

Home care of malaria-infected children of less than 5 years of age in a rural area of the Republic of Guinea

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Objectives To assess the ability of mothers in a rural area of the Republic of Guinea to identify fever in their children, and to estimate the proportion of children who received antimalarial drugs.

Methods Children under 5 years of age in 41 villages were selected by a two-step cluster sampling technique. During home visits we examined the children and questioned their mothers about the child's symptoms and treatment.

Findings Of 784 children examined, 23% were febrile and more than half of them also had a positive smear result for *Plasmodium*. Mothers reported 63% of children with a temperature $\geq 37.5^{\circ}\text{C}$ as sick. Among all children reported as feverish by their mother, 55% had a normal temperature ($<37.5^{\circ}\text{C}$). In contrast, a temperature $\geq 37.5^{\circ}\text{C}$ was found in 38% of children identified as sick but afebrile by their mother and in 13% of children considered healthy. Among febrile children, 18% were given chloroquine at home or had consulted at the health centre or a dispensary.

Conclusion In areas where malaria is endemic, recognition of fever and its presumptive treatment with antimalarial drugs is an essential part of the strategy of the World Health Organization (WHO) to reduce the morbidity due to this disease. This population study shows that mothers often failed to identify fever in their children and to consult or to provide antimalarial treatment. Without great efforts to improve home care, it is unlikely that the morbidity and mortality due to malaria in young children will be greatly reduced.

Keywords: malaria, diagnosis; malaria, drug therapy; child, preschool; home nursing; maternal behavior; chloroquine, therapeutic use; rural population; sampling studies; Guinea.

Mots clés: paludisme, diagnostic; paludisme, chimiothérapie; enfant d'âge préscolaire; soins infirmiers à domicile; comportement maternel; chloroquine, usage thérapeutique; population rurale; enquête par sondage; Guinée.

Palabras clave: paludismo, diagnóstico; paludismo, quimioterapia; infante; cuidados domiciliarios de salud; conducta materna; cloroquina, uso terapéutico; población rural; muestreo; Guinea.

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Introduction

Malaria is a major public health problem in sub-Saharan Africa (1, 2). It represents 20% to 50% of all consultations in health centres and is the greatest cause of mortality in hospitals (3). Mortality is estimated at 2 million deaths annually, mainly in children less than 5 years of age (1, 2). In Africa, 10%

of mortality in children less than 5 years of age is directly attributable to malaria. To reduce the morbidity and mortality of malaria, the World Health Organization (WHO) has developed a strategy which includes, as one of its main components, the early diagnosis and treatment of malaria (4). It is recommended that antimalarial drugs be given at home to all febrile children (4). As many deaths occur within 48 hours of onset of symptoms, this strategy will have optimal impact if treatment is given early. Generally, it is the mothers who identify fever in their children and provide presumptive treatment, but there are few data on these initial steps. Most studies focus on people presenting at health centres and dispensaries, who represent a highly selected proportion of the infected population as most febrile children will not be brought to consultations (5, 6). Taking their children to health centres is the last thing that mothers consider when a sick child has failed to respond to home treatment or the condition is

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exceptionally severe (5, 7, 8). In rural areas, where about 75% of the population live, consultation is less frequent than in urban areas (5). Glick found that 33% of mothers in rural areas of Guinea reported taking their sick children to a health care worker during the last episode of fever compared with 69% of mothers in urban areas (9). Although not unexpected, failure to use chloroquine was associated with mothers' lack of access to health services. Mothers living closer to health care facilities were more likely to consult and to give chloroquine early than mothers living farther away (9). The preferred home treatments are antipyretic and analgesic drugs and herbal preparations (5, 9). Generally, antimalarial drugs are given to less than 30% of febrile children, and they are mostly bought in shops (5, 9–11).

The objectives of this study were both to assess the ability of mothers to identify fever in their children and to estimate the proportion of children who received antimalarial drugs as recommended by WHO.

Methods

This transversal study was conducted between 1 February and 30 June 1996 in the prefecture of Mafèrinyah, a rural area located 75 km from Conakry in Guinea. This area spreads over 650 km² and comprises 41 villages, one health centre and five dispensaries. The population is estimated at 18 000 people of whom 17% are less than 5 years of age (12). Malaria is mesoendemic, with high transmission between May and November during the rainy season.

Children were selected by a two-step cluster sampling technique, comprising villages and households (13). Children had to be less than 5 years of age and had to have lived in the study area for at least 6 months. All selected households agreed to participate in the study. Data were collected during a home visit. For every child of the household the mother was asked "Is this child sick today?". If the mother answered yes, she was asked to describe the symptoms and their duration and to name the disease. The mothers were also asked "By which symptoms and signs do you identify malaria?" and "How did you treat your child?". Malaria is designated as *foulakoaka*, *dembadimi* and *dannawali* in Soussous, as *dembale* in Malinké and as *diontè* in Peuhl. Fever was designated as *fatégangni* in Soussous, *fadikalaya* in Malinké and *bande no wouli* or *ngouleedi bbandu* in Peuhl (all meaning "hot body"). Used in isolation these words are not synonymous with malaria in these languages.

All the children had their axillary temperature taken for 5 minutes with a mercury thermometer and the arm held firmly. They all had a complete physical examination by a physician (ADB or AHB), including palpation of the spleen and blood taken by finger-prick for thick and thin blood smears. The thick smear served to confirm the presence or the absence of *Plasmodium*, whereas the thin smear was fixed with

methanol and stained with Giemsa to identify the species. Microscopic examination was under 100 × magnification, and 100 fields were examined before a negative result was confirmed. Parasitic density was calculated with the following formula: parasitic density/μl of blood = number of parasites in 100 microscopic fields × 8000/number of leukocytes (14). Proportions were compared by using the χ^2 test. Analyses were done with Epi-Info (version 5.1, Centers for Disease Control and Prevention, Atlanta) and SAS software (SAS Institute, Cary, NC).

The study was approved by the ethics committee of the Ministry of Health. Verbal consent from the local authorities and the head of the household was also obtained before the interviews and blood sampling. Children found to be sick were immediately treated by the physicians.

Results

The sample consisted of 784 children less than five years of age, 376 boys (48%) and 408 girls. The children's mean age was 31 months. The 784 children had 552 mothers from whom data were collected. Only 38 (7%) of the mothers were able to read and write.

Malaria infection

Overall, 36% of the children had a positive thick smear result (plasmodial index) and 33% had splenomegaly (splenic index). The proportion of children with splenomegaly and positive thick smear results increased with age, ranging from 7% in infants less than 12 months of age to 52% in children more than 48 months of age. The proportion of children with positive thick smear results also increased with age, ranging from 12% in infants less than 12 months of age to 51% in children more than 48 months of age. The proportion of children with a parasitic density of 4000/μl was similar for all those who were more than 1 year of age, with a mean of 8.5%. *Plasmodium falciparum* was found in 95.3% of smears giving positive results whereas *Plasmodium malariae* and *Plasmodium ovale* were each present in 1.4%. Both *P. falciparum* and *P. malariae* were observed in 1.9% of smears.

Objective morbidity

Of the 784 children, 179 (23%) were febrile (axillary temperature ≥ 37.5 °C) and more than half (99 children) also had a positive smear result. The proportion of positive smear results was twice as high in febrile children than in those without fever (55% vs 29%, $P < 0.001$). The proportion of children with a parasitic density $\geq 4000/\mu\text{l}$ was also four times greater than in febrile children (17% vs 3.6%, $P < 0.001$) and 2.4 times greater in those with a temperature ≥ 38.5 °C than in those with temperatures between 37.5 °C and 38.4 °C (32% vs 14%, $P = 0.01$).

Subjective morbidity

Of the 179 children who had had a temperature ≥ 37.5 °C, 63% (112) were considered sick by their

mother; 64% (63/99) of children with a temperature ≥ 37.5 °C and a positive smear result and 84% (26/31) of children with a temperature ≥ 38.5 °C were also reported sick by mothers. Of children reported as feverish by their mother, 55% had a normal temperature. In contrast, a temperature of ≥ 37.5 °C was found in 38% of children identified as sick but afebrile by their mothers and in 13% of children considered healthy (Table 1). The proportion of children with a temperature ≥ 37.5 °C was not significantly higher among those identified by their

mothers as sick and febrile than among those considered sick but not febrile (45% vs 38%, $P=0.37$).

Of those children considered sick, 33% (87/260) were affected by malaria according to their mother. Among these, the distribution of symptoms was similar to that reported when mothers gave another diagnosis, with only two minor differences: fever was reported more frequently with malaria (90% vs 80%, $P=0.05$) and diarrhoea less frequently (10% vs 27%, $P=0.002$). If we considered that only the 99 children with a temperature ≥ 37.5 °C and a positive smear result were true malaria cases, the sensitivity of the maternal diagnosis for this disease was 32% (32/99), its specificity 92% (630/685), its positive predictive value 37% (32/87) and its negative predictive value 90% (630/697) (Table 2).

Table 1. Comparison between fever reported by mothers and axillary temperature at clinical examination

Mother's perception	% Children with temperature			
	No. children	<37.5 °C	37.5–38.4 °C	≥ 38.5 °C
Sick and feverish	215	55	35	10
Sick but not feverish	45	62	31	7
Healthy	524	87	12	1
Total	784	77	19	4

Table 2. Comparison of the diagnosis of malaria by mothers with the presence of a temperature ≥ 37.5 °C and positive thick smear result

Mother's diagnosis	No. of children	Temperature ≥ 37.5 °C and positive thick smear result	
		% positive	% negative
Positive for malaria	87	37	63
Sick but no malaria	173	18	82
Healthy	524	7	93
Total	784	13	87

Table 3. Treatment given according to different case definitions

Case definition	No. of children	No treatment	Traditional treatment ^a	Chloroquine and antipyretic	Consultation in health centre
Sick according to mother	260	37	31	19	13
Sick and feverish according to mother	215	35	33	19	14
Malaria according to mother	87	45	21	18	16
Temperature ≥ 37.5 °C	179	63	19	14	4
Temperature ≥ 37.5 °C and positive thick smear result	99	64	20	11	4
Temperature ≥ 37.5 °C and parasitic index $\geq 4000/\mu\text{l}$	31	58	29	7	7
Temperature ≥ 38.5 °C and positive thick smear result	21	57	19	19	5
Temperature ≥ 38.5 °C and parasitic density $\geq 4000/\mu\text{l}$	11	55	27	9	9

^a For example, herbal medicine.

Therapeutic attitudes

Of the 179 children with a temperature ≥ 37.5 °C, 18% were given chloroquine at home or had consulted at the health centre or a dispensary (Table 3). By using clinical case definitions with different temperatures or parasitic densities, the proportion of cases who received chloroquine or who consulted at the health centre or a dispensary varied between 14% and 24%. These treatments were given to 34% of the children diagnosed by their mother as having malaria (Table 3).

Discussion

This study, conducted in a rural area of Guinea where a high proportion of children are infected by malaria, showed that mothers had a low ability to identify fever and to diagnose malaria, and that only a small proportion of children affected by malaria received chloroquine at home or consulted the health system. The 37% estimate of the positive predictive value of maternal diagnosis of malaria is low considering that the study was conducted in a mesoendemic area. As the period of high transmission of malaria in Guinea occurs between May and November and because the five months of data collection included only two of these months (May and June), the positive predictive value of maternal diagnosis is likely to be better than the 37% we estimated. However, as the incidence of malaria remains high throughout the year, despite seasonal variation, our estimate is likely to be representative of that calculated on an annual basis. In the Gambia, 76% of malaria cases diagnosed by the mothers were confirmed by clinical examination and blood smears, whereas in Cameroon and Uganda the results were 45% and 40% respectively, similar to ours (15, 16). The ability of health care workers to identify malaria on clinical grounds is also poor (16–18).

Of greater concern is the low ability of mothers to identify fever. Axillary temperature is not as accurate as rectal temperature. The most likely bias associated with this technique is the underestimation of real body temperature. This may have led to an underestimation of the accuracy of mothers who

reported fever, but it does make our results conservative with respect to the underdiagnosis of fever by mothers, which is the critical issue for early treatment of malaria. Even if fever was the most often reported symptom in children considered sick (215/260), the comparison of the history of fever and the measured temperature shows that mothers have great difficulty in correctly identifying fever. In theory, two situations may erroneously lead to that conclusion. First, fever may have disappeared between the time it was identified by the mother and the clinical examination. This may have occurred because mothers were asked "Is this child sick today?" and not "Is this child running a temperature now?" With the latter question they may have answered negatively. Second, fever may have appeared recently and may have gone undetected by the mothers. For prevention of deaths from malaria and complications, this second type of error is of greater concern. Nevertheless, the large discordance between the mothers' observations and the measured temperature strongly suggests that fever is not well identified especially when low (37.5–38.4 °C). This contrasts with results from the Republic of Ghana where Binka found that febrile illness was well recognized by mothers (19).

In this study, more than half of the children with a temperature ≥ 37.5 °C had a positive thick smear result. This confirms the need to give antimalarial treatment to febrile children and supports the WHO recommendation to use an axillary temperature ≥ 37.5 °C as the criterion to provide malaria treatment in endemic areas if laboratory confirmation is not available. As few febrile children are brought to the dispensaries (Table 3), mothers will essentially decide their child's treatment. As the sensitivity of maternal diagnosis of malaria identified only one out of three cases, and among those 45% received no treatment

and 21% received only a traditional treatment, the proportion of cases that received proper treatment was small. Approaches to therapy vary from country to country (20–23). In rural Gambia, 2.3% of mothers give chloroquine and 79% give acetaminophen or aspirin when they suspect malaria (24). In Cameroon, one out of two families has chloroquine at home (24). In our study, the small proportion of mothers that used chloroquine when they suspected malaria may reflect local beliefs about the proper care of this disease or may be attributable to cost or availability of chloroquine. These possibilities should be explored before considering any intervention to improve the treatment of malaria.

Studies on the diagnosis and treatment of malaria generally assess what happens in the dispensaries and health centres (20, 25, 26). This study demonstrates that the vast majority of children affected by malaria do not consult the official health system. Even if a consultation is more likely if a child is sick, the objectives of the malaria programme are likely to be reached only if home care is enhanced. This population-based study shows that there are severe deficiencies with the care received at home. Without great efforts to improve these deficiencies, it is unlikely that the morbidity and mortality due to malaria in young children will be greatly reduced. ■

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Résumé

Prise en charge domiciliaire des cas de paludisme chez les enfants de moins de 5 ans dans une zone rurale de République de Guinée

Objectif Evaluer l'aptitude des mères d'une zone rurale de République de Guinée à déceler la fièvre chez leurs enfants, et estimer la proportion d'enfants ayant reçu un traitement antipaludéen.

Méthodes Nous avons sélectionné des enfants de moins de 5 ans dans 41 villages par sondage en grappes à deux degrés. Au cours des visites domiciliaires, nous avons examiné les enfants et interrogé leur mère à propos des symptômes et du traitement.

Résultats Sur 784 enfants examinés, 23 % étaient fiévreux et plus de la moitié présentaient un frottis sanguin positif pour *Plasmodium*. Les mères ont signalé comme malades 63 % des enfants dont la température était $\geq 37,5$ °C. Parmi les enfants déclarés fiévreux par leur mère, 55 % avaient une température normale ($< 37,5$ °C). En revanche, 38 % des enfants considérés comme malades mais non fiévreux par leur mère et 13 % des enfants considérés comme en bonne santé avaient

une température $\geq 37,5$ °C. Parmi les enfants fiévreux, 18 % avaient reçu de la chloroquine à la maison ou avaient été amenés en consultation dans un centre de santé ou un dispensaire.

Conclusion Dans les zones où le paludisme est endémique, le traitement présomptif par les antipaludéens des enfants fiévreux est un élément essentiel de la stratégie de l'Organisation mondiale de la Santé (OMS) pour réduire la morbidité palustre. Cette étude en population montre que les mères ne parviennent pas toujours à déceler la fièvre chez leur enfant et ne consultent pas toujours ou ne donnent pas toujours de traitement antipaludéen lorsqu'il le faudrait. Faute d'efforts importants pour améliorer la prise en charge à domicile, il est peu probable que l'on parvienne à réduire sensiblement la morbidité et la mortalité dues au paludisme chez les jeunes enfants.

Resumen

Atención domiciliaria a los menores de cinco años afectados de paludismo en una zona rural de la República de Guinea

Objetivos Evaluar la capacidad de las madres de una zona rural de la República de Guinea para detectar la fiebre en sus hijos, y estimar la proporción de niños tratados con medicamentos antipalúdicos.

Métodos Se seleccionó una muestra de menores de 5 años de 41 aldeas mediante una técnica de muestreo por conglomerados en dos etapas. Realizamos visitas domiciliarias para examinar a los niños e interrogar a sus madres respecto a los síntomas y el tratamiento empleado.

Resultados De los 784 niños examinados, el 23% tenían fiebre, y más de la mitad de ellos presentaban además un frotis positivo para *Plasmodium*. Las madres consideraban enfermos al 63% de los niños que presentaban una temperatura $\geq 37,5^{\circ}\text{C}$. Entre todos los niños descritos por su madre como febriles, el 55% tenían una temperatura normal ($< 37,5^{\circ}\text{C}$). En cambio, se halló una temperatura $\geq 37,5^{\circ}\text{C}$ en el

38% de los niños considerados por su madre enfermos pero afebriles, y en el 13% de los niños considerados sanos. Entre los niños febriles, el 18% recibían cloroquina en el hogar o habían visitado el centro de salud o un dispensario.

Conclusión En las zonas donde el paludismo es endémico, el reconocimiento de la fiebre y el tratamiento de los casos sospechosos con medicamentos antipalúdicos es un componente fundamental de la estrategia desplegada por la Organización Mundial de la Salud (OMS) para reducir la morbilidad causada por esa enfermedad. Este estudio poblacional muestra que con frecuencia las madres no logran detectar la fiebre de sus hijos y no consultan al médico ni administran tratamiento antipalúdico. Si no se hace un gran esfuerzo para mejorar la atención domiciliaria, es improbable que se consiga reducir sustancialmente la morbilidad y mortalidad por paludismo entre los niños de corta edad.

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