur and Quetta). As experts in malaria and/or vector borne diseases, the individuals will be responsible for ensuring that the response plan is implemented in their respective provinces/areas and that coordination between the central level and the provinces is strengthened. The latter is currently weak. These individuals will also work closely with the surveillance teams and will report to the WRO in Islamabad.

TOTAL ESTIMATED NEEDS UNTIL JULY 2011

Items	Amounts	Cost (US\$)
Drug doses		
For Uncomplicated PF		
For Uncomplicated PF children	23099	18,271
For Uncomplicated PF adult	112776	159,296
CQ+PQ (14 day)	317040	358,255
ART+LUM	2000	3,277
Artemether children	462	626
Artemether adult	2256	8,921
Total		548,647
Diagnostics		
RDTs (MOH)	2197797	2,297,797
Storage cold chain		10,000
Microscopy and consumables for QA		200,000
Training on use of RDTs and management of cases		50,000
Total		2,557,797
Prevention **		
Long Lasting Impregnated Nets	13025519	76,850,565
Storage and distribution		300,000
Total for LLINs		77,150,565
Indoor Residual spraying		
Insecticide procurement Lambda- cyhalothrin 10% WP /CS	11295 kg	839,730
Protective clothing	602	21,326
Hiring spraymen for 30 days	301	106,632
Spray pumps (Hudson x-pert)	392	92,415
Spray pumps spare part kits	392	6,938
Training		50,000
Field operation		25,000
Transport		108,000
Total for IRS		1,250,042
Fogging		
Vehicle-mounted ULV machines	20	260,000
Hand-operated fogging machines	200	130,000
insecticides and other supplies	75000	487,500
Hiring teams for space spraying for 20days	220	49,720

Total for fogging		927,220
Larviciding		
Larviciding for dengue fever (urban areas)	7000	132,160
Amount of insecticide (L)	1000	25,370
Spray pumps (Hudson) + spare parts	15000	16,950
Training	7200	8,136
Transport		182,616
Total for Larviciding		
Community awareness and community mobilization		400,000
Surveillance as a part of integrated CDs surveillance		0
Technical support		
Periodic support by International experts and WHO mission		300,000
4 national staff , one in each province/hub for 2 years		250,000
Total for technical support		550,000
GRAND TOTAL		83,566,887

** Currently the main gap in the prevention is in LLINs.

Provincial programmes are covering part of IRS and fogging interventions, although there is still a gap mainly in training and in the provision of commodities.

Estimation of prevention cost, mainly LLINs , is an upper estimation based on the rural population living in the affected districts. It will be adjusted when more accurate data on the population in actual need and on the number of bed nets made available from other sources is acquired from the provinces.

CRUDE ESTIMATION OF MALARIA BURDEN IN FLOOD AFFECTED AREAS

The estimation is based on the following assumptions

Rural population in affected (malarious) areas = 36,629,958. This is the same population used to estimate requirements to set up prevention measures.

Considering 12% prevalence as per the last MM survey the expected number of suspected malaria fevers will be 4,395,594 in the next 6 months.

Using the higher estimates of SPR from the MM survey 2009 /MIS 2009 to estimate the number of confirmed cases the following results are obtained:

Punjab 0.3 , Sindh 3.1 , KPK 7.0 , FATA 16.8, Baluchistan 15.7

Assuming the expected 5 times increase above the normal situation due to the emergency, 905,839 confirmed cases are expected in the coming malaria season in the flood affected areas, 30% of them will be caused by *P.faciparum* (271,752). 50% of cases will be seeking care from MOH facilities

Based on these calculations, the burden of clinical cases expected in MoH facilities is of about 2 million cases while confirmed cases might reach half a million.

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