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Research Article

Malaria Case Management in Children at a Lower-Level Health Facility in Uganda: A Mixed-Methods Study

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ABSTRACT

Background: Malaria is often diagnosed and treated clinically despite negative test results in low-resource settings. This has resulted in substantial overuse of antimalarial drugs and delays in the diagnosis of other febrile illnesses thereby increasing mortality and morbidity. This study aimed to describe the malaria diagnosis and treatment practices for uncomplicated malaria among children aged 2-59 months with fever at a health center in Kampala district.

Methods: This was a cross-sectional study using both qualitative and quantitative methods. The study was carried out at Kisenyi health center IV between January and February 2014. A total of 420 children aged 2-59 months with fever were consecutively enrolled. Information regarding malaria diagnosis and treatment practices were extracted from medical records as caretakers exited from the health facility. Key informant interviews were conducted with selected health workers at the facility. Quantitative data was analyzed using Statistics and Data (STATA) version 10 into proportions, means and medians where appropriate while qualitative data was analyzed using the content thematic approach.

Results: Out of the 420 children with fever enrolled, 162(38.6%) were prescribed antimalarial drugs without laboratory evaluation. Out of the 206 patients who were tested for malaria, all the confirmed positive cases and 72(35%) who tested negative were prescribed antimalarial drugs. Majority of the patients (81%) received artemether-lumefantrine, the recommended first line treatment for uncomplicated malaria while a small proportion (15%) was prescribed non recommended antimalarial therapies. From logistic regression, history of antimalarial drug use was found to be significantly associated with laboratory diagnosis of malaria (p-value 0.02)

Conclusion: Appropriate malaria case diagnosis and treatment is still a challenge in lower-level health facilities. A large proportion of febrile illnesses is clinically diagnosed and treated as malaria and many patients are prescribed antimalarial drugs despite negative test results. This has led to continued misuse of antimalarial drugs and under diagnosis of other causes of fever in children thereby increasing mortality and morbidity. To achieve the universal "test and treat" strategy for malaria case management and control, stakeholders should ensure regular supply of laboratory diagnostic equipment. Regular refresher training is needed so that health workers adhere to the recommended national malaria treatment guidelines. Emphasis should be put on proper examination and treatment of alternative causes of children in fever.

Keywords: Malaria; Antimalaria drugs; Malaria diagnosis; Lower-level health facilities

INTRODUCTION

Malaria is a disease caused by infection of red blood cells with protozoan parasites of the genus Plasmodium. The parasites are inoculated into the human host by a female anopheline mosquito. The four Plasmodium species that infect humans are *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malaria* [1]. In Uganda 90% of the infections are caused by P. falciparum. Malaria remains a major public health problem in Uganda with annual estimates of 10 million cases and 43,000 deaths, of which 91% are in children below 5 years of age [2]. According to a recent report

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from the World Health Organization (WHO), Uganda has the world's third highest malaria incidence, with a rate of 478 cases per 1000 population per year [3].

Malaria is the second leading cause of morbidity and mortality in children under five years in Uganda and is responsible for up to 40% of all outpatient visits, 25% of all hospital admissions and 14% of all hospital deaths [4]. The overall malaria-specific mortality is estimated to be between 70,000 and 100,000 child deaths annually in Uganda [5].

The WHO 2010 guidelines on malaria diagnosis recommend a parasitological confirmation of diagnosis in all patients suspected of having malaria before treating with antimalarial drugs [6]. This is a critical step forward in the fight against malaria as it will allow for targeted use of Artemesinin Combination Therapy (ACT) for those who actually have malaria [7]. This will not only help to reduce the emergence and spread of drug resistance but also identify patients who do not have malaria so that alternative diagnoses can be made and appropriate treatment provided [6,8]. The WHO 2010 malaria treatment guidelines recommend parasitological confirmation either by microscopy or Rapid Diagnostic Tests (RDTs) whenever possible [7]. However, the proportion of patients treated for malaria who have a confirmed diagnosis is still low in Africa compared with other regions of the world [9].

In Uganda, most health centers often face challenges of heavy patient load, inadequate laboratory personnel, frequent stock-outs of commodities including drugs and laboratory supplies [10]. Hence malaria laboratory diagnosis and treatment of uncomplicated malaria using ACTs in children is not a consistent practice [11-13]. A study done in 2007 found that malaria diagnostic aides are not readily available in the peripheral health centers in Uganda and even in facilities where they are available, they are inconsistently used and a high proportion of patients with negative malaria test results are given antimalarial drugs [12]. The same study showed that while the prevalence of fever among outpatients attending health facilities in Uganda is high (79.2%), that of parasitemia is low (28.7%) [12].

Another study done in Mulago hospital in Kampala in 2005 showed that 40-45% of cases diagnosed as malaria are not actually malaria. The study also showed that malaria was responsible for only 32% of febrile episodes in the children studied [11]. However, despite these statistics, documented fever or recent history of fever is still traditionally considered sufficient evidence for prescribing antimalarial drugs. This has led to over diagnosis and treatment of malaria especially in Lassa Hemorrhagic Fever (LHF) [14,12]. Furthermore, for those who are tested, a high proportion (42%) of patients with negative results is still prescribed antimalarial drugs [14].

Yet studies have shown that withholding antimalarial drugs in patients with negative tests is safe [15]. These studies therefore highlight the fact that a substantial amount of antimalarial drugs are still being wasted [16-18]. Furthermore, there is under diagnosis and under treatment of other causes of febrile illnesses thereby increasing morbidity and mortality in children [11,19]. Therefore, this study aims to evaluate malaria diagnosis and treatment practices for uncomplicated malaria among children aged 2-59 months in Kisenyi health center IV in Kampala.

MATERIALS AND METHODS

Study design

This was a descriptive cross-sectional survey with a quantitative and qualitative component. Quantitative data was collected to determine the proportion of children with fever who had a laboratory test performed and the proportion of children who were appropriately treated for malaria.

Qualitative data was collected to determine health worker practices and the factors associated with laboratory diagnosis and treatment of uncomplicated malaria in children with fever.

Study site and setting

The study was conducted at Kisenyi health centre IV in Kampala. Kampala is Uganda's largest urban center and capital city. It covers an area of 189 square kilometers and has a population of approximately 1,723,300 people. It is the largest urban and economic center in Uganda, and it is made up of five divisions that is; Kampala central, Lubaga, Kawempe, Makindye and Nakawa. There are four government hospitals, one health centre IV, two health centre IIIs, eight health centre IIs and numerous private health facilities.

Kisenyi health centre IV: The study was conducted in the outpatient clinic of Kisenyi health center IV. The health centre has approximately 100 staff and the in-charge is a senior nursing officer. There are 2 medical officers who oversee the specialized Tuberculosis (TB) and Human Immunodeficiency Virus (HIV) clinics, 13 clinical officers whose duty is to see the outpatients, 4 laboratory technicians and several nursing and other support staff. The clinic runs from 0900-1700 hours, six days a week except on public holidays. The general outpatient clinic receives about 60 clients on a daily basis and half of these are children. Majority of the patients are low-income earners from the neighboring slums. All the children who are brought to the general outpatient clinic are evaluated by clinical officers who range from 2-4 per day depending on the patient numbers. On arrival at the health facility, patients are triaged by a nurse who sends them to the clinician for evaluation. The clinician then requests for the necessary laboratory tests. The health center has two laboratories; a general outpatient laboratory where malaria tests are done and a specialized laboratory that is funded by the Infectious Diseases Institute (IDI project). The specialized laboratory does HIV tests, CD4, full blood counts and chemistries for patients attending the HIV clinic. General outpatients who require other investigations other than a malaria test are sent to the specialized laboratory with permission from the in charge of the facility. Patients who require inpatient services are referred Mulago National Referral Hospital.

Study population

The study unit was a child aged 2-5 (9 months) with documented fever or history of fever in the past two weeks who was brought to Kisenyi health center IV who fulfilled the inclusion criteria of the study.

Selection criteria

Inclusion criteria: It includes all children aged 2-5 9 months with documented fever or history of fever in the past two weeks who were brought to the outpatient clinic at the health facility during the study period. Children whose caregivers provided informed consent.

Exclusion criteria: Children aged 2-5 9 months with fever or history of fever with confirmed malaria who had been brought for a follow-up visit at the health center within 2 weeks of the current illness.

Sample size estimation

We used the Kish-Leslie formula for sample size calculation to estimate the proportion of children with uncomplicated malaria who received appropriate antimalarial drugs. Using 57.7% as the proportion of patients who received Artemether Lumefantrine (AL) in a study conducted to evaluate the challenges of implementing the ACT policy in Uganda [20], we generated a sample size of 480 participants. A 10% provision for non-response and missing data was made giving a sample size of 418 patients.

Sampling procedure and recruitment

Children aged 2-5 (9 months) with documented fever or history of fever in the past two weeks was consecutively enrolled until the required sample size was attained.

Four key informants were purposively selected based on their involvement in the management of children at the health facility. The key informants included a medical officer, clinical officer, nurse, and a laboratory technician depending on their presence and availability during the study period.

Study variables or measurements

Case definition: This was a child aged 2-5 (9 months) brought to the health center within the study period with documented fever or history of fever within the past two weeks.

Independent variables: It includes

- Socio-demographic characteristics: Age and sex of child, education level, marital status, religion, education and occupation of the caretaker.
- Documented fever or history of fever in the past 2 weeks.
- History of antimalarial drug use.

Outcome or dependent variables: It includes

- Proportion of children who had a malaria diagnostic test (microscopy/RDT).
- Proportion of children correctly treated for uncomplicated malaria using the recommended national guidelines.

Data collection

Quantitative data: A structured questionnaire was used to collect quantitative data. The questionnaire was administered by the investigator or trained research assistant. Interviews were conducted in English, Luganda and Swahili which were the dominant languages in the study population. A daily log/checklist at each health facility was filled to determine the factors associated with appropriate malaria diagnosis and treatment at the health center.

Qualitative data: Qualitative data was collected through key informant interviews with four different cadres of health workers at the health center and these included medical doctors, clinical officers, nurses and laboratory technicians.

Study procedure

Prior to commencement of the study, the director of public health and environment of Kampala Capital City Authority (KCCA) was briefed by the investigator about the details of the study and permission to conduct the study at Kisenyi health center was obtained. The study was conducted between 900 hours and 1700 hours which was the official time during which patients were received at the health facility.

On the day of study children who presented at the health facility with documented fever or history of fever in the past two weeks were consecutively enrolled into the study. After completing their evaluation by the clinician, obtaining laboratory tests and receiving their medication, care takers of these children were asked by a research assistant or investigator whether they were willing to be interviewed before they left the health facility. The caretaker was told the purpose of the study and written informed consent was obtained. Thereafter an interview by the investigator or research assistant was conducted and recorded on a structured questionnaire. The age of the child was calculated in months as the difference between date of data collection and date of birth recorded on the Maternal and Child Health (MCH) card where the card was available. Maternal recall of the birth date was used when there was no card. The caretaker's social demographic characteristics were recorded in the questionnaire.

An inquiry was made about the child's clinical history and prior use of antimalarial drugs during the current illness. On the part of drug use, any antimalarial drugs brought by the caretaker were inspected by the investigator to note the type of drug.

If a caretaker did not recall the drugs used, a pictorial poster with pictures of common antimalarial drugs sold in drug shops in Kampala were shown to the caretaker and if she/he could identify any of the drugs as the ones used, that drug was recorded in the questionnaire.

Patient-held records which included exercise books in most cases were reviewed and the malaria diagnosis method used, the malaria test results, antimalarial drugs prescribed/administered as well as any other drugs were recorded in the questionnaire. The caretaker was thanked for their participation in the study after which they were free to go home.

A daily health center log/check list was filled to record the availability of malaria diagnostic aides (microscopes and RDTs), antimalarial drugs, weighing scales, thermometers, displayed malaria treatment guidelines as well as the number of staff attending to patients at the facility on the day of the study.

Key Informant (KI) interviews were held on appointment with the selected participants at the health facility at the end of the study. Five key informant interviews were conducted, and these included a medical officer, a clinical officer, a senior nursing officer, an enrolled nurse and a laboratory assistant. The interviews were guided by an interview guide with topics for discussion including malaria diagnosis and treatment practices at the health facility, the reasons for diagnosis and treatment practices, gaps and suggestions to improve malaria diagnosis and treatment. Interviews were conducted in English by the investigator as the moderator and the research assistant who took notes. Interviews were audio recorded and transcribed by the investigator. At the end of the interview the KI was thanked for participating in the study.

Data management

Data collection tools were administered and filled by the principal investigator or the research assistant. Open ended

question were coded before data entry.

Quantitative data entry was done by the principal investigator with the help of data entry clerks. An electronic file that resembled the layout of the questionnaire was created using epi data version 3.1 software. Data was cross checked before and during entry for completeness and codes were assigned to any missing values. After data collection, all questionnaires were stored in a secure place to maintain confidentiality.

KI interviews were conducted by the principal investigator with the help of an assistant with experience in qualitative research. Audio recordings of the KIs were transcribed and securely stored by the principal investigator.

Quality control

Questionnaires were pretested before commencement of the study to ascertain if the required information could be obtained using the specific questions. The principal investigator trained the research assistants on data collection procedures before the study. After commencement of the study, daily discussions were held with the research assistant to assess progress and to make any necessary adjustments.

Questionnaires and daily logs were cross checked at the end of each day for completeness by the principal investigator and any errors or missing information was corrected.

Key informant interviews were conducted using an interview guide with predetermined questions and probes. The interviews were audio recorded and transcribed by the principal investigator with the help of an experienced qualitative research assistant who checked the transcripts for completeness against the audio recordings.

Data analysis plan

Quantitative data analysis: Quantitative data was checked for completeness, coded, sorted and entered into the computer using Epi-data version 3.1 and exported to STATA version 10 software for analysis. Categorical data was expressed as frequencies and proportions and displayed in form of tables while continuous variables were expressed using means and medians with their respective measures of dispersion.

Binary logistic regression was used to determine associations between dependent and independent variables. Confidence intervals of 95% were used and p-values below 0.05 were considered significant.

Qualitative data analysis: Analysis of qualitative data was done manually after transcribing. Content thematic approach was used for data analysis. This involved, reading scripts several times, identifying themes and sub-themes and grouping data according to these themes. Two independent investigators conducted the analysis. Each of them read the scripts separately to identify themes and sub-themes. They then met to discuss areas of agreement and disagreement and compiled a list of codes that applied to all the scripts. Direct quotations from respondents were identified and used in the presentations of the study findings. Approval to conduct the study was obtained from the Makerere University College of Health Sciences Research and Ethics Committee and the Uganda National Council of Science and Technology. Permission to conduct the study at Kisenyi health center was sought from the district authorities at Kampala Capital City Authority (KCCA). Caretakers of the children were briefed about the study and upon acceptance, written informed consent was obtained before the questionnaires were administered. For purpose of confidentiality only study specific serial numbers were used instead of the names of respondents.

RESULTS

The study was conducted between January and March 2014 at Kisenyi health center IV which is a tertiary health center in the suburban areas of Kampala. A total of 600 children aged 2-59 months who attended the health facility during this period were screened as they exited the health facility. Four hundred and twenty children (420/600) with fever fulfilled the inclusion criteria and were thus enrolled in the study. Two hundred and six (49%) were tested for malaria using either microscopy or RDT. All those that tested positive were treated with an antimalarial drug. However, a significant number of negative ones were also treated for malaria. Out of the 214 children who were not tested for malaria (76%) were presumptively diagnosed and treated for malaria. Other details are presented in the study profile in Figure 1.

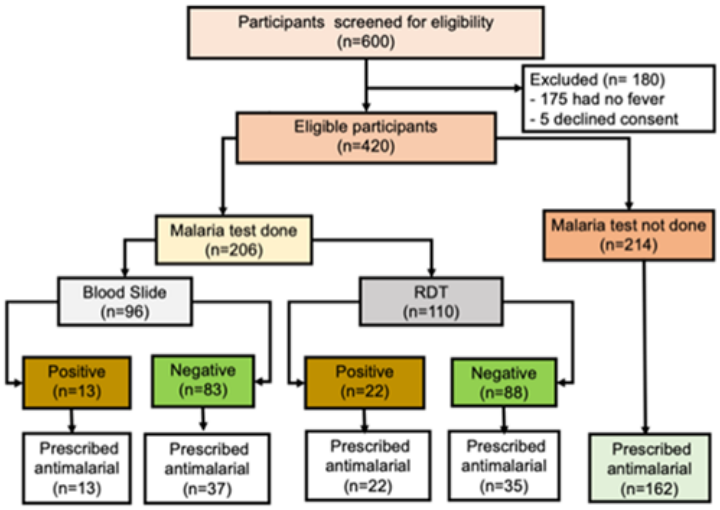

Figure 1: Socio-demographic characteristics of 420 children and their caretakers.

Background characteristics

A total of 420 children aged 2-5 (9 months) were enrolled into the study of whom 222 (53%) were male. The median age was 18 months (Interquartile Range (IQR) 10-36 months) with the majority of the children (64.3%) older than one year.

The median age of the caretakers was 26 years (IQR 22-32 years). The majority of the caretakers (91.4%) were biological parents mainly mothers which is typical to other Ugandan settings where childcare is predominantly a preserve for women. The fathers constituted about 5% of the caretakers.

Sixteen (4%) of the caretakers had no formal education, 404 (96%) were educated with most (48%) having attained primary education (Table 1).

Clinical symptoms in children studied

The median duration of fever for the 420 children who were enrolled was 3 days (IQR 1-14 days). Apart from fever, the other symptoms that were reported by the caretakers are summarized in the below Table 2.

Clinical diagnoses in children with fever at the health center

Malaria was the commonest diagnosis made by clinicians in children who presented with fever at the health facility. This was followed by upper respiratory tract infections and diarrhea. Four children had severe disease during the study period and were referred to mulago national referral hospital, one had severe pneumonia and the remaining three had severe forms of malaria (Table 3).

Malaria case diagnosis in children aged 2-5 (9 months) with fever at the health facility

Laboratory diagnostic aides at the facility included RDTs and a microscope. However, two weeks into the study there was a stock out RDTs. Children with fever who were brought to the health facility had a malaria test done either by RDT (when available) or microscopy whereas others received antimalarial drugs without a malaria test (clinical diagnosis). Overall, 214/420 (51%) patients had a presumptive clinical diagnosis of malaria whereas 206/420 (49%) patients with fever had a malaria test done. There were 35 positive malaria test results (13 by microscopy and 22 using RDT). Negative test results were almost similar in those tested by microscopy or RDT (83 and 88 respectively). The different malaria diagnosis methods are indicated in the given below Table 4.

From the Key Informant Interviews (KII), it was reported that various methods were used to diagnose malaria at the health facility. These methods included presumptive clinical diagnosis, microscopy and RDTs. The diagnostic method used was influenced by a number of factors such as availability of electricity, diagnostic aides and patient numbers.

Table 1: Socio-demographic characteristics of 420 children and their caretakers.

Category	Characteristics	N=420	Percentage
	Child		
Age(months)	≤ 12	150	35.7
	>12	270	64.3
Gender	Female	198	47.1
	Male	222	52.9
ITN use	Yes	370	88.1
	No	50	11.9
	Caretaker		
Age(years)	≤ 25	194	46.2
	>25	226	53.8
Gender	Female	400	95.2
	Male	20	4.8
Relationship with child	Biological parent	384	91.4
	Others	36	8.6
Education status	No formal education	16	3.6
	Primary	200	47.6
	Secondary	180	42.8
	Tertiary	24	5.7
Marital status	Married	283	67.4
	Not married	137	32.6

Table 2: Other symptoms reported by the caretakers of children aged 2-59 months with fever.

Symptom	N=420	Percentage (%)
Cough	251	59.8
Diarrhea	170	40.5
Vomiting	134	31.9
Poor appetite	58	13.8
General weakness	18	4.3
Difficulty breathing	10	2.4
Convulsions	9	2.1

Table 3: Clinical diagnoses in children aged 2-59 months with fever.

Clinical diagnosis	N=420	Percentage (%)
Malaria	258	60.8
URTI	107	25.5
Diarrhea	29	6.8
Others	30	7.1

Table 4: Malaria diagnosis methods among children with fever at Kisenyi HC IV.

Malaria diagnosis method	N=420	Percentage (%)
Clinical diagnosis	214	51
Laboratory diagnosis	206	49
Microscopy, n(%)	96(46.6)	
RDT, n(%)	110(53.4)	

In relation to laboratory diagnosis, key informants noted: It depends on what is in the lab, we use microscopy all the time as long as there is power (electricity) but when there is no power, we use RDT (Clinical officer)

Indeed, during the time of the study, power shortages were observed on several occasions and the health facility did not have a generator. In such instances, RDTs were used when available. During the study period however, RDTs run out of stock for about two weeks. Heavy workload also emerged as a factor for using clinical diagnosis. When there is high workload especially on Mondays we rely on clinical diagnosis (Clinical officer). The occurrence of common signs of malaria was another basis for clinical diagnosis as noted by the health workers.

Sometimes we health workers use clinical diagnosis when the patient has fever, headache, general body weakness, no appetite, vomiting (senior nursing officer). Some respondents noted that it was important to use microscopy to quantify the severity of malaria. However, RDT was also important since it is faster and reduces on the waiting time especially when there are many patients at the health facility.

We usually use RDT when there are many patients to reduce on the Turn Around Time (TAT), it helps speed the process (Laboratory assistant). Health workers also mentioned that microscopy-based diagnosis was prioritized in patients who had received antimalarial drugs before coming to the health facility. If the mother tells us the child has been taking antimalarials, we test using microscopy (Medical officer). In a few instances caretaker concerns were mentioned as a factor influencing the choice of diagnosis. Most caretakers prefer going to the lab whereas others don't want to sit for long lining up for their children to be tested, so they don't want to go to the lab (Enrolled nurse/dispenser)

Malaria treatment among children with fever at the health facility

The Uganda Ministry of Health recommends artemether-lumefantrine (coartem) as the first line treatment for uncomplicated malaria. About two-thirds (270/420) of the patients with a history of fever had a prescription of antimalarial drugs from the health facility. The antimalarial drugs available at the health facility during the study period were artemether-lumefantrine (coartem) and injectable quinine. Other antimalarials were not available and patients who received prescriptions of these drugs had to source them from elsewhere. Majority of the patients (81%) received artemether-lumefantrine (coartem) (Table 5).

From the key informant interviews, the respondents gave a variety of reasons for administering antimalarial drugs for children who present with fever at the health facility. These included the patient's clinical signs and symptoms, severity of the illness and malaria test results.

The presence of malaria symptoms was common basis for treating children with fevers irrespective of whether a malaria test was done. I give antimalarial drugs if the child has clinical symptoms like fever, headache, abdominal pain and vomiting whether a laboratory test is done or not (Clinical officer). Of course, if the child has a positive blood slide or RDT, we have to give the antimalarial drugs but sometimes we base on only clinical symptoms (senior nursing officer)

Emerging from the above voices is the fact that while most health workers were aware of using a positive slide or RDT as a basis for malaria treatment, presumptive treatment based on malaria symptoms was still common.

The antimalarial drug prescribed/administered depended on the type of drug available at the health facility. Most of the health workers cited artemetherlumefantrine (coartem) as the common antimalarial drug used since it is the recommended first line treatment for uncomplicated malaria in the country. We usually use coartem since it is available...and it is the recommended first line drug (Medical officer)

The first line is coartem and if they don't respond, we give quinine. We also have fansidar but it is rarely used (Clinical officer). In general, artemether-lumefantrine (coartem) was the major drug used for uncomplicated malaria being the first line supplied by the public sector. Health workers however resorted to quinine if patients did not improve. If the child is very sick, it is good to give a starting dose of Intramuscular (IM) quinine, then refer to Mulago (Enrolled nurse/dipenser). Sometimes we end up prescribing for them artemether or artesunate but it is rarely available here so the patients have to buy it from clinics (Clinical officer).

Antimalarial drug prescription in patients with negative test results

Overall, antimalarial drugs were prescribed to 270/420 who presented with fever at the health facility. One hundred and sixty-two patients 162/270 (60%) with a prescription

of antimalarial drugs had a presumptive clinical diagnosis of malaria whereas 108/270 (40%) were tested for malaria. An antimalarial drug was prescribed to all the patients who had positive RDT or blood smear results. In contrast, 72 patients with negative malaria test results were prescribed antimalarial drugs (Table 6).

From the KII, majority of the health workers reported giving antimalarial drugs to patients with negative test results. They noted that a number of patients receive antimalarial drugs from various sources before coming to the health facility and so they end up with negative malaria test results. We cannot just rely on laoratory results because the mother will tell you I gave the child some panadol and two coartem tablets last night, automatically the parasite has to hide (Enrolled nurse/dispenser). Most KIs revealed that it was appropriate to give antimalarial drugs despite a negative malaria test result if the child is very sick, had symptoms of malaria or if prior antimalarial drugs had been given. In view of the complexities of a negative blood slide and the decision to treat or not to treat with an antimalarial, health workers observed. If there is no Urinary Tract Infection (UTI) or septiceamia and CBC (Complete Blood Count) shows no bactereamia, but the child still has fever, I don't know why I should not give antimalarials. Actually I would give Intravenous (IV) artesunate if the child is very sick (medical officer). A laboratory assistant noted that a negative malaria test does not necessarily rule out malaria as this depends on the life cycle of the malaria parasite. It depends on the life of the malaria parasite, if the parasite is in the liver, it may not show in the peripheral smear.

From the KII, it was also noted that care takers' demands influenced antimalarial drug prescription by health workers when the patients had negative malaria test results. At times the parents insist and I end up giving them coartem even when the lab test is negative (Clinical officer)

Prior history of antimalarial drug use in children who presented with fever at the health facility

Out of the 420 children who presented with fever within the past two weeks, 117(27.8%) received antimalarial drugs before coming to the health facility. Of these majority 89(76%) received ACTs, the rest received other antimalarial drugs (Table 3). Patients obtained antimalarial from multiple sources, the majority having received them from clinics and drug shops (74.4%). At the health facility, 69/117(59%) patients in whom prior antimalarial drug use was reported had a laboratory test done and of these, 15 patients had positive test results. A total of 81/117(69%) with reported history of prior antimalarial drug use received antimalarial drugs at the health facility.

Factors associated with appropriate malaria diagnosis among children with fever

The current recommendation by WHO is laboratory diagnosis of malaria before treatment is initiated. The factors that were associated laboratory diagnosis in children who presented with fever at the health facility are summarized in below Table 7. History of antimalarial drug use was among the patient factors that were associated with appropriate diagnosis of uncomplicated malaria in children aged 2-59 months (p value- 0.021). The other factors such as child age or history of fever had no influence on laboratory diagnosis of uncomplicated malaria.

Table 5: Antimalarial drug prescriptions among children with fever at Kisenyi HC IV.

Antimalarial drug	N=270	Percentage (%)
ACT AL	219	81
Artemether	5	2
Duocotexin	2	1
Other antimalarials		
Quinine	42	16

Table 6: Malaria diagnosis and antimalarial drug prescription among children with fever at Kisenyi HCIV.

Test Result	Antimalarial drug	
	Yes	No
Microscopy, N=96		
Positive, n=13	13(100%)	0(0%)
Negative, n=83	37(44.6%)	46(55.4%)
RDT, N=110 Positive, n=22	22(100%)	0(0%)
Negative, n=88	35(40%)	53(60%)
No test, N=214	162(76 %)	52(24%)

Table 7: Factors associated with laboratory diagnosis of uncomplicated malaria in children with fever at Kisenyi HCIV.

Laboratory diagnosis	OR	95% CI	P-value
Age	1.19	0.78-1.81	0.428
Fever	1.09	0.70-1.70	0.7
History of antimalarial use	0.58	0.36-0.92	0.021

DISCUSSION

This was a descriptive cross-sectional study that was done to determine the proportion of children with fever who had a malaria diagnostic test and to describe the treatment of uncomplicated malaria in these children. The secondary objective of the study was to determine the factors associated with laboratory diagnosis of malaria at a health centre IV in an urban setting in Uganda.

In this study, nearly half of the children aged 2-59 months who presented with fever at the health facility had a malaria test done either by microscopy or RDT. Compared to previous studies in Uganda, this was a big proportion of patients undergoing malaria laboratory diagnosis. In a cross-sectional study done in government and private not for profit health facilities in Eastern Uganda in 2009, 34.5% of febrile patients were tested for malaria. However, this study was done in a rural setting compared to the current study [11]. This shows that laboratory diagnosis of malaria has improved compared to previous studies. This could be since malaria laboratory diagnosis is currently supplemented by RDTs. The results also showed that prior history of antimalarial drug use was significantly associated with laboratory diagnosis of malaria. This was further noted in the qualitative analysis where health workers revealed that laboratory diagnosis was prioritized for patients who had received antimalarial drugs before coming to the health facility.

However, almost an equal proportion of patients were still presumptively diagnosed and treated for malaria. This is verified by the fact that more than half of the children who were not tested for malaria were prescribed antimalarial drugs. This is contrary to the current WHO guidelines which recommend that whenever possible, in all settings, clinical suspicion of malaria should be confirmed with a parasitological diagnosis either using microscopy or RDT [7]. Our findings also indicate that the test and treat policy which was adopted by Uganda in 2006 has not yet been fully implemented [21]. From our observation and key informant interviews, the number of patients who were clinically diagnosed for malaria increased when RDTs were out of stock and when there was no electricity at the health facility. Other health system factors that were noted to influence clinical diagnosis of malaria included inadequate staff and high patient numbers at the health facility. These health system factors are common in other public government health facilities in Uganda. From this perspective, the study findings are therefore relevant in other lower- level health facilities where the same challenges are still being faced.

A previous study done in Tanzania in 2004 showed that clinical diagnosis of malaria has a very low specificity and sensitivity [22]. Therefore, by treating all febrile cases as malaria leads to over diagnosis of malaria and this may cause other infections to be under diagnosed and untreated thereby increasing morbidity and mortality in children with fever. Furthermore symptom overlap of infections was found to be common (37%) in children with malaria diagnoses in a study done in Uganda in 2004 [17]. This therefore highlights the importance of investigating and treating alternative causes of fever in children. In addition, presumptive diagnosis and treatment of malaria constitutes irrational use of expensive ACTs and could potentially lead to emergence of drug resistance [23].

Overall, one in five of the children who had a malaria diagnostic test had positive results. This is a reflection of the current endemicity of malaria in Kampala [24]. The low prevalence of parasitemia in our study could also be explained by the fact that three out of ten patients who presented with fever received antimalarial drugs from various sources before coming to the health facility. Studies done in Eastern and Northern Uganda found a higher (27.8%) prevalence of malaria among outpatients with fever [11]. This study in rural Uganda was however done in areas of high malaria endemicity.

Nearly one third of the patients who did not have any parasitological evaluation were prescribed antimalarial drugs. For those who were tested, antimalarial drugs were prescribed to all patients with positive malaria test results and four out of ten patients with negative results. This shows that many patients who were not eligible received ACTs and therefore a substantial quantity of drugs were misused. In most of the cases, the first line drug was prescribed meaning that majority of the health workers were following the recommended guidelines. The results also showed that prescription of antimalarial drugs to patients with negative malaria test results is still a common practice among health workers. Studies in Uganda and Tanzania have showed that withholding antimalarial therapy in febrile children with negative blood smears is safe with no increased risk of complications [15,25]. From the key informant interviews, a number of participants reported that it was appropriate to give antimalarial therapy in the presence of negative test results because majority of patients initiate antimalarial therapy before coming to the health facility thereby causing the malaria parasite to "hide" when a malaria test is performed. Other causes of poor adherence to negative malaria test results mentioned were presence of malaria symptoms, severity of the child's illness and caretaker's demands for antimalarial drugs. At the health centre, majority of the prescribers were clinical officers who reportedly had training in malaria case diagnosis and treatment a year prior to the study. From observation it was also noted that there were no wall charts or malaria treatment guidelines in the clinicians' examination rooms. These findings depict the challenges affecting policy implementation. While the policy of test and treat has been adopted by Uganda, more efforts are required targeting health care provider's knowledge and attitudes but also the general public as consumers of these services to popularize the policy [2,26].

It was observed that one in three patients reported after they had used antimalarials. The majority used the recommended first line therapy (AL) however a few patients used ineffective drugs like fansidar and chloroquine that are no longer recommended by the malaria control policy. These antimalarial drugs were mainly sourced from private for-profit service providers like drug shops and clinics. A recent study in Uganda in 2011 found that the quality of health care provided by the private sector was inadequate and only 10% of the febrile children received appropriate treatment for malaria [27,28]. These findings therefore highlight the need for continuous public awareness and strengthening of public private partnerships as well as regulation of the private sector to ensure policy compliance.

CONCLUSION

The study findings show that laboratory diagnosis of malaria is still a challenge in lower-level public health facilities. A large proportion of febrile illnesses is still clinically diagnosed and

treated thereby undermining the efforts for the universal "test and treat" strategy for malaria. The factors associated with laboratory diagnosis of malaria were mainly health system factors which are challenges faced by many public government health facilities in Uganda. Therefore, in order to improve appropriate malaria case management and control; stakeholders should ensure regular supply of RDTs since they are easy to use, do not require electricity and are faster especially in the setting of high patient numbers, regular refresher training of health workers is needed so that they adhere to the recommended national malaria treatment guidelines and policy makers and clinicians should develop clear guidelines regarding antimalarial drug use in febrile patients who test negative for malaria.

LIMITATIONS

Like any cross-sectional study it was not possible to eliminate bias. Since the study involved exit interviews, health workers were not observed during assessment and prescription. However, the health workers were aware that the study was going on. This could have influenced health worker practice regarding malaria diagnosis and treatment.

DECLARATION

Ethical approval

The study protocol was approved by the Makerere University College of Health Sciences Research and Ethics Committee and the Uganda National Council of Science and Technology. Informed written assents were obtained from study participants through their caregivers. The ethical principles outlined in the Declaration of Helsinki were strictly adhered.

CONSENT TO PARTICIPATE

Informed written assents to participate in the study were obtained from the caregivers of the study participants.

CONSENT TO PUBLISH

Assent to publish study findings were obtained from the caregivers of the study participants as they were being enrolled into the study along with assent to participate in the study.

COMPETING INTEREST

All authors declare that no competing interests exist.

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AVAILABILITY OF DATA AND MATERIALS

The minimal dataset is available within the paper. Additional data is available upon reasonable requests from the corresponding author

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