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Prevalence of malaria parasitemia among clients seeking treatment for fever or malaria at drug stores in rural Tanzania 2004

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Summary

OBJECTIVE To determine the prevalence of malaria parasitemia and other common illnesses among drug store clients in one rural community, with a view to the potential role of specialist drug stores in expanding coverage of effective malaria treatment to households in highly endemic areas.
METHOD Follow-back study of 2466 client visits selected from all 10 drug stores operating in the town of Ikwiriri between May 30 and August 31 2004. Of these, 521 (21.2%) were made by or on behalf of persons ill with fever or malaria. Two hundred and ninety three were eligible as residents of the surrounding nine villages and all agreed to participate in the study. Each patient was evaluated by a clinical officer and provided a blood sample for malaria on the day of the shop visit, either at the shop or at home.
RESULTS Only 50 (17.1%) visits by or on behalf of febrile patients resulted in the purchase of an antimalarial drug, while an antipyretic medication was obtained at 226 visits (77.1%). Clinicians diagnosed malaria in 63.8% of patients. Malaria parasites were identified in blood film samples from 24.2% (95% CI: 19.6, 29.5). This is double the parasite prevalence rate of 10.7% (95% CI: 8.6, 13.1) obtained from a household survey of 1004 healthy individuals selected from these villages at the same time. It is not significantly lower than the prevalence observed among 880 clients presenting with fever at health facilities in the district: 29.7% (95% CI: 23.0, 37.3). The prevalence of malaria parasitemia among children younger than 5 years whose families sought fever treatment from drug stores (42.1%; 95% CI: 31.4, 53.5) was equal to that of children presenting with fever at health facilities (42.5%; 95% CI: 25.0, 62.2).
CONCLUSIONS Currently, drug store clients do not obtain malaria-specific treatment in the majority of cases where it might be warranted. Parasitological findings indicate that drug store clients, especially children, are as likely to be infected with malaria as patients seeking care for similar illnesses at health facilities. Drug stores may be attractive partners for policy makers eager to engage the private retail sector in expanding coverage of malaria treatment.

keywords malaria, treatment seeking behaviour, drug stores

Background

Malaria remains the leading cause of outpatient visits and health facility-associated deaths in Tanzania, where the principal malaria control strategy relies on prompt delivery of effective treatment for every case of uncomplicated malaria among children under 5 years of age (United Republic of Tanzania 2003). More broadly, malaria control officials and researchers have increasingly acknowledged the importance of retail pharmaceutical providers when households seek treatment for such illnesses. Some have developed interventions to improve the

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delivery of appropriate malaria treatments through retailers (Tavrow *et al.* 2003; Marsh *et al.* 2004). In addition, recent studies have demonstrated that making even partially efficacious malaria treatments available closer to home has been associated with measurable reductions in severe malaria morbidity and overall child mortality (Kidane & Morrow 2000; Sirima *et al.* 2003). As malaria-endemic countries in Africa begin to adopt new treatment policies based on artemisinin-containing antimalarial drugs, the role for private sector pharmaceutical retailers is unclear (D'Alessandro *et al.* 2005). Policy makers will have to consider the regulatory status and safety profile of newly recommended treatments as well as the potential for unsupervised use to contribute to drug resistance (Basco 2004). Likewise, they will have to answer concerns about making these highly effective treatments available as widely and as affordably as possible while the economic resources to procure them – and even supplies of the drugs themselves – are limited.

Presently, pharmaceutical medicines can be obtained from three types of retail outlets in Tanzania: (1) general shops and kiosks, (2) specialist drug stores (officially designated part II pharmacies and locally known as *maduka ya dawa baridi*) and (3) licensed pharmacies (officially designated part I pharmacies). Specialist drug stores occupy a special role among pharmaceutical providers in Tanzania (Goodman *et al.* 2004) as elsewhere in Africa (Salako *et al.* 2001; Nshakira *et al.* 2002; Brieger *et al.* 2004; Dzator & Asafu-Adjaye 2004). They are located in rural market centres where pharmacies are often lacking. They stock and sell a range of medicines that are not available at general shops and kiosks. Their staff generally have some medical training, and they are fewer in number and more stable than the 10s of 1000s of general shops and kiosks that also sell medicines. For these reasons, drug stores may be an attractive partner for malaria control officials seeking to expand effective antimalarial delivery outside formal health facilities. While a number of studies have documented the role that specialist drug stores can play in care-seeking behaviour (Goel *et al.* 1996; Holtz *et al.* 2003; Brieger *et al.* 2004), relatively little is known about the clinical conditions for which people seek treatment from these outlets. In particular, it would be important for policy makers contemplating interventions in the retail sector to be aware of the prevalence of malaria infection and other clinical conditions among drug store clients.

Methods

This study was completed as part of the Interdisciplinary Monitoring Project for Antimalarial Combination Therapy in Tanzania,* a large multi-year effort evaluating the public health impact of new malaria treatment strategies (Kachur *et al.* 2001). The study protocol was reviewed and approved by the institutional review boards of the US Centers for Disease Control and Prevention, Atlanta, GA, USA (CDC) and the Ifakara Health Research and Development Centre (IHRDC). In addition, this research has been approved by the National Medical Research Co-ordinating Committee of the Tanzania Commission on Science and Technology. Written informed consent was obtained from all adult participants and from parents or legal guardians of minors.

The study was completed in Ikwiriri town, a rural market center in Rufiji District, in Tanzania's Coast Region. *Plasmodium falciparum* malaria transmission is intense and perennial with some seasonal fluctuation. Since 2003, antimalarial combination therapy with sulfadoxine-pyrimethamine plus artesunate has been used for first line treatment of uncomplicated malaria at all registered health facilities in Rufiji District. Ikwiriri is situated near the centre of the district at the northern edge of the Rufiji River floodplain, 7 km from the bridge that links southern Tanzania to Dar-es-Salaam. It comprises nine contiguous villages with an enumerated population of 19 520 participating in a demographic surveillance system (Mwageni *et al.* 2002). Health facilities in the town include one government health centre and two dispensaries sponsored by the Roman Catholic Church and the Free Pentecostal Church of Tanzania. Twelve specialist drug stores were registered in the town as part II pharmacies. Two of these were not operating at the time of the study. In addition, 88 kiosks and general shops also sold medicines during the period of this study. As is common throughout rural Tanzania, no licensed part I pharmacies operate anywhere in Rufiji District.

Four data collectors were recruited from Ikwiriri. They had all attended secondary school and took part in a week long training workshop. Data collectors rotated daily

* The Interdisciplinary Monitoring Project for Antimalarial Combination Therapy in Tanzania (IMPACT-Tz) is a multiyear implementation research evaluation project that rests on a collaborative platform comprising the US Centers for Disease Control and Prevention (CDC), Ifakara Health Research and Development Centre, the National Institute for Medical Research, Muhimbili University College of Health Sciences, the London School of Hygiene and Tropical Medicine (UK), and the Tanzanian Ministry of Health, including its National Malaria Control Programme, the Tanzania Essential Health Interventions Project, and the Council Health Management Teams of Rufiji, Morogoro, Mvomeru, Kilombero and Ulanga Districts. IMPACT-Tz is primarily supported by funding from CDC, the United States Agency for International Development and Wellcome Trust.

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among the 10 operating specialist drug stores in town according to a predetermined schedule that required an equal number of hours at each outlet. This was intended to produce a representative sample of clients proportionate to the utilization rates of the different drug stores. Data collectors observed all client visits made at selected outlets during operating hours for 94 consecutive days beginning 30 May 2004. They recorded the purpose, time and date of each shop visit; the relationship between the client and the intended patient; age, gender and village of residence; and what medicines were purchased on a structured checklist. Clients who attended the drug store and bought medicine for a patient with fever or malaria and who resided within the nine village study catchment area were eligible for enrollment. We based our primary inclusion criterion on the patient or caretaker's reported history of fever or malaria ('*homa au malaria*') because that is the basis for classifying and treating children for malaria under the Integrated Management of Childhood Illness (IMCI) algorithm (United Republic of Tanzania 2002). Previous participants were ineligible for repeat enrollment.

Following their purchase, potential participants or their parent or guardian gave written informed consent before answering a brief exit interview including questions about the intended patient and providing directions to the household. If the patient was present at the drug store, a clinical officer obtained a blood sample, conducted a history and physical examination and provided any additional treatments recommended for the conditions diagnosed. If the patient was not present at the drug store the clinical officer visited him/her at home and conducted these evaluations there. Three clinical officers completed the examinations. On any given day one clinician moved between the outlets where the data collectors were posted and completed all initial evaluations. History and physical examinations were conducted in privacy, away from the store front and according to a semi-structured checklist of symptoms and physical findings that also included open-ended fields for unanticipated findings. Illnesses among children under five were classified according to the IMCI algorithm.

All participants were revisited at home by the clinical officer 24 h later to assess progress, inform the patient and caretakers of the blood slide results, and dispense any additional treatment that was indicated based on the blood slide results or new clinical findings. Follow-up history and clinical evaluation were recorded on the same semi-structured data collection form as the original clinical evaluation. To the extent possible the same clinician who performed the initial evaluation conducted the follow-up visits. All patients with clinical malaria or a positive blood slide were treated with age appropriate doses of sulfadoxine/pryimethamine plus artesunate, which is the recommended first-line treatment for uncomplicated malaria in Rufiji District (Kachur *et al.* 2004).

Thick and thin blood films were stained with 10% Giemsa for 30 min. Blood slides were examined by experienced microscopists who counted parasites and white blood cells. Blood slides were reported as negative if the microscopist observed no asexual parasites in microscopic fields where 500 white blood cells were counted. According to standard procedures at IHRDC, positive blood slides and a 10% sample of negative blood slides were reviewed for quality control. Hemoglobin B level was also assessed for children under 5 years using a portable hemoglobinometer (HemoCue, Mission Viejo, CA, USA).

Data entry forms were completed in the field and checked by the study coordinator (HK, one of the clinical officers) daily. All forms were transported to the project office in Dar-es-Salaam and were double entered into a data base by a single data clerk using EpiInfo, Version 6 (CDC). Discrepancies were resolved by retrieving the hard copy of the data collection instruments. Data cleaning and analysis were completed using Stata Version 8 (Stata Corporation, College Station, TX, USA). Statistical comparisons were adjusted to account for clustering among observations obtained from clients recruited at the same drug store. Statistical comparisons were considered significant at the 0.05 level.

A sample size of 278 drug store clients with fever was calculated based on an anticipated malaria parasitemia prevalence of 30%, prior data on the utilization of drug stores in the community and a design effect of 2.0, estimated with statistical power of 0.8 and precision of 99%. In order to interpret the observed parasitemia prevalence outcomes we compared them with similar assessments completed among other populations in the same communities. A large household survey was conducted in Rufiji District at the same time. Blood slides were obtained from residents of all ages at 1500 randomly selected households in 31 census enumerated villages. This sample included 1004 community members selected from the same nine drug shops study villages. In addition an assessment of clients presenting at 18 sentinel dispensaries and health centres in three districts was completed 6 weeks earlier. Blood slides were obtained from all outpatients with and without fever as well as those with and without a malaria diagnosis. This sample included six health facilities in Rufiji District (none in Ikwiriri) and 880 patients who reported fever or malaria. More details on the methods of the household survey (Njau *et al.*

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2006) and health facility assessment (Causer *et al.* 2006) are described elsewhere.

Results

Data collectors observed 2466 encounters between clients and drug store sellers. A total of 521 (21.2%) of these were made by or on behalf of patients with fever or malaria and 503 (20.4%) were made by residents of the nine village study area. 293 (11.9%) met both eligibility criteria. All eligible participants consented to be enrolled and none was lost to follow up. Eligibility and enrollment rates varied across the 10 drug stores, from 9.2% to 19.0% of all clients observed. Table 1 contains data comparing the characteristics of enrolled clients with those not enrolled in the study. Shop visits that resulted in enrollment were more likely than other shop visits to have been made by a parent or grandparent on behalf of a child under 5 years of age. Aside from the inclusion criteria, there were no other statistically significant differences between clients enrolled and those not enrolled in the study. The mean years of education of the household head was identified only after enrollment and previous studies in this community have shown this to correlate well with relative socioeconomic status (Njau *et al.* 2006).

Table 2 includes information about the drugs purchased by study participants. Although their primary reason for visiting the drug store was to obtain medicine for a patient with fever or malaria, only 50 (17.1%) clients actually purchased an antimalarial drug. Sulfadoxine/pyrimethamine (SP)-containing products were the most commonly obtained antimalarial drug followed by amodiaquine and trimethoprim/sulfamethoxazole, an antibiotic with some antimalarial activity. One client purchased both trimethoprim/sulfamethoxazole and amodiaquine. None of the clients purchased products containing chloroquine, quinine, artemisinin derivatives or other antimalarial compounds, although quinine and artemisinin preparations were available at some drug stores. A substantial majority of clients, 77.1%, purchased antipyretic medications. Although 44 clients obtained both an antipyretic and an antimalarial product, clients who obtained an antimalarial drug were less likely to purchase an antipyretic than those who did not (design-based F statistic (1, 283) = 36.9, $P < 0.0001$). Even fewer clients obtained other antibiotic medications. Only nine clients enrolled in the study (3.1%) did not purchase any pharmaceutical product at all.

The drug store visit was the first source of care for approximately three quarters of illness episodes ultimately treated there, 73.4% ($n = 215$). Of 78 patients who had sought care elsewhere prior to visiting the drug store,

Table 2 Frequencies of medicines purchased at drug stores for clients with fever or malaria, Ikwiriri 2004

Type of drug	Prevalence
Any antipyretic	226 (77.1%)
Any antimalarial	50 (17.1%)
Sulfadoxine/pyrimethamine (SP)	27 (9.2%)
Amodiaquine	12 (4.1%)
Trimethoprim/sulfamethoxazole	12 (4.1%)
Chloroquine	0
Quinine	0
Artemisinin derivatives	0
Any antibiotic	26 (8.9%)
Antibiotics other than trimethoprim/sulfamethoxazole	14 (4.8%)
Any vitamin or mineral supplement	7 (2.4%)

SP, sulfadoxine/pyrimethamine.

Table 1 Characteristics of drug store patrons enrolled and not enrolled in follow-back study, Ikwiriri 2004

Characteristics	Enrolled ($n = 293$) % (95% CI)	Not enrolled ($n = 2173$) % (95% CI)
Male patient	58.2% (52.5, 63.8)	55.3% (53.2, 57.4)
Mean age of patient	25.9 years (21.2, 31.3)	27.2 years (26.4, 27.9)
Patient less than 5 years	23.8% (21.6, 26.0)	14.7 (13.2, 16.3)
Patient visited drug store themselves	56.7% (50.9, 62.2)	59.3% (57.2, 61.4)
Patient's parent or grandparent visited	31.7% (26.7, 37.3)	23.2% (21.4, 25.1)
Other relative visited	3.4% (1.8, 6.2)	6.3% (5.3, 7.4)
Non-relative visited	6.5% (4.2, 9.9)	8.9% (7.8, 10.2)
Visit made because of fever or malaria*	100%	10.5% (9.3, 11.9)
Patient resident in nine study villages*	100%	76.9% (75.0, 78.6)
Patient resident in Rufiji district*	100%	81.9% (80.2, 83.5)
Mean years education of head of household	6.4 years (5.2, 7.6)	Not collected

* Seeking treatment for fever or malaria and residence in one of nine study villages within Rufiji District were criteria for enrollment.

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30 (38.4%) had already been to a health care facility and 36 (46.2%) had made a prior visit to another specialist drug store. Only 12 patients had sought prior treatment outside health facilities or drug stores, 11 from general stores and 1 from a neighbour. Overall 10.2% (95% CI: 7.2, 14.3) of patients for whom an antimalarial drug was purchased at the drug store had already contacted a formal sector health facility.

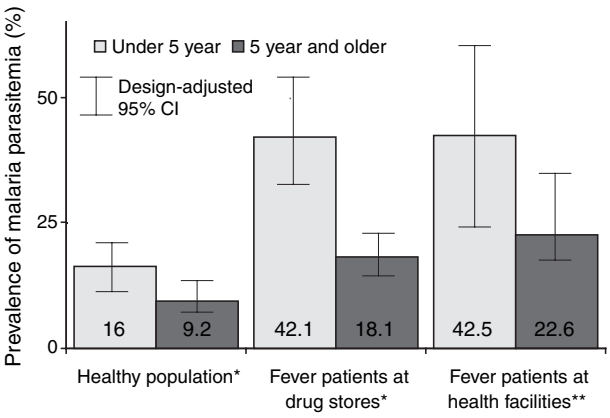
Table 3 displays the reported symptoms and the results of clinical evaluations for the 293 patients on whose behalf these drug shop visits were made. Objective physical findings were few and diagnoses were largely based on reported symptoms. Clinicians were unable to identify a cause for the reported fever in 21.1% of cases. Clinical malaria was by far the most common diagnosis, followed by acute respiratory infection, anemia and gastroenteritis. There was considerable overlap between clinical malaria and other major diagnoses. Of patients diagnosed with acute respiratory infection, 77.8% were also diagnosed with clinical malaria. Thirteen (17.3%) children under 5 years met IMCI criteria for pneumonia (fever or history of fever plus >40 respirations per minute) (Perkins *et al.* 1997). Clinicians diagnosed malaria in 84.6% of cases where they diagnosed anemia and 50.0% of cases where they diagnosed gastroenteritis. Skin conditions and helminthic infections were diagnosed in two cases each and an HIV/AIDS related condition in one case (data not shown). History of danger signs and physical evidence of severe illness were encountered in only four cases. Study clinicians referred these patients to the health centre or nearby mission hospital and provided transport. One adult patient died 3 days following his drug store visit after being admitted at Ikwiriri Health Centre.

Table 3 Frequencies of reported symptoms, clinical findings, and clinician's diagnoses among patients for whom drug store visits were made, Ikwiriri 2004

Condition	Prevalence
Symptoms reported:	
Fever	293 (100%)
Cough	75 (25.6%)
Runny nose	59 (20.1%)
Abdominal pain	41 (14.0%)
Vomiting	31 (10.6%)
Nausea	28 (9.6%)
Diarrhoea	16 (5.5%)
Fast breathing	14 (4.8%)
Sore throat	12 (4.1%)
Difficult breathing	8 (2.7%)
Bloody diarrhoea	3 (1.0%)
Experienced one or more danger sign (very high fever, lethargy, seizure, loss of consciousness, severe vomiting)	4 (1.4%)
Physical findings	
Fever (axillary temperature ≥37.5 °C)	55 (18.9%)
Pallor	34 (11.8%)
Rapid respiratory rate	29 (10.1%)
Rash	3 (1.0%)
Red throat	3 (1.0%)
Clincian's diagnoses	
Malaria	187 (63.8%)
Acute respiratory infection	72 (24.6%)
Anemia	26 (8.9%)
Gastroenteritis	10 (3.4%)
No cause for fever identified	62 (21.1%)
Referred to a health facility for in-patient management of potentially serious conditions	5 (1.7%)

Malaria parasites were identified in blood film samples from 71 participants (24.2%, 95% CI: 18.9, 30.5). The prevalence of malaria parasitemia was strongly associated with age and was highest among children under 5-years old, 42.1% (95% CI: 32.4, 52.5).

We compared malaria parasitemia prevalence among patients in this study with comparable findings from two studies conducted in the same area. These studies evaluated the prevalence of malaria parasitemia among residents of the same nine villages collected at the same time, and among patients seeking treatment for malaria or fever at health facilities throughout Rufiji District collected 6 weeks before enrollment began at the drug stores. These findings are compared in Figure 1, below. Not surprisingly the results demonstrate significantly higher levels of malaria parasitemia among patients seeking treatment for fever or malaria than among the general population. In addition, patients for whom treatment was sought at drug



* Adjusted confidence interval for residents of Ikwiriri villages only
** Adjusted confidence interval for patients at **all** Rufiji HFs in 2004 survey

Figure 1 Prevalence of malaria parasitemia by age group among healthy community members, drug store clients and health facility (HF) patients with fever, Ikwiriri and Rufiji District 2004.

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Table 4 Comparison of clinical diagnoses and laboratory findings for malaria and anemia in patients for whom treatment was sought at drug stores in Ikwiriri 2004

Clinical diagnosis	Predictive value positive	Predictive value negative
Malaria (persons over 5 years)	25.2%	93.0%
Malaria (children under five only)	46.4%	70.0%
Anemia (children under five only)	95.2%	8.9%

stores were just as likely to have malaria parasitemia as those presenting to formal sector health facilities with the same complaint. Among patients seeking treatment at drug stores with a positive blood slide, geometric mean parasite densities were low: 3914 parasites per microlitre for children under 5 years and 1168 parasites per microlitre for older children and adults.

Nearly all children under 5 years of age presenting at drug stores (61/66, 92.4%) for whom a hemoglobin level was obtained were anemic with less than 11.0 g/dl. Moderate anemia (hemoglobin <8.0 g/dl) was present in 37.9% of children and two children demonstrated severe, life-threatening anemia (hemoglobin <5.0 g/dl). Clinical diagnosis of malaria was poorly predictive of a positive blood slide result (Table 4), especially among patients older than 5 years. Clinical diagnosis of anemia in children on the other hand, was a good predictor of low hemoglobin level but relatively insensitive.

Patients with a positive blood film were no more likely than those with a negative blood film to have obtained an antimalarial drug at the time of the initial shop visit (16.9% *vs.* 17.1%, $P = 0.97$). We examined factors that might be associated with receiving an antimalarial drug using logistic regression analyses. Independent variables tested included positive blood slide, age under 5 years, education of the household head, prior visit to a health facility and dummy variables for clinical diagnoses of malaria, anemia, acute respiratory infection and gastroenteritis. Only the years of education of the head of household expressed as a continuous variable approached statistical significance (adjusted OR = 0.98, 95% CI: 0.92, 1.04). Findings were similar for models assessing specific physical findings (temperature > 37.5, rapid breathing, pallor, rash and red throat) and symptoms as reported by the patient or caretaker on the day of enrollment (cough, runny nose, sore throat, fast breathing, stomach pain, diarrhea, nausea and vomiting).

Discussion

Recently the role for home and community management for malaria, especially the use of artemisinin-containing combination treatments (ACTs), has been questioned (D'Alessandro *et al.* 2005). Some have argued that community and retail channels will contribute to overuse of costly drugs that should be conserved for those patients who will truly benefit (Charlwood 2004). Others have maintained that improved access to effective antimalarial drugs is urgently needed and can only be achieved through home and community management of symptomatic malaria (Pagnoni *et al.* 2005). Engaging retail pharmaceutical partners, in particular, might also be essential to avoid widescale unregulated use of antimalarial monotherapies, which could undermine the long-term efficacy of ACTs. In a previous study in Ghana, Dunyo and colleagues established that children diagnosed with malaria by caretakers in the household were as likely to have malaria parasitemia as those diagnosed with malaria in health facilities (Dunyo *et al.* 2000). Our findings can further inform this debate by providing evidence that patients for whom fever or malaria treatment is sought in specialist drug stores are as likely to be infected with malaria parasites as those who seek care at health facilities.

It is important to note that this finding occurred in a district where health facility infrastructure had been substantially enhanced (Armstrong Schellenberg *et al.* 2004) and at a time when highly effective ACTs had been consistently available free of charge at all public and registered nongovernment health facilities for more than 18 months. Data collected in Rufiji District before and after the introduction of facility-based ACT show that the proportion of fever-related care-seeking visits made to health facilities rose from 31.8% (95% CI: 26.6, 37.5) in 2001 to 54.7% (95% CI: 49.7, 59.7) in 2004 [IMPACT Collaboration, unpublished data]. There was no significant change observed in the proportion of fever-related care-seeking visits made to drug stores over this same time interval (26.4%–21.7%). Nonetheless, despite improvements in the delivery and uptake of facility-based treatment, residents in Ikwiriri still relied on drug stores for a substantial proportion of the care they obtained for fever or malaria. It is likely that our observations demonstrate a best possible scenario in terms of delivering ACTs through formal sector health facilities. Even under conditions where the new treatments were accessible and available free of charge a substantial proportion of community members elected to seek care from drug stores where the ACTs were unavailable and artemisinin monotherapies largely unaffordable.

In addition to malaria, our findings indicate that children for whom fever or malaria treatment is sought at drug stores are also at substantial risk for anemia and acute respiratory infection, including clinically evident pneumonia. The overlap between malaria and respiratory

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disease, as well as the lack of an accurate correlation between clinical findings, diagnoses and laboratory results indicating malaria or anemia, is not surprising. Similar findings have been documented in clinical settings in other areas of moderate to high malaria transmission (Redd *et al.* 1992; Kalter *et al.* 1997; Tarimo *et al.* 2001, Chandramohan *et al.* 2002). Efforts to enhance the appropriate availability of antibiotic treatment for childhood pneumonia might also consider involving drug stores.

International calls for home and community management of malaria and for deployment of ACTs have also coincided with new calls for enhanced accuracy in diagnosing malaria (Tarimo *et al.* 2001). Clinical definitions based solely on history of fever are prone to overdiagnose malaria, especially among older children and adults who consume the largest portion of antimalarial treatments both at health facilities and drug stores. Our findings suggest that efforts to expand delivery of ACTs beyond formal health facilities should carefully consider enhancing malaria diagnosis as well. How best to accomplish this is less clear. Clinical algorithms that go beyond the presence of fever alone seem to be of limited use (Mwangi *et al.* 2005), even among hospitalised patients (Reyburn *et al.* 2004). A new generation of rapid diagnostic tests for malaria offers promise (Moody 2002), although there is limited experience with deploying them beyond formal health facility settings. Consensus on how to deploy these new diagnostic tests, particularly for directing access to ACTs among children under 5 years living in areas of stable malaria transmission, is currently lacking (World Health Organization 2004).

Our observation that only 17% of clients visiting drug stores for an episode of fever or malaria actually purchased an antimalarial drug before enrolling in the study is somewhat surprising. Drug stores and general shops have been documented as important sources of antimalarial treatment at many sites in Africa (Williams & Jones 2004). Indeed, in Rufiji and adjacent districts in Tanzania, drug stores and general shops were a common source of chloroquine while it was the recommended first-line treatment for malaria (Njau *et al.* 2006). All the drug stores included in this study had antimalarial drugs available throughout the period of observation. However, data collectors noted that sellers simply provided whatever preparation their customers requested and were seldom asked for advice concerning what treatments might be appropriate. It is also not surprising, then, that we failed to find any association between symptoms, clinical findings or clinical diagnoses and purchasing an antimalarial product. The fact that the years of education of the head of household was nearly significantly associated with antimalarial drug purchase confirms an earlier finding from this site comparing care-seeking by socioeconomic status. In a 2001 sample, poorer people and wealthier people with fever sought care from drug stores with equal frequency. However, the poorer people tended to spend less and were less likely to purchase malaria-specific treatment. In this earlier study education of the household head correlated strongly with an index of socioeconomic status derived from information about household construction and asset ownership (Njau *et al.* 2006). An encouraging finding is that those drug store patrons who did obtain antimalarial treatments mostly purchased appropriate drugs and none obtained artemisinin monotherapies.

The very high proportion of drug store clients who obtained antipyretic medications is not surprising. It suggests that patients and their caretakers recognized fever and/or pain as symptoms for which they could obtain some treatment from drug stores. Although chloroquine purchases were once common, antipyretics have historically outsold antimalarial drugs in these communities (Goodman *et al.* 2004). Since adopting SP for first-line treatment of uncomplicated malaria in 2001, the role of retail drug sellers has been unclear. Unlike chloroquine, which was authorized for sale over-the-counter, SP remains legally classified as a prescription only medicine. It is largely unavailable in general shops, which stock primarily pain killers and antipyretics. Its availability in specialist drug stores in Rufiji District has been quietly tolerated by local and regional drug regulatory authorities. The retrenchment of chloroquine, confusion over the regulatory status of SP, general dissatisfaction with SP among consumers and sellers, and the relatively high prices of alternatives like the artemisinin monotherapies probably all contributed to consumers' heavy reliance on antipyretic treatments, even at specialist drug stores where malaria-specific treatments were available. Encouraging the sale of appropriate doses of effective antimalarial treatments at specialist drug stores, in place of or in addition to antipyretics, could be one means for improving coverage of effective malaria treatment.

The regulatory status of retail drug providers is changing in Tanzania. A 2003 Act of Parliament that created the Tanzania Food and Drug Authority (TFDA) actually makes no mention of the part II pharmacies. Instead it is the TFDA's intention to replace these with accredited drug dispensing outlets (ADDOs). ADDOs are privately owned and operated enterprises that receive training, supervision, and access to quality-assured products through enhanced public-sector drugs regulatory authorities. ADDO facilities must meet minimum standards and sellers must attend a structured training program. In return, participating ADDOs benefit from access to a limited range of prescription only medicines, which they may sell, and to low cost

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financing to help refurbish facilities and hire qualified sellers. This concept has been successfully pilot tested in one region of the country and is intended to roll out nationwide in the coming years (Tanzania Food and Drugs Authority 2005).

Among the limitations to generalizability of our findings are the limited geographic location, the cross sectional design, and the likelihood of the data collectors' presence affecting the behaviour of sellers and their clients. The design and geographic setting were necessary concessions to practical difficulties associated with completing such an assessment in an isolated rural area. The effect of data collectors on sellers may have been less than what might be expected. First of all, participation was voluntary, yet all drug store owners operating in the town unanimously agreed to be included in the study. This allowed us to sample from all outlets. By spending equal time at each shop, we recruited a sample that should be representative of all drug store visits in Ikwiriri, based on relative utilization. In addition study team members have conducted extensive qualitative and quantitative research with these vendors for nearly 5 years and a strong trusting relationship has been developed (Goodman 2004). It is uncertain how the data collectors may have affected consumers' behaviour. It is possible that the presence of the data collector dissuaded some potential customers, or that the presence of another person at the counter attracted others. Clients were not approached about the study until their transaction was completed, so antimalarial drug purchases should not have been affected. Perfect rates of enrollment and follow up of eligible participants indicate that drug store clients were very willing to take part in the study.

Finally, deployment of new antimalarial drugs is a poorly understood process characterized more often by reasoned opinion, than evidence-based choices (Bloland *et al.* 2003). As malaria control officials try to balance concerns about equity and coverage while they introduce new treatment initiatives based on ACTs, drug stores or accredited drug dispensing outlets may be attractive partners. These outlets are relatively manageable in number, tend to be less transient than smaller vendors, and are staffed by sellers with at least a modicum of medical training (Goodman 2004). The roll-out of the ADDO concept could enhance these outlets further by reinvigorating local and regional drug regulatory authorities and making them responsible for training, licensing, supervising and assuring quality of product. In addition to enhancing accessibility of essential medicines, ADDOs might be trained to avoid potentially harmful practices such as the inappropriate use of antimicrobial drugs and the sale of antimalarial monotherapies. On the other hand, rolling out ADDOs nationwide – like adopting a national treatment guideline recommending ACT – will require policy makers to commit substantial resources without comprehensive evidence.

Conclusion

This study presents new information about clients who obtain treatment for malaria and fever at drug stores in a rural Tanzanian community. Comparing malaria parasitemia among patients for whom care is sought at drug stores with levels in the general population and among health facility clients has not been documented elsewhere. The findings from this study indicate that patients for whom care is sought at drug stores are more likely to be infected with malaria than the general population and are comparable to patients presenting at health facilities with the same conditions. These findings have important implications for malaria control program officials considering how to engage the private retail sector in expanding coverage of effective malaria treatments. Our findings should contribute to the debate on home and community management of malaria, especially as ACTs roll out and new approaches to malaria diagnosis – both within and outside formal health facilities – become available. In the context of a highly polarized debate without credible evidence to suggest a clear way forward, the concept of accredited drug dispensing outlets stands as a rare compromise between expanding coverage of effective antimalarial treatment and enhancing regulation and enforcement. As it is expanded nationwide in Tanzania, it will be important to assess the public health gains and losses such an innovation entails.

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Prévalence de la parasitémie malarienne chez les patients ayant recours à des traitements contre la fièvre ou la malaria dans les pharmacies en zone rurale de la Tanzanie en 2004

OBJECTIF Déterminer la prévalence de la parasitémie malarienne et autres maladies courantes dans la clientèle pharmaceutique d'une communauté rurale, dans la vision du rôle potentiel des pharmacies spécialisées, pour l'expansion de la couverture du traitement efficace de la malaria dans les familles, en régions fortement endémiques.

MÉTHODES Etude rétrospective de suivi de 2466 visites de clients sélectionnés dans toutes les 10 pharmacies de la ville de Ikwiriri entre le 30 mai et le 31 août 2004. De ces visites, 521 (21,2%) étaient effectuées par ou pour des personnes ayant de la fièvre ou la malaria. 239 participants étaient éligibles en tant que résidents des 9 villages environnantes et ont consenti pour la participation à l'étude. Chaque patient a été évalué par un agent médical et a procuré un échantillon de sang pour la malaria le jour de la visite, soit à la pharmacie ou à domicile.

RÉSULTATS Seules 50 visites (17,1%) par/pour un patient fébrile a résulté à l'achat de médicaments antimalariques, alors qu'un antipyrétique était obtenu pour 226 visites (77,1%). La malaria a été diagnostiquée chez 63% des patients. Les parasites de la malaria ont été identifiés dans les échantillons de sang de 24,2% (IC95%: 19,6–29,5) des patients. Cette valeur correspond au double de la prévalence de parasitémie qui était de 10,7% (IC95%: 8,6–13,1) dans une étude de surveillance des familles de 1004 individus sains sélectionnés dans les mêmes villages au cours de la même période. Mais, elle n'est pas significativement faible par rapport à la prévalence observée chez 880 clients se présentant avec de la fièvre dans les services de santé du district: 29,7% (IC95%: 23,0–37,3). La prévalence de la parasitémie malarique chez les enfants de moins de 5 ans dont les familles recherchaient un traitement pour la fièvre dans les pharmacies (42,1%; IC95%: 31,4–53,5) était équivalente à celle des enfants se présentant avec de la fièvre dans les services de santé (42,5%; IC95%: 25,0–62,2).

CONCLUSION A l'heure actuelle, les clients des pharmacies ne reçoivent pas de traitement spécifique à la malaria dans la majorité des cas ou cela aurait été nécessaire. Les observations parasitologiques indiquent que les clients des pharmacies et principalement les enfants, sont plus susceptibles d'être infectés par la malaria autant que les patients recourant à des soins pour le même type de maladie dans les services de santé. Les pharmacies pourraient être des partenaires attrayants pour les prises de décisions politiques désireux d'engager le secteur privé dans l'expansion de la couverture du traitement de la malaria.

mots clés malaria, traitement, comportement de recours au traitement, pharmacies

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Prevalencia de parasitemia de malaria entre clientes que buscan tratamiento para la fiebre o antimaláricos en farmacias de zonas rurales de Tanzania en el 2004

OBJETIVO Determinar la prevalencia de parasitemia de malaria y otras enfermedades comunes entre usuarios de farmacias de una comunidad rural, para evaluar el papel potencial de farmacias especializadas en aumentar la cobertura del tratamiento efectivo de malaria a familias en áreas de alta endemicidad.

MÉTODO Estudio retrospectivo de 2466 visitas realizadas a 10 farmacias que operan en el poblado de Ikwiriri entre el 30 de Mayo y el 31 de Agosto de 2004. De estas, 521 (21.2%) fueron realizadas por o para personas enfermas con fiebre o malaria. 293 eran residentes de las 9 poblaciones vecinas y todos accedieron a participar en el estudio. Cada paciente fue evaluado por un agente de medicina y facilitó una muestra de sangre para diagnóstico de malaria en el día de la visita a la farmacia, bien sea en la misma o posteriormente en casa.

RESULTADOS Solo 50 (17.1%) visitas realizadas por o para un paciente febril, resultaron en la compra de un antimalárico, mientras que se obtuvieron antipiréticos en 226 visitas (77.1%). Los clínicos diagnosticaron malaria en un 63.8% de los pacientes. Se identificaron parásitos de malaria en 24.2% de las muestras (95% IC: 19.6, 29.5). Esto es el doble de la tasa de prevalencia de parásitos del 10.7% (95% IC: 8.6, 13.1) obtenida de un estudio realizado en las casas de 1004 individuos sanos, seleccionados en estos mismos poblados, al mismo tiempo. No es significativamente menor que la prevalencia observada entre los 880 clientes que se presentaron con fiebre en los centros sanitarios del distrito: 29.7% (95% IC: 23.0, 37.3). La prevalencia de parasitemia entre niños menores de 5 años cuya familia buscaba tratamiento en las farmacias (42.1%; 95% IC: 31.4, 53.5) fue igual a la de los niños que se presentaron con fiebre en los centros sanitarios (42.5%; 95% IC: 25.0, 62.2).

CONCLUSIONES Actualmente, un gran número de casos en los que está justificado, los clientes de las farmacias no compran el tratamiento específico para malaria. Los hallazgos parasitológicos indican que los clientes de farmacias, especialmente los niños, tienen tanta probabilidad de estar infectados con malaria como los pacientes que buscan ayuda por enfermedades similares en los centros de salud. Las farmacias podrían ser aliados atractivos para los políticos que estén dispuestos a involucrar al sector privado minorista en la expansión de la cobertura del tratamiento para la malaria.

Palabras clave malaria, comportamiento de búsqueda de tratamiento, farmacias

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