Emergency malaria and dengue fever control: lessons from the tsunami in Aceh

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Malaria and dengue fever quickly became the major threat facing survivors of the tsunami in Aceh, Indonesia. The rainy season immediately followed the tsunami, and extensive flooding quickly turned many areas where survivors were sheltering into vast brackish breeding sites for mosquitoes. At the same time, much of the local health system had been lost, and there was a lack of capacity to prevent or respond adequately to the likely needs. Widespread resistance to the main drug treatment (chloroquine) further complicated the crisis.[1] Instigating a timely response was a duanting task.

Strategy and response

On 7 January, following 48 hours of intensive coordination with key NGOs, donor orgnisations and UN and commercial partners, the MENTOR Initiative launched one of the largest malaria and dengue fever emergency control operations ever undertaken. The emergency team included international vector control experts, senior tropical medicine specialists from Kaiser Permanente, seconded Acehnese specialists from the Provincial Health Office (PHO), over 40 local civil engineers and approximately 150 vector control community workers. The spirit of cooperation between all agencies on the ground was extraordinary. Over 60 NGOs and foreign military health teams provided emergency health care, the World Health Organisation (WHO) undertook disease surveillance and outbreak investigation and the MENTOR Initiative took responsibilty for supporting the PHO, NGOs and district health networks to control malaria and dengue fever and prevent epidemics. Initial support focused on ten tsunami-affected districts of Aceh. However, this was quickly expanded to all 21 districts.

> the malaria and dengue fever emergency control operation in Aceh was one of the largest ever undertaken

Building capacity

Access to standardised supplies in an emergency is vital, but so too is the need to ensure that all health care deliverers can use protocols and effectively put the new tools for malaria case management into practice. To achieve this, the MENTOR Initiative, in partnership with the PHO, designed and conducted intensive training sessions for provincial and district national staff and international NGOs. Training sessions for senior district health staff were held twice-weekly in Banda Aceh from the second week of the operation, and later expanded to Aceh Besar, Aceh Jaya, Aceh Barat, Nagan Raya, Aceh Barat Deya, Pidie and Aceh Utara.

Summary	
Agency staff trained	748 (from 60 organisations)
District health teams trained	All 21 districts teams
District health managers trained	80
Senior district health workers trained	130
Total number of healthcare workers trained	**3,296**

Ensuring standardised materials

The immediate need for drugs, rapid diagnostic tests (RDTs) and prevention materials was met through careful coordination between UN agencies, NGOs, donors and private partners. Shipments of drugs and prevention materials arrived in Aceh very rapidly.

Standardised disease materials were made available for all trained partners through a carefully managed storage and distribution system. These stocks also ensured an immediate supply of essential materials for agencies responding to a major earthquake on Nias island in March 2005. In June, provincial and district health teams and the MENTOR Initiative recalled and destroyed 24,500 artemisinin-based combination therapies (ACTs) and 18,710 IM artemether ampoules that were approaching their expiry date. These stocks were replaced with new materials with extended shelf lives.

Summary	
Districts provided with essential materials	All 21 plus Nias island
Rapid diagnostic tests distributed	>450,000
Uncomplicated malaria treatment blister packs distributed	280,000
Severe malaria treatments	12,000 IM artemether (total of 88,000 ampoules); 5,000 IV quinine sets (including drugs/giving sets and fluids/infusions); 65,000 syringe kits

1 A new national treatment policy was agreed in 2004, including rapid confirmatory tests and artemisinin-based combinations (ACT) plus IM artemether or IV quinine for case management. However, neither the policy nor the new practice it embodied had reached Aceh.

Vector control and emergency shelter

The MENTOR Initiative's 40 indoor residual spray (IRS) supervisors trained, equipped and supervised community volunteers across ten districts to implement targeted IRS campaigns in areas hosting displaced people. Teams worked as far afield as 500km along the coast from Banda Aceh, and others travelled inland by boat to reach people who had fled deep into forested areas. The community approach that was adopted resulted in wide acceptance and support for IRS.

Insecticide-treated plastic sheeting (ITPS) ensured that the combined shelter and vector control needs of many homeless families were rapidly met. Larviciding was used to control dengue and malaria vector breeding sites. Of 581 barracks built to house displaced people, 48 were near, or in, areas of standing water; these sites, ideal breeding grounds for malaria and dengue vectors, were treated with a safe WHO-recommended larvicide.

> larviciding was used to control dengue and malaria vector breeding sites

A small, targeted supply of 874 family-sized, long-lasting insecticide-treated nets was provided to the International Committee of the Red Cross (ICRC), NGOs and military health teams to protect pregnant women and young children from malaria infection during inpatient stays in the main emergency hospital facilities in Banda Aceh, and in other west coast locations.

Summary	
Houses sprayed (IRS)	52,000, including 34,319 homes in Banda Aceh (93% of inhabited structures), housing 340,000 people
Barracks and camps sprayed	581 barracks and 1,019 camps (housing 200,000 people), with over 85% coverage of most targeted areas
ITPS (5m x4m) provided	15,000 (covering 75,000 people)
Bodies of water treated	48
IDPs protected	At least 3,500
ITNs installed in hospitals	874
Total population protected	**619,374**

Monitoring malaria

Malaria monitoring is typically based almost exclusively on clinical symptoms. Unfortunately, the clinical sysmotoms of malaria are shared with many other common diseases, making this method highly unreliable. Globally, about 95% of falciparum malaria is reported in Africa, and Asia is believed to have predominantly the non-fatal vivax form of the disease. However, in many parts of Asia, including Aceh, the precise malaria epidemiology is unknown due to the lack of reliable surveillance data.

Two key issues seemed important in Aceh. First, reporting was poor, with only a small minority of NGOs regularly recording all cases. Second, utilisation of health facilities was low among fever patients. Many patients with malaria fever do not consider themselves to be sick. A large proportion of malaria cases do not present at health facilities, and so go unreported. In 2004, 900 suspected malaria cases were reported in Aceh. The proportion of falciparum to vivax malaria was reported as 50:50. In the first six months following the tsunami, over 3,000 confirmed malaria cases were reported, despite only very partial surveillance coverage.

To develop more accurate malaria data for Aceh, the MENTOR Initiative undertook a series of standardised community prevalence surveys and clinic-based fever surveys with health authorities along the west coast in June and July 2005 (reportedly the low season for malaria). The results of the surveys show a much more complex malaria epidemiology than previously reported:

1. Despite being the low season, ongoing malaria transmission was significant in some of the worst tsunami-affected areas on the west coast.
2. The distribution of falciparum to vivax was not 50:50, as had earlier been suggested by official published reports. Our surveys clearly showed that falciparum malaria predominated in half of the eight sub-districts surveyed. In three other affected sub-districts, vivax malaria predominated. On Nias island, falciparum malaria was responsible for three-quarters of all cases in one sub-district (Lahewa), and for a quarter of cases in another (Hiliduho).
3. Men were at more risk of infection than women and children. This was probably because of the social or economic activites that men were involved in.
4. The surveys showed a very large variance in malaria prevalence between villages grouped within the same sub-districts. Across the 31 villages covered in the main sub-districts in Aceh Barat (Woyla Induk and Woyla Timur), prevalence ranged from zero to 31% (equivalent to many African countries).

Our surveys suggest that the malaria risk in Aceh appears to be much greater than previously reported; in the event of an epidemic, very high mortality could result in some areas. MENTOR plans to repeat its surveys to capture transmission patterns and gain a more comprehesive understanding of malaria risk, so that we continue to improve control efforts across Aceh.

Successful response and challenges ahead

Thanks to the inter-agency response, over 700,000 people at risk of malaria and dengue fever were supported and given access to effective prevention and case management services across Aceh. Epidemic risk

was successfully controlled, and doubtless many lives were saved. However, the limited malaria surveillance data available prior to and during the crisis made it difficult to target resources effectively and determine full health impacts accurately. Traditional paper-based surveillance systems are not adequate in emergencies, nor do they reliably cover remote and marginalised areas, where epidemics often begin and heavy disease burdens are often overlooked. Improving surveillance systems through the use of innovative technology and approaches is a vital task.

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