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Malaria treatment in rural Burkina Faso: Treatment-seeking behaviour, availability, prices, and quality of drugs

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Malaria remains, globally seen, the most important parasitic disease. Out of the approximately one million deaths caused by malaria each year, the great majority occurs in children under the age of five years who live in Sub-Saharan Africa. If treated early with effective drugs, malaria is fully curable. However, most of the affected children live in remote and poor communities with low access to appropriate treatment. In addition, there is concern about an increasing infiltration of markets by substandard and counterfeit medications against life-threatening diseases in developing countries. This is particularly worrying with regard to the increasing resistance development of *Plasmodium falciparum* against affordable antimalarial medications, which has led to a change to more expensive drugs in most endemic countries.

In this study we evaluated the behaviour of care givers regarding antimalarial treatment with drugs of children under the age of five. Furthermore, we evaluated the availability, price, and quality of antimalarial drugs at different providers from licensed (public and private pharmacies, community health workers) and illicit (market and street vendors, shops) sources. All parts of the study were conducted in Nouna Health District (NHD) in the Northwest of Burkina Faso, Westafrica. We also evaluated the quality of a number of antimalarial drugs purchased in Ouagadougou, the capital of Burkina Faso.

Methodological the study consisted of four parts which were performed independently from each other, but were interpreted in an interwoven way. In the dry season 2006 a representative structured cross-sectional household survey was conducted to evaluate the availability of antimalarial drugs in the household and the treatment-seeking behaviour of caregivers in NHD. At the same time antimalarial drug sellers were interviewed using a structured questionnaire to assess the availability and price of antimalarial medication in NHD. To scale the problem and to supplement our knowledge, qualitative key informant interviews were held

with representatives of different institutions involved in health care and drug regulation processes in Burkina Faso. Finally, in the rainy season 2006, a representative sample of modern antimalarial medications from licensed and illicit sources was collected. All drugs were tested for their quality with the standard procedures of the German Pharma Health Fund-Minilab. Detected low standard drugs were re-tested with European Pharmacopoeia 2.9.1 standards for disintegration and ultraviolet-visible spectroscopy at the laboratory of the University of Heidelberg for confirmation.

A total of 1052 households were interviewed of which 239 reported a malaria episode in a child under the age of five. The majority (95%) of children were treated with some form of medicine. Treatment was mostly (64%) initiated within the first 24 hours after the onset of symptoms. But we showed also that none of the children received treatment according to the national recommendations on first-line treatment for uncomplicated malaria which were valid at the time of the study. 76% of the children received modern treatment, 19% received traditional treatments and 5% received a mixture of modern and traditional drugs at the same time. We found that only 64% of children that had received modern treatment had actually been treated with antimalarial drugs according to the active ingredient. 18% of children had been treated with non-antimalarials and another 18% had received modern drugs which were not labelled. Modern treatment mainly consisted of chloroquine in combination with antipyretics. Another finding was that 45% of children received treatment initially at household level. Only about one-fifth was taken to a medical professional as a first treatment option. Although not statistically significant, we observed that in villages with health facilities more children were first taken to a medical professional than in villages without a governmental health service (27% vs. 13%). We also found that in villages with health facilities, drugs were mainly purchased from that service (61% vs. 26% in villages without health facility). In villages without health facility 27% of drugs were purchased from community health workers. Drug vendors in the streets and unlicensed shops were less often consulted in villages with health facilities compared to villages where no health facility was situated (10% vs. 20%). Only 15% of all medicines used for treatment were available in the household prior to the malaria episode. We showed that most traditional treatment was collected by the families themselves. Besides we demonstrated that the majority (82%) of children had recovered from the illness episode after treatment and that only about 10% of children were treated with a second-line treatment and 3% with a third-line treatment respectively.

In total 100 different points of antimalarial drug sale were identified in NHD. The medications that were sold as antimalarials could be divided into two groups. These were antimalarials according to their active ingredient and those that were not, but were sold as antimalarials. In total 67% antimalarial and 33% non-antimalarial drugs were found to be on sale in the sample. The sale of non-antimalarials was common at the illicit market, but 44% of the health facilities claimed non-antimalarials also to be antimalarial drugs. Only private pharmacies have labelled antimalarial products truthfully. Chloroquine was found to be widely available in the study district. Amodiaquine, sulfadoxine/pyrimethamine and quinine were mainly sold through health facility pharmacies. Besides, amodiaquine was found to be out of stock at many health facilities. Artesunate and other artemisinin combination therapies (ACTs) were only available from private pharmacies, in the two big towns of NHD. ACTs were found to be about 20-30 times more expensive than chloroquine when comparing the average price of single tablets. In addition, we found that unlike public health facilities, illegal street vendors were present in many little villages, where they were easily accessible for rural populations.

For drug quality tests 86 anti-malarial drug samples were collected, of which 77 samples have been included in the final analysis. The sample consisted of 39/77 (50%) chloroquine, 10/77 (13%) pyrimethamine/sulphadoxine, 9/77 (12%) quinine, 6/77 (8%) amodiaquine, 9/77 (12%) artesunate, and 4/77 (5%) artemether/lumefantrine. 32/77 (42%) drug samples were found to be of poor quality, of which 28 samples failed the visual inspection, nine samples had substandard concentrations of the active ingredient, four samples showed poor disintegration, and one sample contained none of the stated active ingredient. The licensed and the illicit market contributed 5/47 (11%) and 27/30 (90.0%) samples of substandard drugs respectively.

In conclusion, this study has demonstrated that antimalarial treatment in NHD is mostly prompt but absolutely inadequate when considering valid treatment recommendation. Reasons were the unavailability of effective drugs through reliable and accessible structures and the unaffordable prices of the recommended drugs at private pharmacies. In addition, low quality drug products and unqualified drug release practices in the illicit markets endangered treatment outcomes. One central goal in future investigations has to be to make new treatments and adequate health care available to the people in need. Our findings also call for strengthening of drug regulatory and quality control capacities, particularly in view of the now wider available and substantially more costly ACTs.