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Appropriate treatment of malaria? Use of antimalarial drugs for children's fevers in district medical units, drug shops and homes in eastern Uganda

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Summary

OBJECTIVE To evaluate the quality of pharmaceutical care of malaria for children in eastern Uganda prescribed at government health units and drug shops, and administered by caretakers at home; and to assess its appropriateness in relation to national treatment guidelines, which recommend chloroquine over 3 days.

METHODS We followed 463 children under 5 years whose caretakers attended two drug shops and two government health units to seek treatment for fever. The children were examined and the caretakers interviewed on the day of enrolment in the study (day 0), and in their homes on days 3 and 7. Data was collected on drug use prior to attending the shop or health unit, the treatment provided at these study sites, and the administration of drugs at home over the following 3 days.

RESULTS Before attending the study sites, 72% of children had already been given some biomedical drugs, and 40% had received the recommended drug, chloroquine. Health workers prescribed chloroquine for 94% of the children, but only 34% of the recommended doses followed guidelines. Two-thirds of the children were prescribed an injection of chloroquine. By day 3, according to caretaker reports, about 38% of the children had received chloroquine in compliance with the instructions given by the health workers and drug shop attendants. Only 28% of the children had received chloroquine at the optimal dose of 20–30 mg/kg recommended by national policy.

CONCLUSION The methods were useful for examining adherence of both caretakers and health care providers to national guidelines and the extent to which caretakers were compliant with providers' prescriptions. Chloroquine and antipyretics were the drugs of choice for fever in these areas of rural eastern Uganda. But children did not receive the recommended dosage of chloroquine because of lack of compliance on the parts of providers as well as users of health care.

keywords malaria treatment, chloroquine, compliance, home treatment, Uganda

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Introduction

Malaria is the number one cause of child morbidity and mortality in Uganda, and there as elsewhere, prompt and effective treatment is considered the most important control strategy (WHO 1993, 2000). In order to strengthen this strategy, it is important to assess the appropriateness of treatment as it is currently given. This entails recognition of the roles played by users as well as providers of health care, and by drugs bought from shops as well as those dispensed by formal health facilities. Whether or not treatment is appropriate depends on how soon caretakers of small children recognize fever, whether health workers or shopkeepers provide the correct drug in the right dose and formulation, and whether caretakers administer the medicine properly. Where chloroquine (given over 3 days) is the first-line treatment, home medication is an important component of malaria care for

all except those children so seriously ill that they are admitted to hospital.

In general little is known about compliance with medical treatment in developing countries (Homedes & Ugalde 1993). A promising approach is suggested by Krause *et al.* (2000) who distinguish and compare compliance of health workers to guidelines and compliance of patients to prescriptions. There has been some research on whether antimalarial drugs provided by shopkeepers for fever are appropriate (compliant with guidelines) and whether they are taken correctly when the patient returns home (Agyepong & Manderson 1994; Marsh *et al.* 1999). Yet considering that effective treatment is the primary control strategy for malaria, there is a pressing need for more research on the extent to which health care providers follow guidelines and caretakers in turn adhere to prescriptions.

This article addresses the issue of appropriate treatment in terms of both drug provision and drug consumption. It analyses the use of antimalarial drugs in 463 children perceived as suffering from uncomplicated malaria and treated at four study sites in eastern Uganda (two government health units and two drug shops). Data is presented on drug use prior to attending the shop or health unit, the treatment provided at these study sites, and the administration of drugs at home over the following 3 days.

Background

Malaria care in Uganda is offered by non-profit health facilities (mainly government with some NGO units such as mission hospitals). In rural areas, primary health care units usually treat fever as malaria on an outpatient basis. But a large proportion of fever is treated outside the public non-profit system with medicines bought from private providers (Kengeya-Kayondo *et al.* 1994; Adome *et al.* 1996; Lubanga *et al.* 1997) as is the case in many African countries (Ongore & Nyabola 1996; Foster 1995). These private sources of care include clinics, drug shops, provision shops selling drugs, and practitioners working from their homes. Only some of the clinics and drug shops are registered, and the professional qualifications of private providers vary (Whyte 1991).

The Uganda Ministry of Health recommends chloroquine as the first line treatment for fever. As laboratory examinations are not available for most common illnesses, and given the holoendemic nature of malaria in most parts of the country, government health workers are taught to treat fever presumptively with antimalarials. Guidelines are available in several versions. The Malaria Control Unit under the Ministry of Health has issued charts for chloroquine dosage by age, while the Integrated Management of Child Health Initiative suggests dosage by body weight or by age. The National Standard Treatment Guidelines specify chloroquine dosage by weight, while the manual issued by the Uganda Essential Drugs Management Programme uses age.

Government health units are supplied quarterly with kits of essential drugs for primary health care. The only antimalarial included here is chloroquine in tablet and injectable form (a limited amount of sulphadoxine–pyrimethamine is also provided in the supplementary maternity care kits supplied to larger units). However the governmental units can purchase other antimalarials on the essential drug list from the Central Medical Stores, and many units have some quinine and sulfadoxine–pyrimethamine (Fansidar) in stock. In provision shops proprietary brands of chloroquine are available, while the shops specializing in drugs (Class C drug shops) sell mostly generic chloroquine tablets in loose form. They also have injectable chloroquine, needles and syringes. Some shops sell other antimalarials (quinine, amodiaquine and sulfadoxine-pyrimethamine), but these are more expensive than generic chloroquine and not nearly as commonly used (Adome *et al.* 1996).

Materials and methods

The material reported here is part of a larger study of quality of malaria care in Tororo and Busia Districts, whose long-term objectives are to describe the process and outcome of malaria care provision in government health facilities and private drug shops and to contribute to the improvement of care by identifying problems and developing appropriate ways of solving them. The study took place over a 3-month period between May and August 1998. It included observation of drug provision at study sites, as well as examinations of children and interviews of their caretakers at home on days 0, 3 and 7. Only the methods used to elicit the data presented in this article are described here.

Two government health facilities (District Medical Units, hereafter referred to as DMUs) and two drug shops were selected in Tororo and Busia Districts in Eastern Uganda. They were chosen for adequacy of patient/customer attendance, to enable a minimum recruitment of five ill children per day. Two of the study sites (a drug shop and a DMU) were located about 100 m apart in the same trading centre; the other two were about 7 km apart. The sites were manned by clinical staff who remained stable throughout the period. Their qualifications were as follows:

- Drug shop 1: A newly qualified nurse and a trainee nurse, with occasional support from a Clinical Officer

(a person with 3 years of training after senior secondary school, formerly known as Medical Assistant);
- Drug shop 2: An elderly man with long experience as a Nursing Orderly/Dresser in government health units;
- DMU 1: A Clinical Officer, an Enrolled Nurse and a Nursing Aide (who all did consultations and prescriptions);
- DMU 2: A Clinical Officer, with support from an Enrolled Midwife and occasionally a Leprosy Control Assistant doubling as a Nursing Aide.

Children whose caretakers attended these four facilities were enrolled in the study according to the following criteria:

- Age less than 60 completed months on the day of enrolment;
- Presented at the designated care point with a history of fever and/or provided with antimalarial drugs at the site of enrolment;
- Clinical condition that permitted treatment as an outpatient (treated and allowed to return home, not admitted at the care point or referred for admission elsewhere);
- Resident within a distance from the care point of not more than 30 min by bicycle.

Children were excluded from the study if they had symptoms of severe or complicated ill health such as convulsions, excessive drowsiness, or delirium or if they were unconscious or unresponsive, unable to drink or breastfeed, vomited everything, could not sit up or stand.

A total of 468 children were enrolled in the study, of whom 463 were followed up to completion. Of the five children who did not complete follow-up, two were dropped at the request of their caretakers, two others moved out of the study catchment area before the end of the follow-up period. One child died on day 6 after what was reported by the caretaker to have been full recovery from the illness presented on day 0.

Using a pre-tested instrument, observations were recorded about the clinical interaction. At the DMU, the researcher noted drugs and dosages prescribed for children reported to have fever or diagnosed with malaria. At drug shops, where there is no 'prescription' as such, a record was made of the drugs recommended and those actually provided, and the instructions given about dosage. (For analytical purposes, the recommendations of the shop attendant were considered comparable with the prescriptions of the health workers in the DMUs.)

The study was explained to the caretaker (in almost all cases this person was the child's mother) and initial questions were posed. If the caretaker consented, a researcher at the study site examined the child. If the child fitted the inclusion criteria, a researcher followed them home for a longer interview on the same day (day 0). A semistructured questionnaire covered the history of the illness and a detailed description of medicines and other care given before coming to the study site. On day 3, researchers visited the home again, examined the child, and interviewed the caretaker about symptoms and changes in the child's condition. Detailed questions were asked about the medicine that had been given, including any other medicine than that provided at the study site. The interviewer confirmed the caretaker's report by asking to see any leftover medicine.

The research team comprised one medical doctor, two clinical officers and two nursing officers who observed the care process at the study sites and carried out the physical examinations of the children. Interviews with caretakers were performed by a team of 20 research assistants. The whole study team was trained over a 10-day period on the study approach, methods and tools, and they all participated in a 1-week pre-test of the tools and study process.

The study was designed to interfere as little as possible in the naturally occurring care processes. However, in cases where children did not respond adequately to the treatment they were receiving, the researchers were obliged to offer advice and facilitate access to alternative treatment options. This usually meant providing transport and money to pay user fees at health units.

The protocol for the study was accepted through the Makerere University Medical School approval process for health research on human subjects, and duly registered and approved by the Uganda National Council for Science and Technology. Informed consent was obtained from all study sites and participants, as well as from leaders at the study sites and in the communities covered.

Results

Characteristics of study population

The study included 463 children under 5 years of age: 224 (48.4%) boys and 239 (51.6%) girls. The median age was 14 months and 43% of the children were under 12 months. Of the 463 children enrolled in the study, 218 attended at the two drug shops (116 and 102, respectively), and 245 at the two DMUs (114 and 131, respectively). The median age of the children and the percentage of infants did not differ significantly between drug shops and DMUs. The caretakers/responders were nearly all females (94.2%) and mothers (89.8%) of the enrolled children. Most of the male respondents (24 of 27, 88.9%) were fathers of the enrolled children.

As expected, nearly all children (98.1%) had a history of fever, but only 187 (40.4%) had a temperature over 37.5 °C at the time of enrolment. Fast breathing was recorded in 39 (8.4%), ear infection in 29 (6.3%) and abscesses in 17 (3.7%). Palpable spleen was found in 260 (56.4%). The mean haemoglobin (Hb) level was 8.6 g/dL, with about one-third of the enrolled children (31.5%, 146 of 463) having less than 8 g/dL and half (47.6%, 216 of 463) between 8.0 m/dL and 10.0 g/dL. Of the 146 with an Hb level < 8.0 g/dL, 102 (69.3%) had splenomegaly (enlarged spleen), significantly more than children with an Hb level > 8.0 g/dL (49.8%, 158 of 317; $P = 0.0001$). Significantly more children with splenomegaly went to the DMUs (63.3 %, 155 of 245) than to drug shops (40.6%, 106 of 261; $P = 0.002$) The other physical findings including Hb levels and the symptoms reported by the caretaker did not differ significantly between children attending DMUs and drug shops.

Drugs and actions taken before enrolment at the study sites

Among the caretakers interviewed, 332 (71.7%) reported that the enrolled children had been given some biomedical drugs prior to the enrolment visit; 40% (186 of 463) of enrolled children had received chloroquine. Use of other antimalarials before enrolment was reported in only 11 children, who reportedly received quinine (5), amodiaquine (5) and primaquine (1). The frequency and pattern of prior use of antimalarials was similar in children enrolled at drug shops and at government health units. Other drugs reported as given to children prior to enrolment included aspirin (36.7%, 170 of 463), paracetamol (32.6%, 151 of 463) and antibiotics (all types combined: 15.8%, 73 of 463).

In about 75% (250 of 332) of the cases, the medicines given to the child were bought in shops in the community, while 13.2% of the children (44 of 332) had been given drugs recommended and provided by a health-care facility. Another 12.0% (40 of 332) received drugs taken from a home stock of medicines.

Close to half (48.2%, 223 of 463) of the respondents reported no other supportive care action than giving medicine to help the child, while a third (33.9%, 157 of 463) said they had cooled the child with a wet cloth. Nearly a quarter of the caretakers (22.9%, 106 of 463) reported taking no action to deal with the illness of the enrolled children prior to the enrolment visit. Most (75.5%, 80 of 106) of those reporting no action said it was because they lacked money to buy medicines, and/or the sickness was still in the early stages (27.4%, 29 of 106).

The median duration of ill health among the enrolled children was 3.6 days with 60% ill for less than 3 days; a similar duration of illness was reported for children enrolled at drug shops and district health units. The mean duration of illness among the children for whom nothing had been done was 2.16 days, compared with 3.99 days for the children who had received some care or support.

Prescription and dispensing of drugs at study sites

All study sites had a range of antimalarial drugs in stock, including chloroquine (in oral and injection formulations), quinine and sulphadoxine-pyrimethamine. Both drug shops also had primaquine and amodiaquine, as well as syrup formulations of chloroquine and quinine.

All enrolled children had some medicine prescribed or recommended, and subsequently dispensed to them. An average of 3.2 drugs was dispensed per child. The average number of drugs dispensed was slightly higher at drug shops (3.33; SD 1.26) than in DMUs (3.02; SD 0.81). At the drug shops the prescription was mostly given by the drug seller; only in 12 of 219 cases (5.5%) did the caretaker ask for specific drugs. The drugs requested in such cases were chloroquine (8), aspirin (6), paracetamol (3) and chlorpheniramine (3).

As shown in Table 1 the most commonly used drug was chloroquine, prescribed or recommended for 94.0% (435 of 463) of the children: 98.4% (241 of 245) in DMUs and 91.7% (200 of 218) in drug shops. Other antimalarials were used very little; 83.4% (386 of 463) received antipyretic prescriptions, with DMUs recommending paracetamol more frequently than aspirin, and the reverse for drug shops. More than half of the children enrolled (58.1%) received a prescription of antibacterial drugs; 23.3% were given to them by injection. About 55% received a prescription of both antimalarials and antibiotics.

Table 2 shows that the most common practice was to give chloroquine by injection followed by oral treatment; 284 of 433 children were given at least one injection of chloroquine. Only a third were treated exclusively with oral medication. However, there was considerable variation in injection frequency between the two drug shops and between the two DMUs.

The total amount of chloroquine prescribed at the DMUs and recommended for purchase at the drug shops was computed for the body weight of each enrolled child. The dose per kilogram body weight prescribed for each child is summarized in Table 3. Only one-third of the children enrolled at all four study sites had the recommended total dose of chloroquine (20–30 mg/kg) prescribed. The proportion is close to 30% in three of the study sites (drug shops 1 and 2, and DMU 1) and much higher (about 50%) at DMU 2. One-third were prescribed less and one-third more than the recommended dose. The

Table 1 Common drugs prescribed – by site of enrolment

Name of the drug	Drug shop 1 ($n = 116$)	Drug shop 2 ($n = 102$)	DMU 1 ($n = 114$)	DMU 2 ($n = 131$)	Total ($n = 463$)
Chloroquine (all forms)	98 (84.5%)	96 (94.1%)	114 (100%)	127 (96.9%)	435 (94.0%)
Other antimalarials†	3 (2.6%)	2 (2.0%)	0	2 (1.5%)	7 (1.5%)
Paracetamol	28 (24.1%)	27 (26.5%)	84 (73.7%)	93 (71.0%)	232 (50.1%)
Aspirin	69 (59.5%)	61 (59.8%)	25 (21.9%)	3 (2.3%)	158 (34.1%)
Anti-bacterial drug – any	55 (47.4%)	50 (49.0%)	63 (55.3%)	101 (77.1%)	269 (58.1%)
Antibiotic as injection	17 (14.7%)	20 (19.6%)	26 (22.8%)	45 (34.4%)	108 (23.3%)
Folic acid	4 (3.4%)	48 (47.1%)	11 (9.6%)	2 (1.5%)	65 (14.0%)
Chlorpheniramine	17 (14.7%)	35 (34.3%)	5 (4.4%)	4 (3.1%)	61 (13.2%)
ORS	3 (2.6%)	4 (3.9%)	20 (17.5%)	32 (24.4%)	59 (12.7%)
Mebendazole	17 (14.7%)	11 (10.8%)	13 (11.4%)	13 (9.9%)	54 (11.7%)

† Other antimalarials given include quinine (5) fansidar (1) and amodiaquine (1).

Table 2 Routes of administration of chloroquine – by site of enrolment

Routes of administration	Drug shop 1 1 ($n = 97$)	Drug shop 2 2 ($n = 95$)	DMU 1 ($n = 114$)	DMU 2 ($n = 127$)	Total ($n = 433$)
Oral only	53 (54.6%)	26 (27.4%)	34 (29.8%)	36 (28.3%)	149 (34.4%)
Oral and injection	9 (9.3%)	57 (60.0%)	12 (10.5%)	87 (68.5%)	165 (38.1%)
Injection only	35 (36.1%)	12 (12.6%)	68 (59.6%)	4 (3.1%)	119 (27.5%)

Table 3 Doses of chloroquine prescribed by site of enrolment

Amount	DMU ($n = 240$)	Drug shops ($n = 200$)	Total ($n = 440$)
Less than 20 mg/kg	74 (30.8%)	100 (50.0%)	174 (39.5%)
20–30 mg/kg	94 (39.2%)	56 (28.0%)	150 (34.1%)
Over 30 mg/kg	72 (30.0%)	44 (22.0%)	116 (26.4%)
Mean dose	26.2 (SD 11.99)	23.3 (SD 15.77)	24.9 (SD 13.90)

NB: While patients enrolled at health centres had opportunity for drug dosing based on body weight (nearly all patients – 97.6%, 239/245 – enrolled there had their weights taken as part of the clinical care), those at drug shops could only have this done by age (age was enquired about in 94.1%, 206/219 of the children enrolled at drug shops.

mean dose prescribed was close to the middle of the recommended range, but quite varied across sites. It was lowest (19.3 mg/kg) at drug shop 2, and highest (31.4 mg/kg) at DMU 2.

Caretaker compliance with providers' chloroquine prescriptions

The total amount of chloroquine administered to each enrolled child between day 0 and day 3 was compared with the initial prescription for the same child to gauge the compliance of the caretaker with the prescriber's recommendations. Table 4 shows the level of compliance at each of the study sites. Overall, 37.8% (161 of 426) of enrolled children received all and only the amount of chloroquine as prescribed. Among the rest of the children (who did not receive the exact dose as prescribed), the tendency was to give more rather than less, with only one-quarter overall getting less chloroquine than prescribed. Compliance to prescription was similar at three of the study sites and higher (at 48.2%) at the other site, DMU 1). In general, compliance did not vary markedly according to the source of the drugs.

Table 5 presents the total dose reported as administered to enrolled children between enrolment (day 0) and the fourth day of follow up (day 3). Only 28.1% of the children receiving chloroquine had the optimal total dose of 20–30 mg/kg administered to them between enrolment and the fourth day of follow-up. One-third (33.4%) received less than 20 mg/kg, while

Table 4 Caretaker compliance with chloroquine prescription – by site of enrolment

Compliance*	Drug shop 1 ($n = 96$)	Drug shop 2 ($n = 94$)	DMU 1 ($n = 114$)	DMU 2 ($n = 122$)	Total ($n = 426$)
Received less	26 (26.0%)	17 (18.1%)	31 (27.2%)	30 (24.6%)	103 (24.2%)
Received exact	33 (34.4%)	31 (33.0%)	55 (48.2%)	42 (34.4%)	161 (37.8%)
Received more	38 (39.6%)	46 (48.9%)	28 (24.6%)	50 (41.0%)	162 (38.0%)

* Total dose administered compared to that prescribed.
Excludes 9 children (2 at each of the drug shops and 5 at DMU 2) in whom chloroquine was prescribed but the dose administered between day 0 and day 3 was not possible to estimate from the information given by the caretakers.

Table 5 Total Dose of chloroquine administered between day 0 and day 3

Dose	Total ($n = 434$)
Less than 20 mg/kg	145 (33.4%)
20-30 mg/kg	122 (28.1%)
Over 30 mg/kg	167 (38.5%)
Mean dose	28.9 mg/kg

two in every five children (38.5%) received more than 30 mg/kg.

Discussion

In order to assess the quality of drug treatment, it is useful to measure both the provider's compliance with guidelines and patient's compliance to prescription. However, measuring compliance is complicated and difficult. In this study we have assessed the providers' (health workers and shopkeepers) adherence to the national standard by open observation. The researchers were trained to influence the providers' decisions as little as possible, but their presence may have affected the situation to some extent.

The strength of this study design was that caretaker compliance was measured by following up the children in their homes to find out whether they had been given the medicine prescribed for them. We relied on caretakers' reports; and to improve validity, the remaining tablets were counted. It was assumed that the injections reported contained the correct amount of chloroquine in every case, but there is a possibility that more or less was actually injected. Although caretakers' reports may not be completely accurate, we note that in Kenya, Marsh and colleagues compared mothers' reports about doses of chloroquine with plasma chloroquine in the children, and found a high degree of agreement (Marsh *et al.* 1999).

Standard treatment guidelines assume that patients have not yet received any medication, but the reality is that most have already been given something at home before presenting at a treatment facility 3.6 days (median) after onset of symptoms. Of the children in our study, 72% [compared with 88.5% in the study by Lubanga *et al.* (1997)] had received some modern drugs before coming to the study sites. The choice of drug was appropriate (in line with national policy) for the 40% who were given chloroquine; only 2% had received other antimalarials. The fact that so many caretakers had given chloroquine and still sought further treatment may indicate that they judged the chloroquine ineffective. This could be because of chloroquine resistance or incorrect dosages or administration; or perhaps the caretakers needed more tablets or wanted an injection. Antipyretics had also been administered (37% had been given aspirin and 33% had received paracetamol). Caretakers reported information about prior treatment, so it is not certain that all the drugs were accurately identified; frequency of prior drug taking may be under-reported (Nwanyanwu *et al.* 1996). Nevertheless frequent home treatment with chloroquine and antipyretics is an important finding that has two practical implications. First, health care providers need to enquire carefully about prior treatment in order to avoid overdosing children. Secondly, there is a need to communicate to shopkeepers and caretakers that antipyretics alone are not sufficient to treat fever. As these are often dispensed together with chloroquine, caretakers may not be aware that the two kinds of medicine have different functions.

Providers at the DMUs and drug shops were compliant with the standard guidelines of using generic chloroquine as the first-line drug. Chloroquine was used almost exclusively, although other antimalarials were available. This finding is in agreement with the results of a population-based study of drug use in 1994, where chloroquine accounted for 90% of the antimalarials used (Adome *et al.* 1996). It is remarkable that the pattern of malaria treatment established through the provision of essential drug kits to non-profit units extends to the drug shops. Generic chloroquine is the medicine of choice even in the drug shop situated in Busia, a border town to Kenya where many different antimalarials are available and sold.

The common use of chloroquine in injectable form was striking; high injection rates in Uganda contrast sharply

with the national guideline restriction of injections to 15% of outpatient prescriptions (Birungi *et al.* 1994; Birungi 1998). Practical difficulties in administering oral tablets to children, frequency of vomiting, and the need for sure and fast drug uptake in very sick children were some of the reasons given by providers to justify frequent use of injections. If injection rates are to be brought down, it will be necessary to address the stated concerns of providers, for example, by finding ways to provide cups and water at the site where medicine is dispensed (drinking water is often not available) and teaching providers to show and explain about giving oral chloroquine to children with nausea.

Although the providers' choice of drug for fever was appropriate in 94% of cases, the dosage prescribed was appropriate in only 34%. Overall, the dosage patterns did not vary systematically between drug shops and DMUs, although one DMU was more adherent to National Standard Treatment Guidelines than the other three sources. Chloroquine dosage can be calculated according to age or weight. Age was asked in nearly all drug shop transactions observed (scales were not available there) and weight was taken in all health unit consultations. Yet this information was apparently not used to reckon dosage according to guidelines. The need for better training and closer supervision of providers on the correct dose of chloroquine for children was evident. But it would also be helpful if dosage schedules (currently differentiated according to seven age categories) could be simplified.

Polypharmacy characterized treatment at both kinds of delivery point. Sick children received an average of three drugs. The use of both antimalarials and antibiotics was especially pronounced at government units, where 67% of children were given antibiotics. Physical examination of the children revealed only about 75 cases (about 18% of all children) for which antibiotic treatment might have been appropriate. The overuse of antibiotics is a cause for concern in that resistance towards antibiotics may develop in the community because of the intense drug pressure.

Antipyretics were given in over three-quarters of cases, with the drug shops significantly more likely to provide aspirin, whereas the DMUs, in line with standard treatment guidelines for children, relied primarily on paracetamol. In light of concern about the risk of Reyes syndrome, there is need for training of shop operators on avoidance of aspirin for small children (Nyamongo 1999; Marsh *et al.* 1999).

The pattern of prescription and dispensing of medicines at drug shops and government units shows remarkable similarities as well as several interesting contrasts. In interpreting these findings it must be borne in mind that drug shops in rural Uganda function like private clinics in many respects (Whyte 1991, 1992). In the two drug shops studied, the attendants had working experience from government health units. Familiarity with biomedical drugs may be assumed to be higher than in ordinary provision shops that sell medicines, such as those in the studies from Kilifi in Kenya (Marsh *et al.* 1999; Molyneux *et al.* 1999).

More than one-third of the caretakers were 'compliant' in the sense that they administered the medicine in the amount prescribed. The fact that 23% gave less is not surprising in that there is a tendency to stop treatment when the symptoms dissipate; underdosing is common (McCombie 1996). But another 20% gave more than was prescribed. One of the factors in overdosing could be that whole tablets were dispensed even where half tablets were prescribed. Considering that 40% of children had already received chloroquine for their illness before attending the study sites, the level of overdosing with chloroquine is actually much higher.

The issue of compliance is doubly problematic in the situation that characterizes the study area and probably much of rural Uganda today. Is it meaningful to measure caretakers' compliance with providers' instructions when providers do not adhere to treatment schedules of the Ministry of Health? Krause *et al.* (2000) underline the importance of studying compliance with guidelines and prescriptions at all steps of the health care process in order to identify the step with the greatest need for improvements. Our study suggests that if a choice had to be made, attention should be given to the providers of malaria care. Only 34% adhered to the recommendations of the standard treatment guidelines, while 37.8% of their patients/customers followed the advice they gave. However, given the overall importance of the care provided at home, both before and after contact with a health worker or drug shop attendant, it seems preferable to address both users and providers of medicine in efforts to make malaria treatment more appropriate.

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References

Adome RO & Whyte SR (1996) *Popular pills, community drug use in Uganda*. Het Spinhuis, Amsterdam.

Agyepong IA & Manderson L (1994) The diagnosis and management of fever at household level in the Greater Accra Region, Ghana. *Acta Tropica* **58**, 317–330.

Birungi H (1998) Injections and self-help: risk and trust in Ugandan health care. *Social Science and Medicine* **47**, 1455–1462.

Birungi H, Asiimwe D & Whyte SR (1994) *Injection Use and Practices in Uganda*. WHO/DAP/94.18. WHO, Geneva.

Foster S (1995) Treatment of malaria outside the formal health services. *Journal of Tropical Medicine and Hygiene* **98**, 29–34.

Homedes N & Ugalde A (1993) Patients' compliance with medical treatments in the third world: what do we know? *Health Policy and Planning* **8**, 291–314.

Kengeya-Kayondo JF, Seeley JA, Kajura-Bajenja E *et al.* (1994) Recognition, treatment seeking behaviour and perception of cause of malaria among rural women in Uganda. *Acta Tropica* **58**, 267–273.

Krause G, Borchert M, Benzler J & Diesfeld HJ (2000) From diagnosis to drug taking: staff compliance with guidelines and patient compliance to prescriptions in Burkina Faso. *International Journal for Quality of Health Care* **12**, 25–30.

Lubanga RG, Norman S, Ewbank D & Karamagi C (1997) Maternal diagnosis and treatment of children's fever in an endemic malaria zone of Uganda: implications for the malaria control programme. *Acta Tropica* **68**, 53–64.

Marsh VM, Mutemi WM, Muturi J *et al.* (1999) Changing home treatment of childhood fevers by training shop keepers in rural Kenya. *Tropical Medicine and International Health* **4**, 383–389.

McCombie SC (1996) Treatment seeking for malaria: a review of recent research. *Social Science and Medicine* **43**, 933–945.

Molyneux CS, Mung'ala-Odera V, Harpham T & Snow RW (1999) Maternal responses to childhood fevers: a comparison of rural and urban residents in coastal Kenya. *Tropical Medicine and International Health* **4**, 836–845.

Nwanyanwu OC, Redd SC, Ziba C *et al.* (1996) Validity of mother's history regarding antimalarial drug use in Malawian children under five years old. *Transactions of the Royal of Tropical Medicine and Hygiene* **90**, 66–68.

Nyamongo IK (1999) Home case management of malaria: an ethnographic study of lay people's classification of drugs in Suneka Division, Kenya. *Tropical Medicine and International Health* **4**, 736–743.

Ongore D & Nyabola L (1996) Role of shops and shopkeepers in malaria control. *East African Medical Journal* **73**, 390–394.

WHO (1993) *Report of a study group on the implementation of the global plan for malaria control*. WHO, Geneva.

WHO (2000) *Malaria*. World Health Organization, Geneva, Technical Report Series 892.

Whyte SR (1991) Medicines and self-help: the privatization of health care in Eastern Uganda. In: *Changing Uganda: the Dilemmas of Structural Adjustment and Revolutionary Change* (eds HB Hansen & M Twaddle) James Currey, London, pp. 130–148.

Whyte SR (1992) Pharmaceuticals as folk medicine: transformations in the social relations of health care in Uganda. *Culture, Medicine and Psychiatry* **16**, 163–186.