

## Hospital-acquired malaria associated with dispensing diluted heparin solution

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Transmission of malaria, a mosquito-borne protozoan disease, naturally acquired by exposure to bites of infective female *Anopheles* spp has also been documented to be through blood and organ transplant from infected persons, and accidental infection of drug users or medical personnel was reported<sup>1</sup>. This report implicates a probable mean of transmission of malaria associated with inappropriate dispensing of diluted heparin solution.

Seven cases of malaria in children aged 3–5.5 yr due to *Plasmodium falciparum*, were reported from a district hospital in Riyadh region, in central Saudi Arabia, where local malaria transmission is non-existent. Later on two more children from the same town were admitted to another hospital with same diagnosis. All cases were chloroquine-resistant and were successfully treated with quinine. Extensive entomological surveys in the town, including the hospital, failed to trap anopheline mosquitoes. All children, except one (a 2.5-year old Sudanese girl), were Saudi, who neither had been to a malarious area, nor received blood transfusion. None of the family members of the Saudi cases suffered from a recent febrile illness. There were no cases of malaria in the hospital among Saudis other than those in the paediatric ward. The Sudanese girl, the index case, was admitted to the hospital with fever soon after arrival from Sudan.

Interviews with the parents of the eight Saudi cases revealed three common epidemiological characteristics. First, all cases had history of a recent admis-

sion to the same hospital for acute gastroenteritis or bronchopneumonia 9 to 16 days prior to the second admission, when diagnosis of malaria was made. Second, the first admission of all cases coincided with admission of at least a case of malaria in the same ward. Third, the patients were admitted to different rooms and all of them received medications through a fixed cannula. In the same month there was an unexplained cause of a fatal fever in a 2-month old girl with congenital heart disease, who had fulfilled all the above mentioned three epidemiological characteristics. However, diagnosis of malaria was not considered on admission. There were no cases of malaria in the hospital among Saudis other than those in the paediatric ward.

We concluded that malaria was acquired during the first admission. Thorough review of medical procedures and direct observation of nursing practices revealed that heparin solution used to flush cannula was used to be diluted by nurses inside the paediatric ward in a 500 ml bottle of normal saline. The bottle is used for three days and then discarded. Disposable syringe and needle supposed to be used for each patient. A nurse should have diluted heparin from the bottle for another patient. Red blood cells infected with *P. falciparum* parasite, must have remained in the tip of the needle and dropped inside the bottle. Thus, contaminated, the bottle became a common source for infection with malaria. Malaria cases stopped appearing soon after we stopped this practice and supervised unit dosing of heparin. Conceivably, it is possibly that other cases of malaria as well as cases of other seri-

ous diseases with longer incubation periods could have occurred due to nurses' malpractice.

Malaria transmission through heparin locks for children in paediatric ward was reported from other hospital in Riyadh in Saudi Arabia<sup>2</sup>. Accidental self-inoculation with infected blood, even subcutaneously, has been well-documented to have resulted in malaria in doctors, laboratory workers and nurses<sup>3-7</sup>. Our observation probably gives an alternative explanation for the so called "baggage malaria", a term coined by Castelli *et al*<sup>8</sup> as an explanation for cryptic malaria in Italy. It is important to ask about history of recent hospitalization, intravenous medication on admission and concurrent admission of malaria cases in the ward, during the investigation of unexplained occurrence of malaria case(s) in a non-malarious area.

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