

# Confidential inquiry into malaria deaths

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The results of a confidential inquiry into mortality attributed to malaria in South Africa's Mpumalanga Province are being used to guide the design of strategies for improving the management of cases and reducing the probability of deaths from the disease.

Voir page 265 le résumé en français. En la página 266 figura un resumen en español.

The Lowveld Region of South Africa's Mpumalanga Province is predominantly rural, and 40% of the 850 000 inhabitants live in traditional dwellings. There are seasonal malaria epidemics in which 90% of the cases are caused by *Plasmodium falciparum*. Control of the disease is based on the spraying of dwellings with pyrethroid insecticides and the early diagnosis and treatment of cases at 72 clinics.

A major epidemic of malaria in 1996 led the Primary Health Care Directorate and the Malaria Control Programme in Mpumalanga to authorize a confidential inquiry into all deaths attributed to the disease. The aim was to reveal common problems and deficiencies in case management through a detailed review of the routine hospital and clinic records of deceased patients and through interviews with close relatives and in-depth confidential statements from the health professionals involved. The matters investigated included the circumstances at the time of the patients' presentation and all aspects of diagnosis, referral and treatment. It was envisaged that the findings might be used to guide the design of strategies that would improve the management of malaria cases and reduce the probability of deaths.

## Review team

All deaths associated with malaria which occurred in the first six months of 1996 were reviewed by a team

comprising two specialist physicians, a medical microbiologist, the head of the local military medical services, and the provincial consultant in communicable disease control and malaria control programme management. Information on deaths was obtained from routine reports to the malaria control programme and from statutory notifications to the provincial information office and the Register of Deaths in the Department of Home Affairs.

A data sheet was completed for each deceased patient on the basis of:

- hospital, clinic or private practitioners' case notes;
- nursing and drug records;
- notes on laboratory and radiological examinations;
- death certificates.

Semi-structured interviews were conducted with patients' next of kin by staff of the malaria control programme, and confidential statements were requested from health personnel so that particular questions and concerns of the review team could be dealt with.

Primary care management was judged against practices advocated in *Malaria — guidelines for the diagnosis and treatment of uncomplicated malaria*, a clinic manual of the Mpumalanga Department of Health. Hospital case management was assessed in relation to practices advocated in standard references (1,2) and to the hypothetical standard of a reasonable doctor or nurse working in a busy rural hospital. Quantitative data were collated and analysed by means of a customized EPI Info 6.02 database (Centers for Disease Control, October 1994).

## The broad picture

The 42 deaths attributed to malaria represented a case fatality ratio of 0.7%. *Plasmodium falciparum* was found in the peripheral blood of all patients. Thirty-two of the deaths occurred in February and March, when 72% of the cases in the six-month period of the study were notified. The ratios of male to female mortality and male to female cases were 1.47:1 and

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1.45:1 respectively. The mean age at death was 34 years, the range of ages at which death occurred was 3–77 years, and 45% of the deaths occurred in the age range of 20–39 years. The two pregnant women who died were in the age range of 20–29 years. The highest case fatality ratio of 9.7% occurred in persons aged over 70 years.

Thirty-nine of the 42 people who died were residents of the high-risk malaria area. The remaining three had travelled to areas where the disease was endemic and had failed to follow the recommendations of the South African Department of Health concerning prophylaxis.

### Delays in consulting the health service

In at least 14 of the cases in which death occurred and the time of onset could be determined there were delays of three or more days before the patients contacted the formal health service. Seven patients waited for at least a week before doing so. It was not possible to confirm family members' claims that nine patients presented to health professionals on the day of onset, and the advanced stage of the disease at presentation in seven of these cases indicated that delays in seeking assistance from the formal health sector had possibly taken place.

Interviews with relatives revealed that, following the onset of illness, four patients had spent extended periods with traditional healers and two others had done the same with spiritual healers. The consequent delays in approaching the formal health sector ranged from two to 22 days. Two deaths were linked to the inability of the persons concerned to attend a clinic or hospital because of a lack of transport.

### Malaria management

Twenty-three of the 42 patients who died were initially assessed by 16 clinic staff or seven general practitioners; for the remaining 19 patients the initial contact was with a hospital. There was substantial cooperation from the nursing and medical staff after reassurances were given that the inquiry would lead to evidence-based recommendations intended to reduce the risk of malaria deaths, and that there would be no punitive action.

### Primary care management

In three cases there were delays in diagnosis because malaria was not considered by clinic staff. Two of these patients had a history of fever and presented with diarrhoea/vomiting and jaundice respectively, but diagnostic tests for malaria were not performed, on the ground that the patients were afebrile at presentation. The third patient presented with fever and was initially treated with paracetamol only.

Malaria was not considered in two patients who presented with fever to general practitioners outside the high-risk area. In one case a travel history would have revealed an extended period in a high-risk area. In the other an occupational history would have shown that the patient worked at a railway station where trains might have served as vehicles for anopheline mosquitoes originating in a malarious area.

In two instances the magnitude of the epidemic had resulted in antimalarial supplies running out in clinics, leading to the transfer of patients to hospital and consequent delays in the initiation of therapy.

One patient who presented with severe vomiting and diarrhoea was inappropriately treated with oral antimalarial agents and was not referred to hospital until the following day, by which time the clinical condition had deteriorated.

Chloroquine was still being used as the first-line antimalarial therapy for uncomplicated malaria during 1966. An inadequate clinical response to this drug was found in 11 patients.

### Hospital management

Forty-one of the patients were in contact with hospitals: four public and one private hospital in the Lowveld Region, and one public and one military hospital outside the malarial area. Delays occurred among the 34 cases for which data on times of initial hospital contact and administration of the first dose of antimalarial therapy were available: although 19 of these patients received treatment within the first two hours, nine waited four hours or more, the longest delay being 98 hours.

Delays in the initiation of treatment paralleled delays in diagnosis by hospital laboratories. The median delay was four hours in the 37 cases in which information was available on the time of preparation of a Giemsa blood film and of the arrival of the laboratory report in the patient's ward.

Antimalarial therapy was not prescribed in six hospitalized cases despite laboratory confirmation of *Plasmodium falciparum* infection. It is worth noting that four of these cases were admitted during weekends. Two additional patients did not receive antimalarial medication even though there was a doctor's prescription for it in their notes.

Five patients with complicated malaria were treated with chloroquine alone, four of them orally and one intramuscularly. Five other patients were started on chloroquine but later switched to quinine because their clinical status was deteriorating. Chloroquine had to be used in one hospital because quinine was unavailable. Treatment was initiated with oral quinine in two patients and with intravenous quinine in 21 patients. In two patients in the latter group, unfortunately, the drug was not administered in dextrose. An incorrect dose of antimalarial drugs was prescribed for four patients.

Among 31 hospitalized cases for which it was possible to make an accurate assessment of the

proportion of doses of antimalarial therapy administered according to the prescribed schedule, 21 received all the prescribed doses but six patients who eventually died received half or fewer of the prescribed doses.

The clinical picture of patients who died was similar to that described previously (3). Although an assessment of consciousness was recorded for 41 of the 42 patients who died, the available records allowed the determination of renal status in only 26, respiratory assessment in 35, investigation for acidosis in 15, and determination of platelet counts in 29 patients. Fluid balance monitoring was performed in 35 patients.

Regular blood pressure monitoring took place in 33 patients. At least one blood glucose measurement was made in 29 patients, but only 14 of these patients were monitored at the frequency recommended for expeditious detection and treatment of hypoglycaemia.

It was considered that five patients were prematurely discharged from hospital.

Although the case-fatality ratio was relatively low the review suggested that avoidable factors contributed to the deaths of many patients. A majority of malaria deaths could be prevented by a well-targeted control programme, a high level of suspicion of malaria among health care workers, prompt diagnosis and initiation of correct therapy, and a high standard of nursing care (4).

The review showed that the basic principles of malaria prevention and management had been violated. The shortcomings included:

- use of inappropriate antimalarial prophylaxis or no prophylaxis by travellers to high-risk areas;
- avoidable delays in diagnosis and initiation of adequate therapy;
- failure to administer the correct antimalarial at the correct dosage and frequency;
- inadequate monitoring of severity indicators in complicated cases.

A comprehensive set of recommendations, formulated by the review team and implemented by the Mpumalanga Department of Health, concerned the following matters:

- an intensive radio communication campaign aimed at encouraging patients to present at an early stage of the disease;
- the retraining of clinic staff on the guidelines in the malaria manual used by the Department of Health;
- frequent checks on the availability of antimalarials in clinics and hospitals;
- a therapeutic efficacy monitoring study on chloroquine resistance;
- the introduction of a rapid card test (ICT Malaria Pf Test™) for malaria diagnosis in hospital accident and emergency units.

The results of the review were communicated to and debated with medical staff in each hospital. Medical officers accepted responsibility for checking errors in prescribing, monitoring and administering medicines. Algorithms for diagnosis, standard treatment guidelines and a monitoring chart were developed and put into use by local medical staff, and copies of WHO guidelines (2) were distributed to hospital staff.

Much of the success of the present confidential inquiry is attributable to the recognition by medical staff of its potential contribution to the improvement of patient care. The results demonstrate the value of the method in identifying remediable causes of death in a priority public health programme in a developing country setting. The potential benefits of the approach should be pursued in other health programmes in comparable settings. ■

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## Résumé

### Enquête confidentielle sur les décès par paludisme

La Région du Lowveld, dans la province de Mpumalanga en Afrique du Sud, est soumise à des épidémies saisonnières de paludisme principalement causées par *Plasmodium falciparum*. Une équipe médicale multidisciplinaire a passé en revue les dossiers cliniques et analyses particulières réalisées pour 42 malades décédés entre le 1<sup>er</sup> janvier et le 30 juin 1996 avec un diagnostic de paludisme, dans l'intention de mettre à jour les facteurs évitables, ou les écarts de prise en charge par rapport aux normes de soins minimales admissibles, ayant pu jouer un rôle dans ces décès. Des entretiens ont

été organisés avec la famille proche des malades et des rapports confidentiels ont été fournis par le personnel de santé.

Des facteurs évitables sont apparus à l'examen dans la plupart des cas. Les insuffisances possibles à corriger que l'on a relevées étaient les suivantes : une prophylaxie inappropriée ou l'absence de prophylaxie antipaludique chez les voyageurs, des malades venus consulter tardivement et des retards au diagnostic, l'absence d'antipaludiques appropriés, des retards de quatre heures et plus dans le démarrage du traitement à

l'hôpital, et l'administration incomplète du traitement prescrit. La mauvaise surveillance des complications du paludisme était monnaie courante. Les recommandations de l'équipe d'examen ont été mises en œuvre pour corriger ces insuffisances.

Cette technique d'audit s'est révélée précieuse pour définir les facteurs évitables qui jouent un rôle dans

la mortalité par paludisme. Des enquêtes confidentielles sur les décès survenus dans d'autres programmes de santé publique des pays en développement devraient être employées pour orienter l'élaboration des stratégies visant à prévenir les décès évitables.

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## Resumen

### Estudio confidencial sobre las defunciones por paludismo

En la región de Lowveld, en la provincia sudafricana de Mpumalanga, se producen epidemias estacionales de paludismo causadas principalmente por *Plasmodium falciparum*. Con miras a detectar factores evitables, como por ejemplo desviaciones respecto a las normas mínimas aceptables de tratamiento de los casos, que pudieran haber contribuido a las defunciones por paludismo, un equipo médico multidisciplinario revisó las historias clínicas y las investigaciones especiales llevadas a cabo en relación con 42 pacientes que habían fallecido con un diagnóstico de paludismo entre el 1 de enero y el 30 de junio de 1996. Se entrevistó a parientes de los fallecidos, y el personal sanitario aportó informes confidenciales.

En la mayoría de los casos habían intervenido factores contribuyentes corregibles. Entre las deficiencias potencialmente evitables cabe citar una profilaxis antipalúdica inadecuada o inexistente entre los viajeros,

las demoras en la búsqueda de atención médica y el diagnóstico, la falta de medicamentos antipalúdicos, retrasos de cuatro o más horas del comienzo del tratamiento en los hospitales, y la administración incompleta de la medicación prescrita. La vigilancia insuficiente de las complicaciones del paludismo fue un hallazgo habitual. Se ha procedido a aplicar las recomendaciones del equipo de estudio a fin de subsanar esas deficiencias.

La técnica de auditoría empleada fue muy útil para identificar los factores remediabiles que contribuían a la mortalidad por paludismo. Las investigaciones confidenciales sobre las defunciones registradas en otros programas de salud pública en las circunstancias de los países en desarrollo deberían servir para orientar la formulación de estrategias de prevención de las defunciones evitables.

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