

SCHOOL OF PUBLIC HEALTH  
COLLEGE OF HEALTH SCIENCES  
UNIVERSITY OF GHANA

MALARIA DIAGNOSIS AND TREATMENT PRACTICES IN TOLON DISTRICT,  
NORTHERN REGION

The crest of the University of Ghana is a shield-shaped emblem. It features three golden wheat stalks at the top, with the word 'BY' centered between them. Below the stalks, the name 'TAHIRU UKASHA' is written in black capital letters. Underneath the name, the identification number '(10508382)' is displayed. The central part of the shield contains a golden decorative motif consisting of two interlocking spirals and a horizontal bar with arrowheads at its ends. At the bottom of the shield, a banner contains the Latin motto 'INTEGRUM PROCEDAMUS' in golden capital letters.

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## DECLARATION

I, Tahiru Ukasha, declare that except for other people's investigations which have been duly acknowledged, this thesis is the result of my own original research undertaken under supervision and that it has neither in whole nor in part been presented for another degree in this university or elsewhere.

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## DEDICATION

I dedicate this work to Almighty Allah, who by His abundant grace and mercies has led me this far. I further dedicate this thesis to my family and friends for their support and encouragement and prayer.



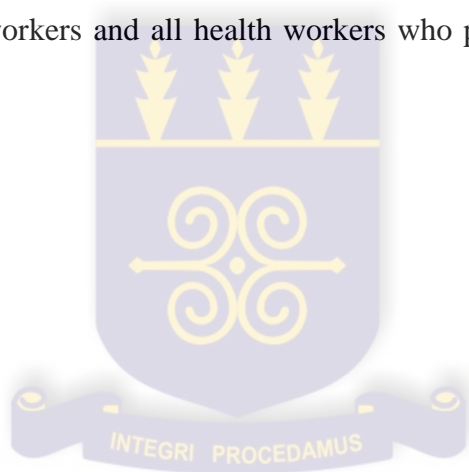
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Finally, to my field workers and all health workers who participated in this study I say thank you.



## ABSTRACT

**Introduction:** Effective case management involving prompt parasitological diagnosis and treatment with Artemisinin-based Combination Therapy (ACT) has been recognized as the cornerstone of malaria control strategies. Despite Ghana's adoption of these recommendations, malaria accounts for 66 % of all OPD cases in Tolon District which is higher than the regional average. This puts doubts in malaria diagnosis and treatment practice. This study therefore sought to assess malaria diagnosis and treatment practices in the Tolon District.

**Methods:** A health facility based cross sectional study was conducted in the Tolon District from December 2014 to May 2015 to assess malaria diagnosis and treatment practices. Direct observation of patient consultations, interviews and record abstraction were employed for data collection. Categorical variables were expressed as proportions and continuous variables were summarized. Logistic regression was used to assess associations between test and treat and the independent variables.

**Results:** The study assessed six health centres, 25 health workers, 175 patient consultations and 420 patient records. Testing rate was 67.1% (278/420). ACT was prescribed to 89.3% of the patients and only 41.0% of suspected malaria patients were diagnosed and treated with ACT. However 57.5% (50/87) of patients with negative test results received ACT and 75.9% (104/137) of those who were not tested also received ACT. Compliance to treatment guidelines was found to be associated with type of facility and supervision. Compared to health centres, CHPS has 0.64 times [AOR = 0.64, 95% CI: 0.43-0.95] decreased likely hood of compliance to guidelines and supervised health workers are 2.50 times [AOR = 2.50, 95% CI: 1.15–5.41] more likely to comply with

guidelines. Cadre of health worker, training, years served by health worker and patient age were not significantly associated with compliance to treatment guidelines.

**Conclusion:** Malaria diagnosis and treatment practice in Tolon District is sub optimal. Despite availability of RDT, only 67.1%(282/420) of suspected malaria cases were tested and 89.3% (375/420) of the patients received the first line treatment drug AA and 57.5% (50/87) of patients who tested negative for malaria and 75.9% (104/137) of patients not tested for malaria received ACT. Compliance is higher in health centres than in CHPS. Supervision should be intensified especially in the CHPS compounds.



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## LIST OF ACRONYMS

AA	Artesunate-Amodiaquine
ACT	Artemisinin-based Combination Therapy
AL	Artemether-Lumefantrine
AMFm	Affordable Medicine Facility-malaria
CHPS	Community-based Health and Planning Services
DHMT	District Health Management Team
DP	Dihydroartemisinin-Piperaquine
IMCI	Integrated Management of Childhood Illnesses
ITN	Insecticide Treated Net
IPT	Intermittent preventive treatment
NHIS	National Health Insurance Scheme
NMCP	National Malaria Control Program
OPD	Outpatient Department
QHP	Quality Health Partners
RDT	Rapid Diagnostic Test
SMC	Seasonal Malaria chemoprevention
SP	Sulphadoxine-Pyrimethamine
TBMM	Test Base Malaria management
WHO	World Health Organisation

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

Malaria is an acute febrile illness caused by a protozoon parasite of the genus plasmodium and transmitted through the bite of female anopheles mosquito. The main Anopheles species in Africa are *An. gambiae* and *An. Funestus*. Ghana has a prevalence rate of 52% and 48% for *An. gambiae* and *An. Funestus* respectively with varied Monthly Entomological Inoculation Rate (EIR) between zero and 388 infective bites (Kasasa et al. 2013). There are five species of parasites that affect man: *P. falciparum*, *P. vivax*, *P. malariae*, *P. ovale* and *P. knowlesi*. The predominant parasite species is *P. falciparum*, which causes the most severe form of malaria and this causes high fever and chills. It is most predominant in Africa, Southern Asia, Central America, and South America. , *plasmodium ovale* and *plasmodium malariae* caused milder disease in human s that is not generally fatal. The fifth species, *plasmodium knowlesi*, is a zoonosis that causes malaria in macaques but can also infect humans Severity of the disease depends largely on the species of infecting parasite, age of the person and state of immunity. In 2010 there were 252 million episodes of clinical *P. falciparum* malaria in Africa (Griffin, Ferguson, and Ghani 2014).

Malaria remains a major public health problem worldwide with an estimated 3.3 billion of the world's population being at risk of the disease (World Health Organization, Global

Malaria Programme, and World Health Organization 2014). Though preventable and curable, malaria burden is high especially among children and pregnant women in most developing countries. Globally, Malaria prevalence is on the decrease but it still remains a public health challenge in Africa. According to the latest estimates, 198 million cases of malaria occurred in 2013 and the disease led to 584 000 deaths. The burden is heaviest in the WHO African Region, where an estimated 90% of all malaria deaths occur, and in children aged under 5 years, who account for 78% of all deaths (World Health Organization, Global Malaria Programme, and World Health Organization 2014).

Economic burden of malaria cannot be over looked, in 2013, global expenditure on malaria was US \$ 2.7 billion representing approximately 53% of the amount required to achieve global malaria control and elimination targets. This was from available international and domestic funds(World Health Organization, Global Malaria Programme, and World Health Organization 2014).In 2014 PMI spent US \$5.5 million on malaria diagnostics and treatments and US \$ 4.5 million on training of personnel(“ghana\_mop\_fy14.pdf,” 2014.).

Malaria control involves prompt diagnosis and treatment of all patients and also preventing the entire population, especially the vulnerable group, from getting malaria. Preventive strategies are targeted at controlling the vector, which employ integrated vector management approach including use of Insecticide Treated Nets (ITNs), Indoor Residual Spraying (IRS) and environmental management coupled with Intermittent Preventive Treatment of malaria in pregnancy (IPTp), Intermittent Preventive Treatment of malaria in infants (IPTi) and Seasonal malaria chemoprevention (SMC).

Prompt diagnosis and treatment leads to a rapid and complete cure of the Plasmodium infection thereby reducing the human parasite reservoir. This curtails the disease transmission and progression thus reducing morbidity and mortality.

Malaria diagnosis and treatment has evolved over the years from presumptive treatment to a recent test and treat policy. This policy calls for universal parasitological confirmation of all suspected malaria cases and treating only confirmed cases with efficacious and relatively expensive Artemisinin-based Combination Therapy (ACT). Until recently, prescription practices in malaria case management varied greatly in sub-Saharan Africa with chloroquine and Sulphadoxine-Pyrimethamine (SP) being the main stay of malaria treatment. However, as a result of intense parasite resistance, the use of more effective ACTs has become the new trend, replacing chloroquine and SP which had become ineffective in most areas endemic for Plasmodium falciparum malaria. In 2004, Ghana made a transition from chloroquinemonotherapy, joining other countries that had adopted ACTs for the treatment of uncomplicated malaria. As at 2009, most *Plasmodium falciparum* endemic countries and territories majority from the WHO African Region had adopted ACT in their national drug policy.

In Ghana, though Artesunate-Amodiaquine (AA) remains the recommended first line ACT for treating uncomplicated malaria, revised malaria case management guidelines have made provision for Artemether-Lumefantrine (AL) and Dihydroartemisinin-Piperaquine (DP) as alternatives for patients who do not tolerate AA. With these alternatives health workers are no longer restricted to AA for the treatment of uncomplicated malaria. The guidelines also strongly recommend universal diagnostic testing and prescription of ACTs for only confirmed malaria patients. However, lack of diagnostic services at lower level

facilities as well as individual differences in health workers' clinical judgments and decision-making preclude strict compliance to this guideline. Variations in prescription practices are therefore bound to occur, making conformity to existing guidelines doubtful.

## **1.2 Problem Statement**

Globally, Malaria prevalence is on the decrease but it still remains a public health challenge in Africa. According to the latest estimates, 198 million cases of malaria occurred in 2013 (uncertainty range 124–283 million) and the disease led to 584 000 deaths (uncertainty range 367 000–755 000). The burden is heaviest in the WHO African Region, where an estimated 90% of all malaria deaths occur, and in children aged less than 5 years, who account for 78% of all deaths (WHO, Malaria Report 2014). In Ghana it remains the number one cause of OPD attendance with a general OPD attendance rate of 30%, 27% inpatient morbidity and 7.2% mortality rate in 2014 (NMCP, 2014). However, proper diagnosis and treatment practice particularly at the peripheral level is vital to its control.

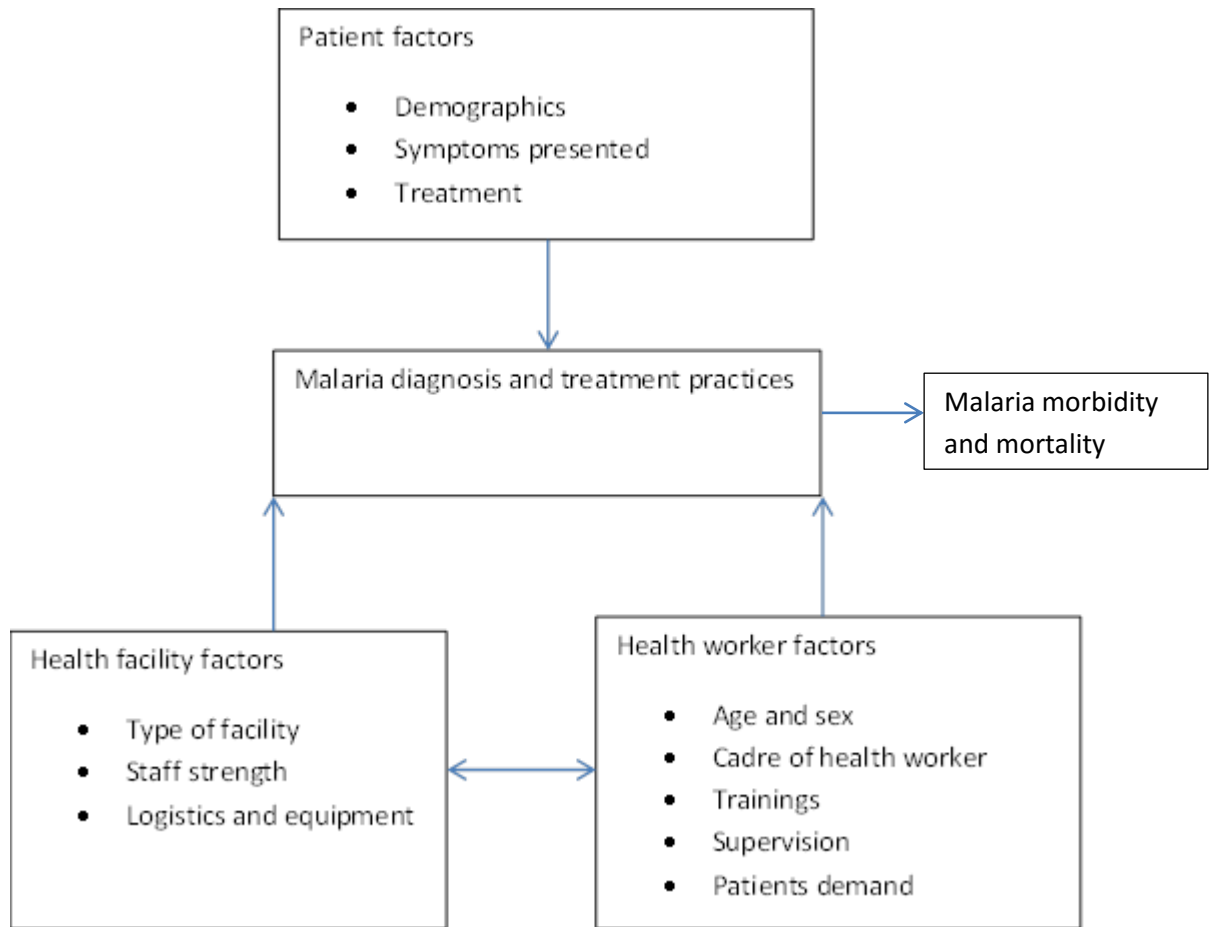
Proper diagnosis and treatment depends on availability of rapid diagnostic tests (RDTs) and other logistics as well as trained health workers. Supervision and availability of treatment guide in facilities can also affect treatment practice positively. Current WHO recommendations for diagnosis and treatment include; (i) Prompt parasitological confirmation by microscopy or alternatively by rapid diagnostic tests (RDTs) for all patients with suspected malaria before treatment. Treatment solely on the basis of clinical suspicion should be considered only when a parasitological diagnosis is not accessible. (ii) An additional ACT, dihydroartemisinin-piperaquine, has been added to the treatment options (Aregawi et al. 2009). Ghana adopted this cost effective and efficient malaria

treatment policy. Compliance to this policy guidelines will reduce over prescription which goes a long way to reducing the chances of malaria parasites developing resistance to the ACTs. The cost-effectiveness of implementing test based management of malaria hinges on health workers adhering to test-results and restricting ACTs to test positive cases while looking for other causes of fever in the test-negative cases. The rates at which clinicians across sub-Saharan Africa have ignored negative test results and prescribed antimalarial have been high (Abreha et al. 2014) where 51% of test negatives were prescribed with ACT and chloroquine. There is generally high discordance between practice and the malaria management guidelines studies in Africa (Landman et al. 2015; Gerstl et al. 2015; Mazigo et al. 2011; Pulford et al. 2012)

Malaria diagnosis and treatment practice in Ghana, especially at the peripheral level is arguably not optimum. Malaria Morbidity remains high in Ghana, casting doubts on diagnosis and treatment practice. In Northern region, malaria prevalence is 40% higher than the national prevalence of 27.5% (NMCP, 2014). In Tolon district, malaria is the leading cause of morbidities accounting for 66% of all OPD cases which is higher than the regional average. This makes it doubtful given the decline in OPD malaria case in the country and also the district lying in the savannah zone with short rainy season in which plasmodium species flourish. The higher figures may be due to practitioners holding to presumptive treatment with little attention to the malaria treatment guidelines.

Compliance to the 'test, track and treat' policy is needed in order to reduce the incidence of malaria. This study therefore seeks to assess the malaria diagnosis and treatment practice in Tolon district.

### 1.1.3 Conceptual Framework



**Figure 1 Conceptual framework**

### 1.3 Narrative of the conceptual framework

Malaria diagnosis and treatment involves interplay of factors at health facility; health worker and patient levels. Diagnosis and treatment according to the ‘Test track and treat’ policy has effect on morbidity and mortality from malaria

## **1.4 Justification**

In order to achieve global and national targets of malaria control, diagnosis and treatment of malaria treatment must conform to the ‘test track and treat’ policy just like other control strategies. Prioritizing the test and treat policy of malaria control at all levels especially the peripheral level is key to the achievement of the sustainable development goals. The results of this study will be useful to the Northern Region, the President’s Malaria Initiative (PMI) and the country as a whole. The Northern Region and the Malaria Control Program can use the results as baseline to assess adherence the ‘test track and treat’ policy of malaria and identify areas to inform policy interventions.

The study will also generate information on the proportion of malaria cases that are confirmed by either microscopy or RDT and proportion that are placed on appropriate anti-malarial treatment. This will reflect compliance to the ‘test track and treat’ policy. Also, factors influencing diagnosis and treatment of malaria, such as type of facilities with diagnostics, staff strength and cadre of staff will guide policy interventions as far as malaria diagnosis and treatment is concerned.

## **1.5 Study Objectives**

### **1.5.1 General Objective**

To assess malaria diagnosis and treatment practices in Tolon district, Northern region, Ghana

### **1.5.2 Specific Objectives**

1. To determine proportion of suspected malaria cases that received parasitological test.
2. To determine proportion of confirmed malaria cases who received anti-malarial according to the national guideline.
3. To determine the proportion of patients with negative parasitological test who received anti-malarial contrary to treatment guidelines
4. To determine the factors that influence malaria diagnosis and treatment according to treatment guidelines

## CHAPTER TWO

### 2.0 LITERATURE REVIEW.

#### 2.1 Epidemiology of malaria

As of 2015, an estimated 3.2 billion people in 97 countries and territories are at risk of being infected with malaria (compared to 2.4 billion in 106 countries in 2000). 214 million incidence of malaria and 438000 deaths, representing a decrease in incidence rate by 37% and 60% in mortality rate. An estimated 88% of malaria cases in 2015 occurred in WHO Africa region (World Health Organization et al. 2015). The number of malaria deaths in children under 5 years is estimated to have reduced from 723 000 globally in 2000 (range: 563 000–948 000) to 306 000 in 2015 (range: 219 000–421 000). The chunk of these reduction occurred in the WHO African Region, where the estimated number of deaths declined from 694 000 in 2000 (range: 569 000–901 000) to 292 000 in 2015 (range: 212 000–384 000). Malaria now accounts for 10% of child deaths in sub-Saharan Africa making it the fourth leading cause of child death in sub-Saharan Africa. However malaria remains a major killer of children, particularly in sub-Saharan Africa, Killing a child every 2 minutes WHO et al (2015). Despite these global improvements, some 15 countries in sub-Saharan Africa including Ghana still lag behind with 32% reduction rate within the same period. Ninety percent of malaria cases in Africa are caused by *P. falciparum* and should be treated with the recommended ACT

To improve upon this Ghana came out with the 3<sup>rd</sup> edition of case management guidelines in July 2014. Given increase parasite resistance to previously used anti-malaria medicines the guideline states among others that Accurate and prompt malaria case management

requires that all who provide health care should be able to: Confirm the diagnosis by use of appropriate test (RDT or microscopy) and provide correct and prompt treatment in accordance with the National Guidelines.

Malaria diagnosis and treatment practices have attracted immense research attention all over the world particularly in Africa. It has been extensively studied mostly to evaluate health worker performance in the implementation of the new drug policies and guidelines. Varied study methods have been employed in these studies making it difficult to compare the results. Some studies assessed case management in children only (Eriksen et al. 2006; Sarrassat et al. 2011; Osterholt et al. 2006). Others assessed it in all age groups (Juma and Zurovac 2011). A few studied older children and adults (Zurovac et al. 2006). Some studies used record review while others used direct observation of health worker-patient interactions among other techniques.(Kwarteng et al. 2015).

However, the results are largely consistent in terms of the existence of gaps in case management. Though health worker adherence has been recognized as a key success factor in malaria case management, most studies have shown poor compliance of health workers to standard guidelines.

## **2.2 Laboratory testing**

Current policy on malaria diagnosis and treatment requires that all suspected malaria cases be confirmed by either microscopy or RDT. This policy is not getting the needed attention as many African countries still resort to presumptive treatment even when they have the capacity to confirm malaria cases. In assessing drivers to full adoption of T&T policy for malaria treatment in Senegal, analysis showed that adherence to test results is the first indicator of T&T adoption and is dependent on accumulation of experience with positive

RDTs (OR 0.55 CI<sub>95</sub>0.53– 0.58). Adherence is achieved, and was also associated with increased experience with positive RDTs (OR 0.60 CI<sub>95</sub> 0.58–0.62). Logistic models suggest that full adoption of T&T clinical practices can occur within 2 years, that monitoring these behavioral responses rather than RDT or ACT consumption will improve evaluation of T&T uptake, and that accelerating T&T uptake by focusing training on adherence to test results will reduce over diagnosis and associated health and economic costs in mesoendemic regions (Faust et al. 2015). An earlier study in Tanzania revealed a reduction in prescription of anti-malarial to parasite-negative individuals from 89.1% (244/274) to 38.7% (46/119) in Biharamulo and from 76.9% (190/247) to 10.0% (48/479) in Rubya after policy change (Bastiaens et al. 2011).

In WHO Africa region, 62% of patients suspected with malaria received diagnostic test (World Health Organization, Global Malaria Programme, and World Health Organization 2014). In a study in Zambia on evaluation of quality malaria case management more than 80% of patients had a temperature taken to establish their fever status. About 67% (CI<sub>95</sub>66.1-68.7) were tested for parasitemia by either rapid diagnostic test or microscopy, whereas the remaining 22.5% (CI<sub>95</sub>21.3.1- 23.7) were not subjected to any malaria test (Chanda-Kapata et al. 2014). This is in line with the findings of Mubi (2013) in study on malaria case management in Tanzania, of the 168 patients in facilities with diagnostics, 63% were tested for malaria and only 30% tested positive (Mubi et al. 2013). Also a study in Nigeria to assess the current state of compliance to policy guidelines on the use of artemisinin-based combination therapy (ACT), out of 480 (45%) tested positive. 51% (1105) of the prescriptions was on the basis of presumptive treatment. 58%

of slide negative results received antimalarial drugs (Ezenkuka et al,2014)Malaria diagnosis studied in Ethiopia revealed that the mean monthly number of malaria blood films processed at secondary or tertiary facilities was 225, with a mean monthly 56 confirmed parasitologically. In primary facilities, the mean monthly number of clinical malaria cases seen was 75, of which 57 were tested by rapid diagnostic test (RDTs). None of the surveyed laboratory facilities had formal quality assurance or quality control protocols for either microscopy or RDTs(Hailegiorgis et al. 2010). In another study in Uganda, 96.9% of the patients admitted have their samples tested for malaria and only 46.3% tested positive (Sserwanga et al. 2015). Proper malaria diagnosis by microscopy will reduce misdiagnosis significantly, given that the laboratory technicians have adequate training and resources. A study in Uganda on improved malaria case management through implementation of sentinel sites found that testing rate increased from 39% to 97% (p0.001)(Sserwanga et al. 2011). Also, a study in Nigeria on status of the use and compliance with malaria rapid diagnostic tests in formal private health facilities showed that 73.8% of febrile patient were subjected to parasitological testing. Among those tested 61.8% were tested by microscopy and 38.2% were tested with RDT(Mokuolu et al. 2016). In a recent study in Ghana, by the research and development division of the Ghana health service, only 26.6% of the 4603 clients tested positive for malaria(Ansah et al. 2015). However some countries reports lower testing rates, (Rowe et al. 2009) in their study in Angola found that on 30.7% of suspected malaria patients received parasitological testing. Similarly (Pulford et al. 2012) in Papua New guinea found that only 15% of suspected malaria patients were tested using RDT and 3.6% were tested by microscopy. Also in Senegal (Sarrassat et al. 2011) in their study on management of uncomplicated malaria in

children under 12 years found that only 22% febrile children and 19% of children diagnose with malaria got blood smear. A study on patterns and predictors of malaria care-seeking, diagnostic testing, and artemisinin-based combination therapy for children under five with fever in Northern Nigeria revealed that, of the 61.5% of patients who sought treatment promptly, only 9.8% received a diagnostic blood test (Millar et al. 2014)

### **2.3 Malaria treatment with ACT**

Compliance to treatment guidelines means treating only confirmed cases with recommended drugs by WHO and also prioritizing the first line treatment drugs. In Ghana, the treatment drug for malaria as per the revised treatment policy (2014), three Artemisinin-based Combination Therapy (ACT) products have been selected for use nationally:

Artesunate-Amodiaquine (A-A)

Artemether-Lumefantrine (A-L)

Dihydroartemisinin-Piperaquine (DP)

All these drugs are safe for use in children (except the use of A-L in children below 6 months). In the 1<sup>st</sup> trimester, it is recommended that quinine is used. Either Artesunate-Amodiaquine or Artemether-Lumefantrine combination can be used in 2 or 3 trimesters of pregnancy.

In Ghana Home-based care (HBC) and CHPS have been involved in malaria case management to ensure that malaria case management guidelines are strictly followed at the peripheral level, a cross sectional study on the effectiveness of the national implementation for the treatment of malaria, diarrhea and pneumonia was conducted 2 and 8 years after implementation of HBC in the Volta and Northern Regions of Ghana,

respectively. The results revealed that, regarding appropriate treatment of uncomplicated malaria, 36.7% and 19.4% of malaria cases were treated with ACT under the HBC in the Volta and Northern Regions respectively, and 14.7% and 7.4% under the CHPS in the Volta and Northern Regions (Ferrer et al. 2016).

If all malaria cases in Africa are brought for care 70% percent of malaria patients could be treated with ACTs distributed to public facilities in Africa; however, because not all children with fever are brought for care, less than 26% of all children with malaria received an ACT (World Health Organization, Global Malaria Programme, and World Health Organization 2014). A systematic review and meta-analysis conducted in sub-Saharan Africa reported adherence to positive and negative test results to be 97% (95% CI 94-99) and 78% (95% CI 66-89) (Kabaghe et al. 2016). In another systematic review including four studies in Ghana, Adherence data were available for four different ACT formulations: artemether-lumefantrine (AL) (range 39-100%), amodiaquine plus artesunate (AQ + AS) (range 48-94%), artesunate plus sulphadoxine-pyrimethamine (AS + SP) (range 39-75%) and artesunate plus mefloquine (AS + MQ) (range 77-95%) (Banek et al. 2014). In a study in Zambia, of the 2247 malaria cases reported (complicated and uncomplicated), 71% were parasitologically confirmed while 29% were clinically diagnosed (unconfirmed). About 56% (CI<sub>95</sub> 53.9-58.1) of the malaria cases reported were treated with artemether-lumefantrine (AL), 35% (CI<sub>95</sub> 33.1-37.0) with sulphadoxine-pyrimethamine, 8% (CI<sub>95</sub> 6.9-9.2) with quinine and 1% did not receive any antimalarial. Approximately 30% of patients who were found negative for malaria parasites were still prescribed an anti-malarial, contrary to the guidelines. A study in Cameroon on malaria

prevalence and treatment of febrile patients at health facilities and medicine retailers revealed that 73% of the patients were prescribed an antimalarial, and 51% were prescribed an ACT (Mangham et al. 2011).

A Study in Malawi on patient-health worker and health facility determinants of correct malaria case management found that 60% of confirmed malaria cases were prescribed with the first line anti-malarial drug. (Steinhardt et al. 2014). In a rural Ugandan hospital, the anti-malarial frequently prescribed for uncomplicated malaria and severe malaria were AL (88.5%) and Quinine (84.6%) respectively. As much as 88.1% of the prescriptions conformed to the new anti-malarial treatment policy.

Compliance to treatment guidelines is not encouraging in some areas. In a study in Zambia on evaluation of quality malaria case management where approximately 30% of patients who were found negative for malaria parasites were still prescribed an anti-malarial, contrary to the guidelines. Similarly a study in rural western Kenya also reported that Among malaria-negative children; 210 (57.2%) in Homa Bay and 45 (7.0%) in Kisii received anti-malarial; (Onchiri et al. 2015).

A Study in South East Nigeria reported use of ACTs in public health facilities to be high (88.8%) compared to private health facilities (32.4%). This high use especially in the public facilities did not correspond with utilization of laboratory diagnosis. Majority (51.1%) of facilities had used RDTs and only 43.5% were still using it at the time of the survey with the private clinics being in the minority (42.1%). This reported use of ACTs with limited laboratory diagnosis means the level of inappropriate malaria case management could be high (Uzochukwu, 2010).

Similarly, another study reported clinician management and prescription practices in both private and public health facilities but observed that documentation of history and physical examination findings was less likely in the private sector compared to the public sector. Overall, only 45% of patients had malaria diagnostic blood slides while only 3% of patients diagnosed with malaria received ACT.(Meremikwu et al. 2007)

In a study in Nigeria on antimalarial prescription practice, clinicians in the private sector were less likely to record history or physical examination than those in public facilities, but otherwise practice and prescribing were similar. Overall, 45% of patients had a diagnostic blood slides; 77% were prescribed monotherapy, either chloroquine(30.2%), sulphadoxine-pyrimethamine (22.7%) or artemisinin derivatives alone (15.8%). Some 20.8% were prescribed combination therapy; the commonest was chloroquine with sulphadoxine-pyrimethamine. A few patients (.5%) were prescribed sulphadoxine-pyrimethamine-mefloquine in the private sector, and only 3.0% patients were prescribed artemisinin combination treatments(Faust et al. 2015).

In Kenya, Juma and Zurovac (2011) assessed health worker case management of malaria three years after implementation of new malaria policy. Significant observations were that AL was prescribed for 63.6% of children under-five years and for 65.0% of patients aged five years and above, while amodiaquine or SP monotherapies were prescribed for only 2.0% of children and 3.9% of older children and adults. Malaria testing rate was low in all age groups despite age specific recommendations. Disregard for test results was widespread as in the under-five age group; AL was prescribed for 74.7% of test positive,

40.4% of test negative and 60.7% of patients for whom no test was performed. For patients aged five years and above, the findings were similar; 86.7% of test positive, 32.8% of test negative and 58.0% of patients with no test performed were treated with AL.

In a related study, where the analysis of the findings were restricted to 64 facilities with malaria diagnostics and AL available on the day of the survey, Zurovac et al (2008) assessed the impact of age specific recommendations on routine malaria treatment.

Similar treatment practices were observed in spite of the existing age specific recommendations. They observed that 43.0% of patients aged five years and above and 25.9% of children had parasitological malaria testing of which 87% were by microscopy. Also, AL was prescribed for 79.7% of patients aged five years and above with positive test results, for 9.7% with negative results and for 10.9% without malaria test. For the children, 84.6% with positive tests, 19.2% with negative tests, and 21.6% without malaria test received AL.

#### **2.4 Factors that influence malaria diagnosis.**

Compliance to malaria treated guidelines has the propensity to reducing over treatment by reducing presumptive treatment and neglect for test negative results, a study conducted in Tanzania on malaria diagnostic testing and treatment practices in three different *Plasmodium falciparum* transmission settings in Tanzania: before and after a government policy change reported a drastic reduction in prescription ACT to test negative patients from 89.1% (244/274) to 38.7% (46/119) in Biharamulo and from 76.9% (190/247) to 10.0% (48/479) in Rubya. Factor influencing malaria diagnosis includes health facility factors, patients' factors and health worker factors; type of facility, cadre of health worker,

years in service (experience), training on test-base malaria case management stock of ACT and RDT, age of patient and symptoms presented by the patient have all been found to have influenced malaria diagnosis and treatment practices. There were marked inter-district variations in the proportion of patients in whom a diagnostic tool was used and in the choice of anti-malarial for the treatment of malaria confirmed cases. Association between health worker characteristics and quality of case malaria management showed that nurses performed better than environmental health technicians and clinical officers on the decision whether to use the rapid diagnostic test or not. Gender, in service training on malaria, years of residence in the district and length of service of the health worker at the facility were not associated with diagnostic and treatment choices(Chanda-Kapata et al. 2014), similarly (Wasunna et al. 2010) reported that enhance training on malaria case management has no significant influence on case management.

A study in Netherland analyzed barriers among Dutch general practitioners to determine why physicians don't adhere to guideline recommendations during their practice. This qualitative study conducted six focused group discussions using 30 General Practitioners with an average of seven per session. Factors that prevented physicians from complying with key recommendations in clinical guidelines for 56 key recommendations were discussed separately for various groups of physicians and sessions involved. The results of the study showed that, the barriers or factors varied greatly within guidelines with the most perceived barriers being lack of agreement with the recommendations because of lack of applicability or evidence (68%), environmental factors such as organizational constraints (52%), lack of knowledge regarding the guideline recommendations (46%),

and guideline factors such as unclear or ambiguous guideline recommendations (43%). (Lugtenberg et al. 2009).

A study conducted in Nigeria and Cameroon on what determine provider preference for the treatment of uncomplicated malaria reported that, 69% of providers stated a preference for artemisinin-based combination therapy (ACT), which is the recommended treatment for uncomplicated malaria in Cameroon and Nigeria. A preference for ACT was significantly associated with working at a for-profit facility, reporting that patients prefer ACT, and working at facilities that obtain antimalarial from drug company representatives. Preferences were similar among colleagues within a facility, and among providers working in the same locality. Knowing the government recommends ACT was a significant predictor, though having access to clinical guidelines was not sufficient (Mangham-Jefferies et al. 2014).

In ascertaining the factors that influence community and health worker acceptance and adherence to new malaria treatment guidelines, lack of access to microscopy or distrust in the accuracy of diagnostic tools were cited as reasons attributable to the practice of presumptive treatment of malaria. The acceptability of RDT was also reported as low mainly because of lack of confidence in it (Wijesinghe et al. 2011)

Sarrassat et al (2011) evaluated discrepancies between official guidelines and nurses' malaria case management practices in Senegal and observed that the prescribing practices were fairly in compliance with guidelines. Laboratory confirmation and disregard for negative test result were some of the challenges cited. Among 2,789 children treated with anti-malarial, 74% received the recommended ACT. However, only 22% of 1,879 febrile children and 19% of the children diagnosed with malaria had blood smear microscopy.

Also, of children with a negative blood smear result, as much as 80% received an anti-malarial. Ambiguous guidelines, health system's dysfunctions and nurses' own considerations were cited as predictors of the observed discrepancies.

A similar study in Malawi observed that 70.8% of children diagnosed with malaria were treated with an effective anti-malarial and the rest were subject to treatment error. Interestingly, this study revealed that neither in-service malaria training nor supervision was associated with treatment quality. Acute respiratory infections training however, was significantly associated with treatment error whereas high fever and chief complaint of fever were associated with fewer errors (AOR= 0.25, 95% CI = 0.10, 0.60 and AOR= 0.25, 95% CI = 0.13, 0.48, respectively)(Osterholt et al. 2006).

An operational research conducted in Namibia to identify the key barriers to appropriate diagnosis of malaria in public health facilities and to evaluate the effectiveness of various training approaches in improving the uptake and adherence to rapid diagnostic tests (RDTs), found that districts receiving any training improved testing rates from 25% to 66% at minimum compared to the control. The enhanced training plus mentorship arm resulted in a significantly greater proportion of fevers receiving RDTs compared to the district receiving enhanced training alone, increasing from 27% to over 90% at end line. No ACT was prescribed to untested patients after caregivers received mentorship or SMS reminders. These improvements were all sustained over the 15-month follow-up(Lourenço et al. 2014)

A study in Uganda found that prescribers profession (OR = 97.51, 95% CI = 27.29, 348.34) and diagnosis of uncomplicated malaria (OR = 10.13, 95% CI = 3.37, 30.42) being the main determinants of conformity (Ucakaon et al. 2011). There were marked

inter-district variations in the proportion of patients in whom a diagnostic tool was used and in the choice of anti-malarial for the treatment of malaria confirmed cases. Association between health worker characteristics and quality of malaria case management showed that nurses performed better than environmental health technicians and clinical officers on the decision whether to use the rapid diagnostic test or not. Gender, in service training on malaria, years of residence in the district and length of service of the health worker at the facility were not associated with diagnostic and treatment choices. However, Ssewanga et al (2015) found that duration of service less than 6 years 3.4 (OR = 3.40, 95% CI = 1.24, 9.33) more likely to comply to treatment guidelines(Sserwanga et al. 2015)

Health workers turn to prescribe antimalarial to patients who presented with the primary symptom of malaria. In a study in Uganda, health worker category and patient's main complaint were predictors of malaria treatment. Patients with main complaint of fever were more likely to be treated for malaria (OR = 5.22, 95% CI = 3.61, 7.54) just as patients who were seen by supervised health workers (OR = 1.63, 95% CI = 1.06, 2.50). Patients were less likely to be treated for malaria if more qualified health workers saw them. (OR = 0.61, 95% CI = 0.40, 0.93) (Zurovac et al. 2008).

In another study in Cameroon, treatment provided to patients significantly differed by type of facility: 65% of patients at public facilities, 55% of patients at private facilities and 45% of patients at medicine retailers received an ACT (P = 0.023). The odds of a febrile patient being prescribed an ACT were significantly higher for patients who asked for an ACT (OR = 24.1, P < 0.001), were examined by the health worker (OR = 1.88, P = 0.021), had not previously sought an antimalarial for the illness (OR = 2.29, P = 0.001) and sought

treatment at a public (OR = 3.55) or private facility (OR = 1.99, P = 0.003)(Mangham et al. 2011).

In general, assessments needed to identify suspected malaria were low in all the facilities with hot body/fever and headache ranking the highest and convulsion ranking the lowest. Parasitological assessments in all the facilities were also very low. All patients interviewed were prescribed ACTs which is in adherence to the drug of choice for malaria treatment in Ghana. However, there were no significant differences in the quality of malaria treatment given to the uninsured and insured patients(Fenny et al. 2014)

In a study conducted in the Eastern region of Ghana, Predictors of appropriate treatment were measured temperature of  $\geq 37.5^{\circ}\text{C}$  (AOR = 2.7, 95% CI = 1.48, 4.85) and being managed at a hospital (AOR = 9.2, 95% CI = 5.29, 15.95). Measured temperature of  $\geq 37.5^{\circ}\text{C}$  was also an independent predictor of AA prescription (AOR = 3.2, 95% CI = 1.58, 6.51)(Ameme 2013).

Proper diagnosis and treatment is also dependent on availability of treatment guidelines and studies indicate inappropriate treatment despite availability of treatment guidelines. In a study conducted in Ethiopia, treatment guidelines for malaria were available in only 38 (31%) of the surveyed facilities. Febrile patients with negative malaria laboratory test results were managed with artemether-lumefantrine or chloroquine in 51% (53/104) of assessed health facilities (Abreha et al. 2014).

The type of facility has significant association with compliance to treatment guidelines It was significantly high at HC III [115 (53%)] than at HC IV (29%) [PRR=0.28 (95%CI 0.148 0.52), p=0.000]. Compared to the nursing aide, the adherence level was 1.57 times

higher among enrolled nurses ( $p=0.004$ ) and 1.68 times higher among nursing officers,  $p=0.238$ , with statistical significance among the former.(Bawate et al. 2016)

Zurovac et al found supervision on test-based malaria management to influence compliance, supervised health workers (OR = 1.63; 95% CI: 1.06–2.50) more likely to comply contrary to findings of Bawate et al (2016) who found that supervision has no significant association with adherence to guidelines.

Patient's preference as a factor also affects malaria diagnosis and treatment practices. Those who prefer Test Base Malaria Management (TBMM) are less likely to demand antimalarial when test is negative. According to (Baiden et al. 2012), a total of 3047 caregivers were interviewed. Nearly all (98%) reported a preference for TBMM over presumptive treatment. Caregivers who preferred TBMM were less likely to be concerned about the denial of ACT to their test-negative children (O.R. 0.57, 95% C.I. 0.33–0.9).

A systematic review showed that prescriber practice varied with ACT availability. ACT prescribing was significantly higher in facilities with ACT stock than facilities without ACT stock whilst alternative anti-malarial prescriptions decreased. The review also showed that ACT was prescribed in the absence of ACT stock indicating that ACT stock alone cannot explain the adherence to treatment guidelines (Hensen et al. 2011).

## **CHAPTER THREE**

### **3.0 METHODS**

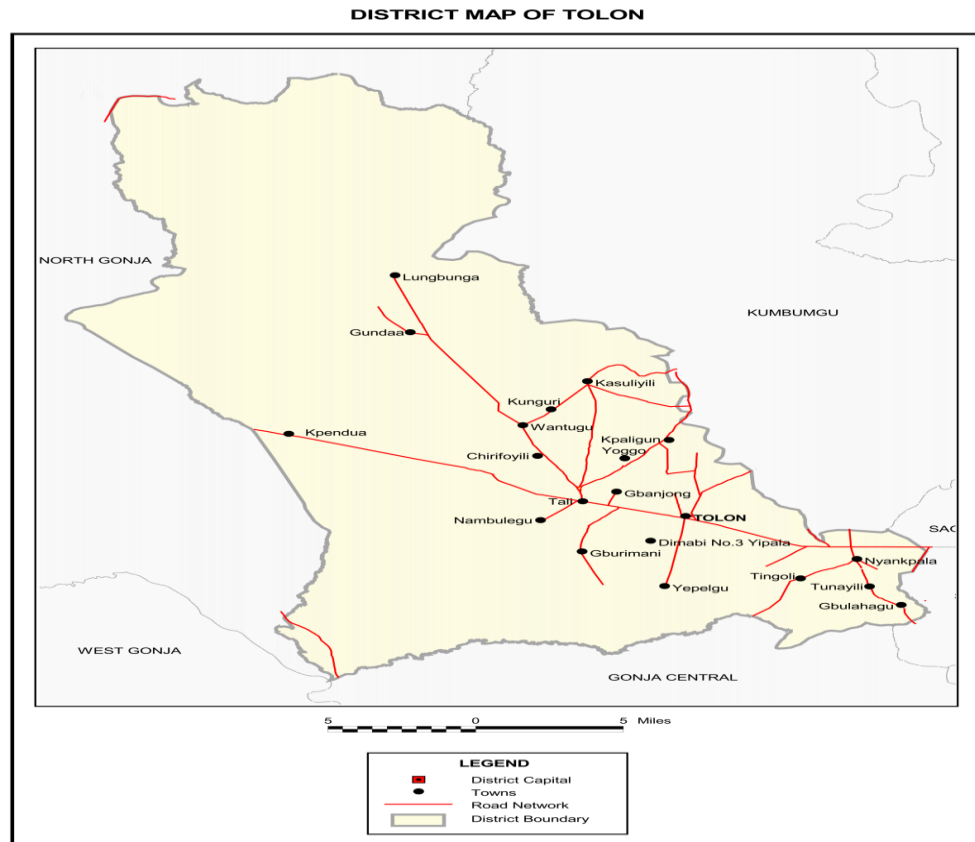
#### **3.1 Study Design**

A health facility based cross sectional survey, was conducted in three of the four sub districts of the district involving records review, uninterrupted observation of patient consultations and interview health workers to assess malaria diagnosis and treatment practices in the district.

#### **3.2 Study Area**

##### **3.2.1 Demography**

The Tolon District Assembly came into existence in 2011 by LI. 2142 with Tolon as the district capital. It was among the 42 inaugurated districts in 2012. The District was carved out from the then Tolon/Kumbungu District. The District lies between latitudes  $9^{\circ} 15''$  and  $10^{\circ} 02'$  North and Longitudes  $0^{\circ} 53'$  and  $1^{\circ} 25'$  West. It shares boundaries to the North with Kumbungu, North Gonja to the West, Central Gonja to the South, and Sagnarigu Districts to the East. It is one of the 26 districts in the northern region with four (4) main sub-districts, namely; Tolon, Nyankpala, Wantugu and Lingbunga with a total population of Eighty-four thousand seven hundred and twenty-four (84,724), a projection from 2010 census with an annual growth rate of 2.9%. Over 80% of the people depend on agriculture for livelihood.



**Figure 2 Map of Tolon district**

### **3.2.2 Health services**

Twelve (12) health facilities, comprising of three (3) health centres: Tolon, Nyankpala and Wantugu health centres, Afreakmed Community Hospital, UDS Clinic and seven (7) Community Based Health Planning Services (CHPS), namely; Yoggu, Kpendua, Gbrumani, Gbulahagu, Kasuyili, Lingbunga and Zantani CHPS. There are 157 communities with 314 Community Based Surveillance (CBS) volunteers.

### **3.2.3 Environmental Factors**

The main vegetation is grassland, interspersed with guinea savannah woodland, characterized by drought-resistant trees such as acacia, (*Acacia longifolia*), mango (*Mangifera*), baobab (*Adansoniadigitata* Linn), Shea nut (*Vitellariaparadoxa*), dawadawa, and neem (*Azadirachta indica*)

The district is characterized by a single rainy season, which starts in late April with little rainfall, rising to its peak in July-August and declining sharply and coming to a complete halt in October-November. The dry season starts from November to March with day temperatures ranging from 33°C to 39°C, while mean night temperature range from 20°C to 26°C. The Mean annual rainfall ranges between 950mm - 1,200mm. The area experiences occasional storms, which have implications for base soil erosion depending on its frequency and intensity especially when they occur at the end of the dry season. The situation also has an implication as staple crop farming for instance is highly restricted by the short rainfall duration.

### **3.3 Study Variables**

#### **3.3 Dependent variable**

The main dependent variable is diagnosed and treated with ACT, i.e. diagnosed by confirmation with RDT and treat only confirmed cases with ACT. For our study definition of compliance to treatment guidelines is patient being diagnosed and treated with ACT.

#### **3.4 Independent variables**

The independent variables of interest are varied and include:

##### **3.4.1. Health facility factors;**

- Availability of anti-malarial
- Availability of guidelines and protocol for malaria treatment
- Availability of key equipment like thermometer, weighing scales, diagnostics
- Staff strength
- Availability of quality assurance activities e.g. Wall charts

##### **3.4.2 Health worker factors;**

- Demographics (age, sex)
- Supervised on test-based malaria case management
- Length of service (how long health worker has been practicing)
- Exposure to in-service training
- Possession of guidelines and protocol
- Cadre of health worker

### 3.4.3 Patient factors;

- Age of and sex patient
- Patient symptoms e.g. fever
- Tested for malaria
- Tested positive for malaria
- Tested positive and treated with ACT

### 3.5 Study population

The study population included health facilities, health workers involved in outpatient consultation, and health records of patients diagnosed with uncomplicated malaria in Tolon District for the year 2015.

### 3.6 Sample size calculation

Six health facilities in three of the four sub districts were included in the study. Lingbunga sub district was excluded due to in accessibility. Three health facilities and 3 CHPS compounds were selected.

The sample size for record review and data extraction was calculated using the formula for estimating a single proportion:

$$n = Z^2 P(1-P)/d^2$$

Where n is the minimum number of patients to be included in the study

Z = 1.96 is the standard score for the confidence interval of 95%

P = proportion of patients managed correctly for malaria

d = tolerable error of 5%

A proportion of 50% compliance was considered for this study to maximize sample size and hence increase precision.

### **3.7 Sampling Method**

Convenient sampling was employed to select Tolon district, three of the four sub districts were considered in this study due to the fact that the Lingbunga sub district is not accessible. The health centre in each sub-district was considered and a CHPS compound was selected randomly

#### **3.7.1 Patients records**

Number of records to be reviewed in each facility proportionate to the case load for the year 2015. All malaria cases recorded in the OPD register were numbered from one to the nth record to get the sampling frame. A systematic random sampling was then employed to select 420 health records of patients diagnosed with malaria. The sampling interval “51” was determined using the sample size and the sampling frame for the period under review. The first record was selected randomly from 1 to 10 and every “51” record was then selected until the desired sample size is met. See table1

**Table 1 Number of patients' records reviewed by health facilities in Tolon District, 2015**

Facility	Case load (m)	Proportion of cases (T/m)	Calculated sample size	Allocated sample size
Tolon	4072	0.190	79.8	80
Nyankpala	3878	0.181	76.0	76
Wantugu	4069	0.190	79.8	80
Kasuliyili	3174	0.148	62.2	62
Yoggu	3063	0.143	60.0	60
Gbulahagu	3168	0.148	62.2	62
Total	T= 21424	1.000	n= 420	420

Calculated sample size =  $(T/m)*n$

T = Total outpatient malaria case load for the year 2015

n = Calculated sample size

m = Malaria case load per facility for the year 2015

Sampling interval = Total number of records/Sample size

$$= 21424/420 = 51.02$$

Therefore sampling interval = 51

Simple random sampling and systematic sampling were employed to select sampling units from the various health facility records. In each facility, first sample was demined by randomly selecting a number from 1 to 9 and this became the starting point for sampling.

Then after, the successive samples were determined systematically with a sampling interval of 51.

### **3.7.2 Health workers**

Any health worker involved in malaria diagnosis and treatment at the time of the study was included. In all 25 health workers were interviewed and 175 patient consultations were observed without interruption.

### **3.8 Inclusion criteria**

Patient more than 2 months with fever or history of fever within the last 48 hours for an initial visit and was diagnosed with uncomplicated malaria

Any health worker involved in diagnosis and treatment on day the survey team visit the facility

Facility heads or their representatives

### **3.9 Exclusion**

Children two months or less and follow up patients who need specialized care.

Follow up patients who need specialized care.

For caretaker with two patients, one will be excluded.

Health workers not involved in diagnosis and treatment during our visit.

### **3.10 Data collection technique and tools**

Three methods were used in collecting data. These include:

1. Records review and data abstraction using checklist: Health facility records of malaria treatment were reviewed from the OPD registers in the selected facilities using a checklist.

The checklist was designed to document the following information: sex, age, diagnosis, treatment and symptoms for Patient who were diagnosed with uncomplicated malaria in 2015

2. Interview of health workers using a Health Worker Interview Questionnaire: Health workers performing outpatient consultations and who were observed during the time of the survey were interviewed. The questionnaire was to assess health worker knowledge about malaria diagnoses and treatment practices as well as training, supervision and work experience.

3. Assessment of health facilities was done using a Health Facility Audit Questionnaire: General issues pertinent to malaria case management such as staffing, availability of standard guidelines, logistics and equipment as well as some service delivery practices

### **3.11 Ethical clearance**

Ethical approval was sought from the Ethical Review Committee of the Ghana Health Service. Permission was also sought from the Northern Regional Health Directorate, Tolon District Health Directorate and the in-charges of the various health facilities included in the study. Informed consent was obtained from the health workers, patients and their caretakers. They were assured of confidentiality before the study.

Participants were informed about the purpose, procedures, risks and benefits of participating in the study. For participants who could not read, the consent form was read and explained to them in the presence of an impartial witness. Participants who agreed to be part of the study signed or thumbprint the consent form as an indication of their willingness to participate. Consent for children was obtained from their caretakers.

All the information obtained from this study was kept confidential and used for the purpose indicated for the study. The information was securely stored without the names of the participants, in a file, which was accessible only to the research team.

This study poses no risk to participants. Participants were informed that participation in the study is voluntary and they may withdraw from the study at any time without attracting any penalty. Participants were not coerced into taking part in the study and that there was no direct benefit or compensation for participation.

### **3.12 Training of interviewers**

The field workers were trained prior to the commencement of the data collection. They were trained on how to use the survey tools and their interpretations objectives of the survey was spelt out to them during the training. Simulated practices were repeated to ensure 90% concordance between field workers and trainers.

### **3.13 Pre-testing and review of data collection tools**

The data collection tools were pre-tested at fuo Government clinic and SDA hospital in Tamale metropolis, which have similar settings as the facilities in the Tolon District. The tools were pre-tested in order to ensure they reflect the local conditions, and that the questions are clear and well understood by the respondents as well as making sure that the tools are well formatted. The necessary modifications were made based on the pre-test.

### **3.14 Data collection**

A day was used to introduce the trained survey team to the selected health facilities. They visited the selected health facilities early in the mornings of days scheduled for the various

facilities. At each health facility the team members met the health facility in-charges or their representatives to seek permission for the commencement of the study.

Assessment of the health facility for facilities and logistics relevant to malaria case diagnoses and treatment practices was done with the Facility Audit Questionnaire. The respondents included the in-charges of the various facilities and other members of staff who can adequately provide information on key aspects of the facility and the services provided.

Health workers who performed outpatient consultations in the various health facilities were eligible. They were enrolled in the study for interview after seeking their informed consent

Patients arriving at the facility will be recruited based on the inclusion criteria and their willingness to be part of the study. Patients and caretakers who agreed to be part of the survey were recruited and given identification before they entered the consulting rooms. After their consultation, data on demographics, diagnosis and treatment were extracted. Seven patient's consultations were selected for each prescriber serially until the required sample size for the facility is obtained

### **3.15 Quality control**

Trained field workers were used in the data collection to ensure quality data. During the data collection, the principal investigator (PI) supervised the field workers and data collected were crosschecked from the participants for correctness. Two independent data entry clerks entered the data into excel template prepared by the PI. Discrepancies were resolved by referring to the original data collection tools. Data validation checks were used on the template to ensure accuracy during the data entry process

### **3.16 Data processing and analysis**

#### **3.16.1 Data processing**

Data cleaning and verification was done to ensure good quality data. For each variable on which analysis will be done, the frequencies were run to identify missing variables and incorrectly entered data.

#### **3.17 Data analysis**

Univariate analysis was carried out to produce frequencies, proportions and means for health facilities, health workers and patients' records. Chi square was also use to determine association between diagnosed and treat and independent variables such as patient age, cadre of health worker, training on test-based malaria case management, years served (experience), supervision and type of facility.

Bivariate analysis was done using odds ratio and their corresponding 95% confidence interval to assess association between independent variables that have been found to significantly influenced diagnose and treat such as patient symptoms, supervision and type of facility on the new malaria treatment guideline, cadre and health facility factors malaria treatment according to treatment guidelines. The unadjusted odds ratios with associated p-values were calculated for each predictor variable. Binary logistic regression was done to determine factors associated with diagnose and treat. The variables which were significant as well as those proven plausible in literature to be factors for compliance to treatment guideline including patient age group cadre of health worker, length of service were adjusted for in a multiple logistic regression model to detect factors that were statistically significant. The results were presented in two by two tables which displayed the

frequencies, percentages, crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) and p-values.

## **CHAPTER 4**

### **4.0 RESULTS**

#### **4.1 Characteristics of study population**

##### **4.1.1 Health facilities**

Six health facilities were included in the study of which three are health centers and the rest are CHPS compounds. There is no government hospital in the district. Two facilities from each Sub-District comprising a health center and a CHPS compound. From the facility assessment, only two facilities reported stock out of RDT and ACTs anytime in the last six months, these are Gbulahagu and Yoggu CHPS. These same facilities did not have treatment charts displayed. The rest of the facilities have all the tools needed for appropriate diagnosis and treatment of malaria in Tolon District. Some of the tools the research captured are at least one weighing scale, a thermometer, and standard treatment guidelines. All the facilities have had supervisory visit anytime in the last six month.

##### **4.1. 2 Health worker characteristics**

Twenty five health workers consented to participate in the study. All were observed during their consultation and afterwards interviewed. The age range of health workers was 22 to 52 with a mean age of 29.8 years (SD 6.7 years). Of those interviewed 13 (52%) male, 12 (48%) were from health center. Seven (28.0%) of the health workers did not have in-service training in test-based malaria case management in the last six months. table 3 shows distribution of health worker by type of facility.

**Table 2 Characteristics of health workers by type of facility in Tolon District, 2015**

<b>Characteristic</b>	<b>Type of facility</b>		
	<b>N (%)</b>	<b>Health center n (%)</b>	<b>CHPS n (%)</b>
<b>Gender</b>			
Male	13(52)	8(32)	5(20)
Female	12(48)	5(20)	7(28)
<b>Trained</b>			
Yes	18(72)	10(40)	8(32)
No	7(28)	3(12)	4(16)
<b>Years served</b>			
<1year	5(20)	2(8)	3(12)
1-5	8(32)	3(12)	5(20)
6-10	10(40)	6(24)	2(8)
>10	2(8)	2(8)	0(0)
<b>Cadre</b>			
MA	3(12)	3(12)	0(0)
Nurse	7(28)	6(24)	1(4)
Comm.	10(40)	4(16)	6(24)
Nur. Aid	5(20)	0(0)	5(20)

#### **4.1.3 Patient Characteristics**

Ages of suspected malaria patients ranged from 1 year to 85 years with a mean age of 15.4 years (SD 18 years). Of the 420 records reviewed 187(44.6%) are males and 149(35.5%) were children aged <5 years. One hundred and seventy five patient consultations were observed. Of these 78(44.6%) were male and 58(33.14%) were children aged <5 years. Table 4 shows distribution of suspected malaria cases by age gender and type of health facility for both record review and patient consultation observation.

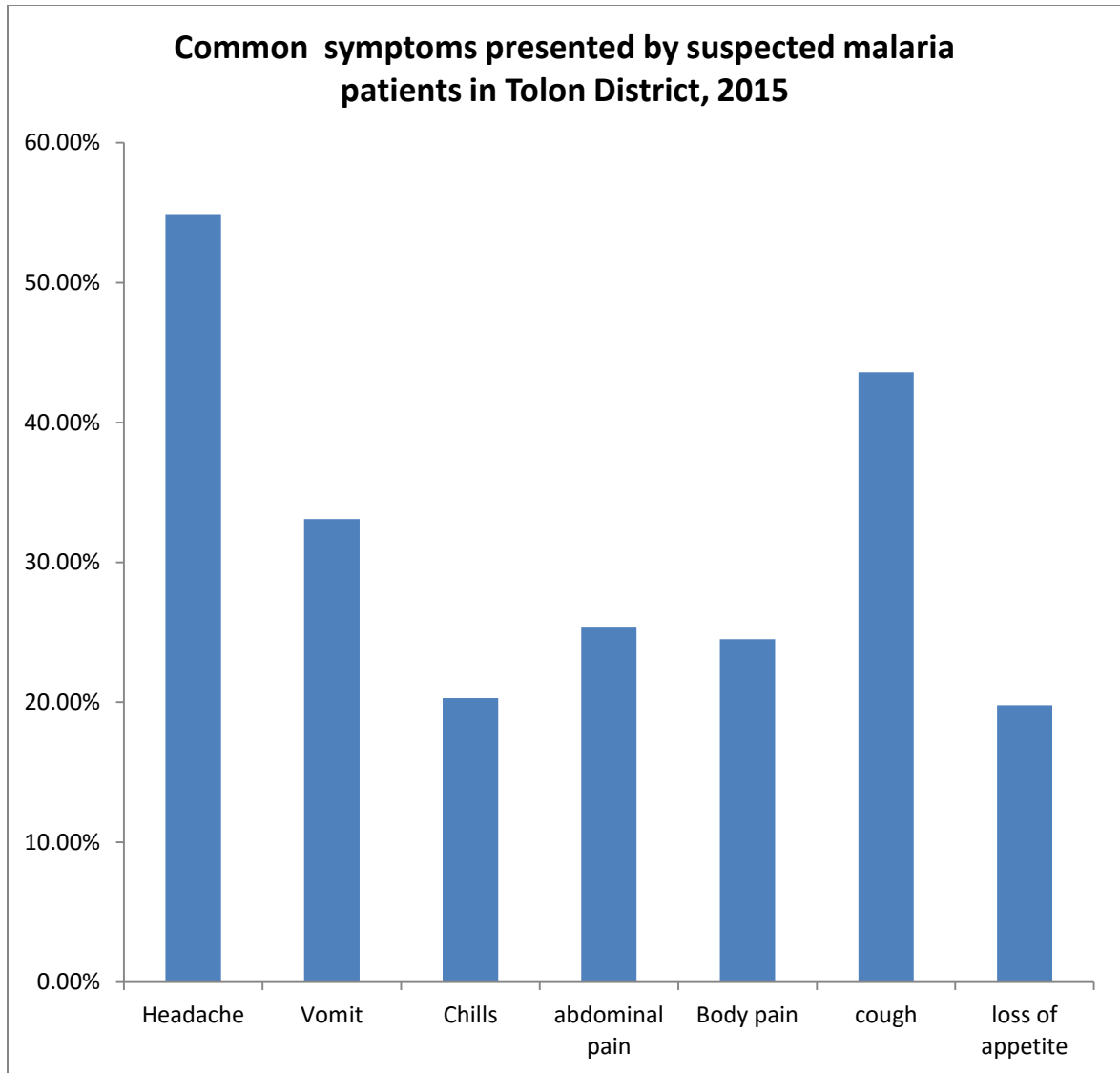
**Table 3 Distribution of patients by age, sex, and type of health facility for both record review and patient consultation observation in Tolon District, 2015**

<b>Variable</b>	<b>Number of record reviewed</b>	<b>Number of observations</b>
	<b>N (%)</b>	<b>N (%)</b>
<b>Age of patient</b>		
<5 years	149(35.5)	58 (33.14)
≥5 years	271(64.5)	117(66.86)
<b>Gender</b>		
Male	187(44.5)	78 (44.57)
Female	233(55.5)	97 (55.53)
<b>Facility type</b>		
Health Centre	236(56.2)	91 (52.00)
CHPS	184(43.8)	84 (48.00)

## **4.2.0 Malaria diagnosis and treatment**

### **4.2.1 Patient assessment from record review**

Most of the records reviewed documented basic assessment task performed by health workers. Common symptoms presented by patients with fever include abdominal pain, chills body pain, cough, headache, vomiting and loss of appetite. See figure3



**Figure 3 Common symptoms presented by suspected malaria patients in Tolon District, 2015**

Malaria diagnosis is mainly by RDT as there is no functional laboratory in any government facility in the district. From observation of 175 patient consultations, 119 (68%) of patients had a malaria diagnostic test performed; 43 (74.1 %) in children <5 and 76 (65.0 %) in patients  $\geq 5$  years. Of patients who had a malaria test performed, 83 (69.7 %) had malaria positive results more commonly in older patients 58 (76.3 %) than in <5

children 25 (58.1%). All the 83 patients who tested positive for malaria, 25(69.4%) of patients who tested negative, and 59(96.2) of those who were not tested for malaria received ACT. See table 5

**Table 4 Parasite-based malaria testing and prescription rates (%) with AA by age group. Observation data**

Variable	All patients N (%)	Patient age group	
		<5 years n (%)	≥5 years n (%)
	<b>Number of patients</b>	175(100)	58(33.1)
<b>Patients tested for malaria</b>	119(68)	43(74.1)	76(65)
<b>Patients tested positive</b>	83(69.7)	25(58.1)	58(76.3)
<b>Patients tested negative</b>	36(30.3)	18(41.9)	18(23.7)
<b>Patients with positive test prescribed with AA</b>	83(100)	25(100)	58(100)
<b>Patients with negative test prescribed with AA</b>	25(69.4)	11(61.1)	14(77.8)
<b>Patients not tested for malaria</b>	61(34.9)	15(25.9)	46(39.3)
<b>Non tested prescribed AA</b>	59(96.7)	15(100)	44(95.7)

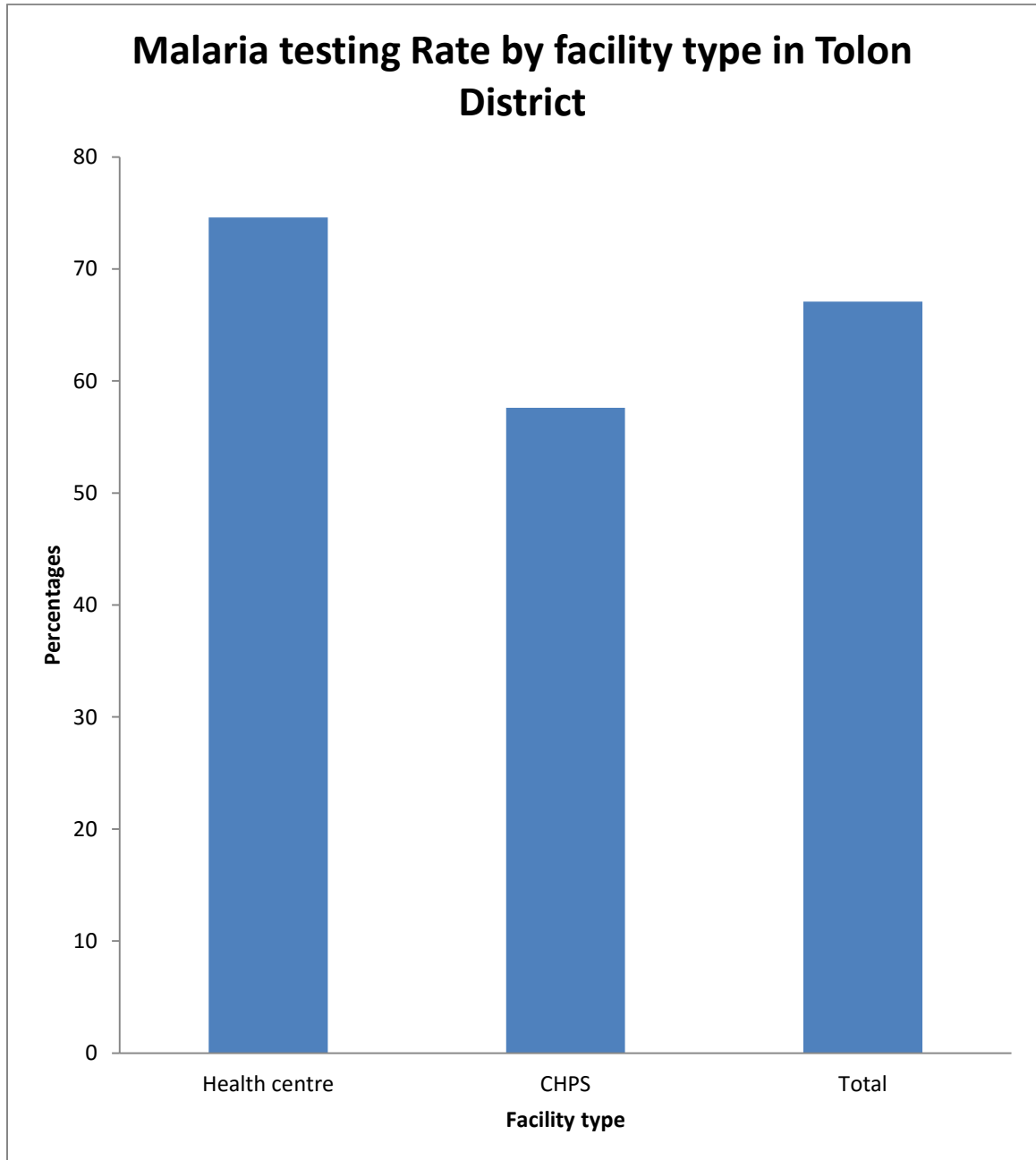
From review of 420 patient records, 282(67.1%) of patients had a malaria diagnostic test performed; more among patients aged <5 years as 108(72.4) of them were tested.

Of patients who had a malaria test performed, 196(69.5%) had malaria positive results more commonly in older patients 126 (72.83 %) than in <5 children 67 (63.81%). Fifty 50(57.5%) of patients who tested negative, and 104(75.9%) of those who were not tested for malaria received ACT. In all 375(89.3) received an ACT. See table 6. Comparing table 6 and table 7, one can conclude that the presence of the research assistance during patient consultation did not affect health workers decision since the proportions are almost the same

**Table 5 Parasite-based malaria testing and prescription rates (%) with ACT by age group. Records review data**

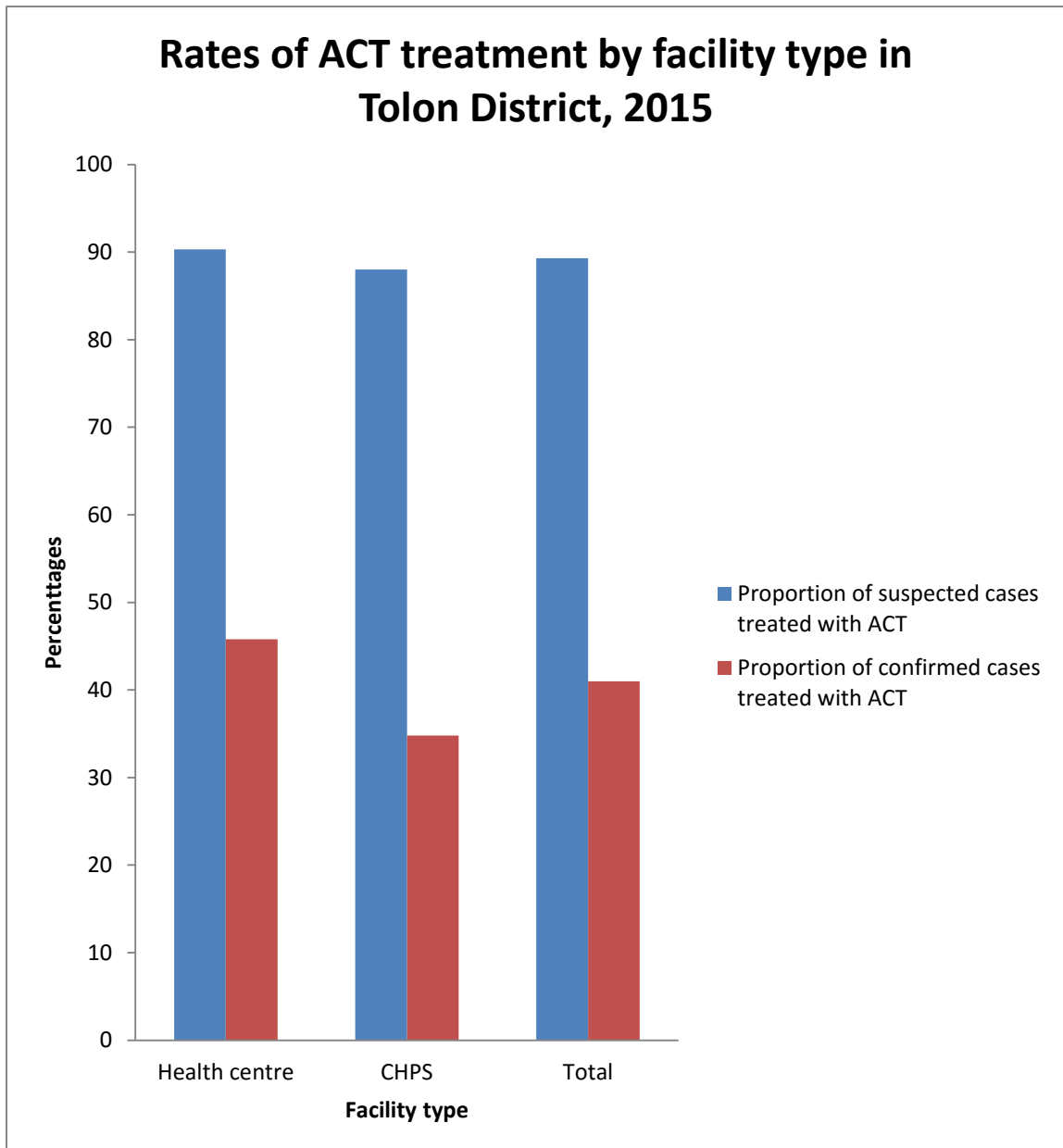
Variable	All patients N (%)	Age group	
		<5years n (%)	≥5 years n (%)
<b>Number of patients</b>	420(100)	149 (35.5)	271(64.5)
<b>Patients tested for malaria</b>	282(67.1)	108(72.4)	174(64.2)
<b>Patients tested positive</b>	196(69.5)	69(63.8)	127(72.8)
<b>Patients tested negative</b>	87(30.6)	40(36.2)	47(27.2)
<b>Patients with positive test prescribed with ACT</b>	172(87.7)	60( 87.0)	112(88.2)
<b>Patients with negative test prescribed with ACT</b>	50(57.5)	27(71.1)	23(46.9)
<b>Patients not tested for malaria</b>	137(32.6)	43(28.8)	94(35.4)
<b>Non tested prescribed ACT</b>	104(75.9)	23(52.27)	81(82.65)

The overall testing rate was 67.1%, health centres reported higher testing rates. Fig 4 shows malaria testing rates by facility type in Tolon District, 2015.

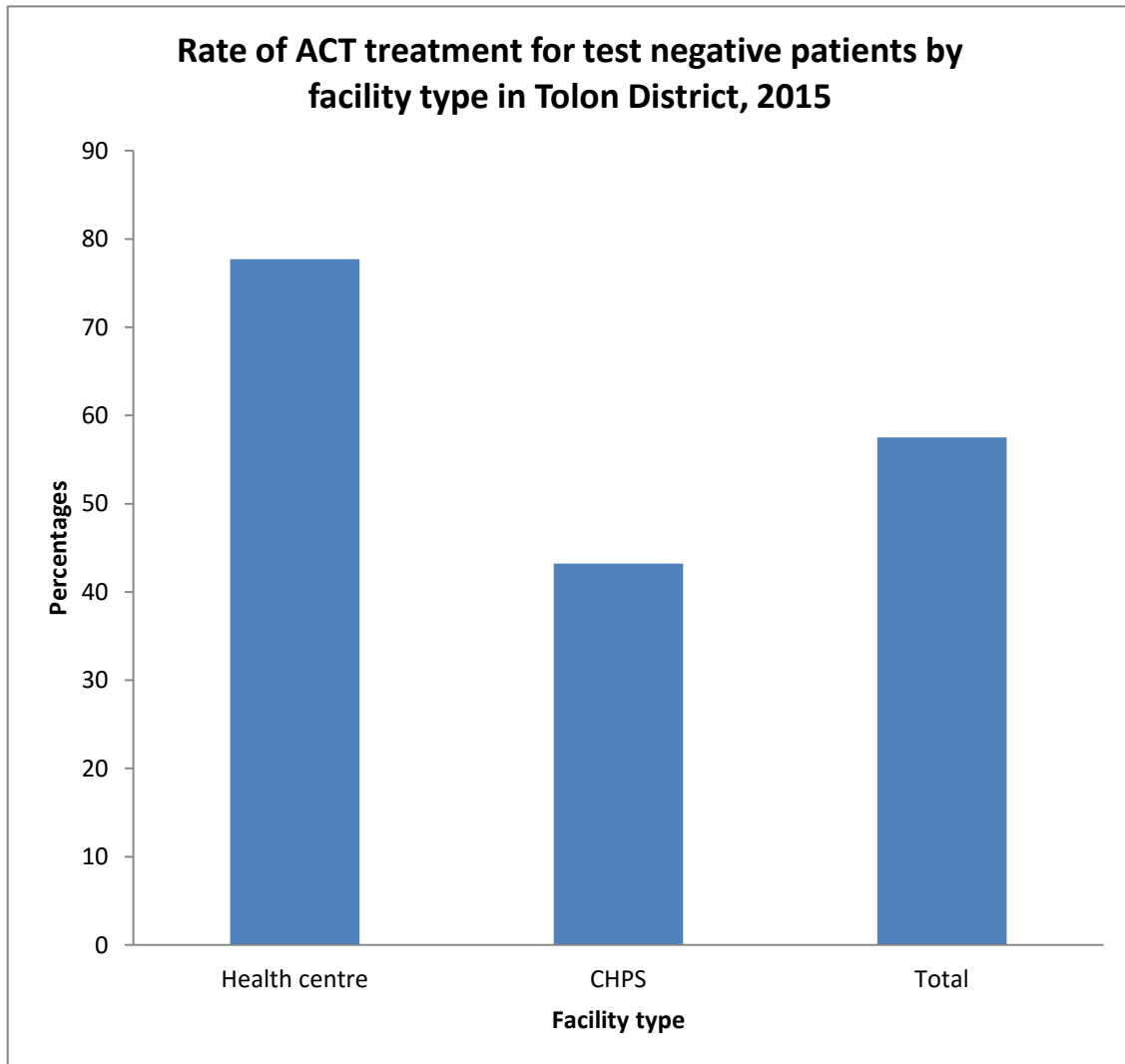


**Figure 4 Malaria testing rates by facility type in Tolon District, 2015**

ACT was prescribed to 375 (89.3%). Only 41% of patients were diagnosed and treated according to treatments according to treatment guidelines. Health centres reported good results compared to the CHPS compounds. Fig5 show Rates of ACT treatment by health facility in Tolon District, 2015.



**Figure 5 Rates of ACT treatment by facility type in Tolon District, 2015**



**Figure 6 Rate of ACT treatment for test negative patients by facility type in Tolon District, 2015**

In all 57.5% of suspected malaria cases that tested negative for malaria were treated with ACT. Prescription of ACT to test negative patients was 77.7% in health centers against 43.2% in CHPS. Fig 6 shows Rates of ACT treatment for test negative patients by facility type in Tolon District

Factors pertaining to health facility, health worker and patients were assessed in univariate analysis to determine associations between these factors and malaria diagnosis and treatment practices in Tolon District. Table7 shows patient, health worker and health facility factors that influence malaria diagnosis and treatment in Tolon District, 2015

**Table 6 Patient, health worker and health facility factors that influence malaria diagnosis and treatment in Tolon District, 2015**

Factor	Diagnosed & treated with ACT			p-value
	N	Yes n (%)	No n (%)	
<b>Age of patient</b>				
<5 years	58	21(36.2)	37(63.8)	0.18
≥5 years	117	55(47.0)	62(53.0)	
<b>Headache</b>				
Yes	61	29(47.5)	32(52.5)	0.42
No	104	47(45.2)	67(54.8)	
<b>Vomit</b>				
Yes	95	46(48.4)	49(51.6)	0.09*
No	78	28(35.9)	50(64.1)	
<b>Chills</b>				
Yes	35	17(48.6)	18(51.4)	0.49
No	140	59(41.2)	81(58.8)	
<b>Abdominal pain</b>				
Yes	42	13(31.0)	29(69)	0.06*
No	133	63(47.4)	70(52.6)	
<b>Gender of patient</b>				
Male	78	32(41.0)	46(59.0)	0.56
Female	97	44(45.4)	53(54.6)	

**Table 7 Patient, health worker and health facility factors that influence malaria diagnosis and treatment in Tolon District, 2015**

Factor	Diagnosed & treated with ACT			p-value
	N	Yes (%)	No (%)	
<b>Gender of health worker</b>				
Male	91	40(44.0)	51(56.0)	0.88
Female	74	36(48.6)	48(51.6)	
<b>Trained</b>				
Yes	66	57(86.4)	9(13.4)	0.43
No	49	19(38.8)	30(61.2)	
<b>Supervised</b>				
Yes	126	61(48.4)	65(51.6)	0.03*
No	49	15(30.6)	34(69.4)	
<b>Years served</b>				
<5 years	91	40(44.0)	51(56.0)	0.88
≥5 years	74	36(48.6)	48(51.4)	
<b>Cadre</b>				
Medical	21	7(33.3)	14(66.7)	0.32
Assist				
Nurse	154	69(44.8)	85(55.2)	
<b>Facility type</b>				
CH	236	108(62.8)	128(51.6)	0.03
CHPS	184	64(37.2)	120(48.4)	

From table 6 factors that show significant associations in the univariate analysis [ vomit (p=0.09), abdominal pain (p=0.06) and health worker being supervised (p=0.03)] and type of facility(p= 0.02) were assessed in the table8 below.

**Table 8 Logistic regression of factors associated with diagnose and treat with ACT from observation**

Variable	N	Unadjusted		P-value	Adjusted		P-value
		OR	95% CI		OR	95%CI	
<b>Age</b>				1.73			0.19
<5years	61		1		1		
≥5 years	117	1.56	0.82-2.98		1.58	0.80-3.13	
<b>Vomiting</b>				0.10			0.10
Yes	95	1.68	0.91-3.10		1.79	0.89-3.59	0
No	78	1			1		
<b>Abdominal pain</b>				0.06			0.38
Yes	42	0.50	0.24-1.04		0.70	0.31-1.56	
No	133	1			1		
<b>Supervised</b>				0.03*			0.02*
Yes	126	2.13	1.06-4.29		2.50	1.15-5.41	
No	49	1			1		
<b>Facility type**</b>				0.02*			0.006*
HC	236	1			1		
CHPS	184	0.64	0.43-0.94		0.64	0.43-0.95	

\*= statistically significant, OR= odds ratio

\*\*= Data from records extraction

Table 7 displays factors associated with diagnose and treat with ACT and only two factors were significant in the bivariate analysis, health worker being supervised ( $p=0.031$ ) see table8. After adjusting for age of patient and years served by the health worker, health worker being supervised remained significant with ( $P=0.021$ ) and patient receiving treatment in a health centre with ( $P=0.006$ )

## CHAPTER FIVE

### 5.0 DISCUSSION

This study assesses malaria diagnosis and treatment practices in Tolon District as against the national malaria case management guidelines. Health facilities need to be equipped with logistics and well trained staff in order to manage malaria cases in accordance with the case management guidelines. From the results, all the health facilities had the capacity to test for malaria parasites indicating the readiness to test patients suspected of malaria before treatment. Though none of facilities have a functional laboratory, malaria RDTs were available in all the facilities during the period of the study. Only two facilities reported shortage of RDT and ACT anytime in the last six months prior to the study. The availability of testing and treatment logistics confirms the PMI report of provision of adequate logistics to aid compliance with the policy. The fact that all the health facilities had at least two staff trained to use malaria RDT to diagnose malaria indicated that health workers were equipped to manage malaria appropriately by following the test-based policy. Therefore noncompliance of the health workers and prescriber to the policy could not be attributed to lack of training, shortage of staffs or inadequate or unavailability of the necessary logistics in the health facilities.

The district has fairly younger health workers within the age range of 22 and 56 with mean age of 29.8 years (SD 6.7) who are more likely to comply with protocols and guidelines. A Study in Benin found that younger health workers are more likely to comply with treatment guidelines compared to older health workers. According to study on predictors of health worker performance after Integrated Management of Childhood Illness training in Benin, Younger health workers significantly performed better than older

ones(Steinhardt et al. 2015).Seven (28.0%) of the health workers did not have in-service training in test-based malaria case management in the last six months. table 2 shows distribution of health worker by type of facility. This implies more 72% (18/25) health workers have been trained on test-base malaria case management and they are more likely to comply with treatment guideline According to a non-randomized trial of pre-and post-evaluation of the training and reporting interventions about prescription behaviors and availability of anti-malaria drugs among clinicians and pharmacists in the private sector in three governorates in Yemen was conducted, adherence of clinicians in the private sector to the new national guidelines for anti-malaria drugs improved from 21% in pre-intervention ( before training) period to 38% after the intervention( after training) for artesunate + SP being prescribed as the first line treatment(Bin Ghouth 2013). Only 48% of the health worker who have more than five years suggesting that they are less likely to comply to treatment guidelines going by the finding from a study on Assessing drivers of full adoption of Test and Treat policy for Malaria in Senegal showed that adherence to test results is the first indicator of T&T adoption and is dependent on accumulation of experience with positive RDTs (OR 0.55, 95%CI 0.53–0.58).(Faust et al. 2015).

The study revealed that health workers were conforming to the anti-malarial policy of using ACT in the treatment of uncomplicated malaria. In general noncompliance of health workers was more pronounced in the direct observation as proportions in the observation are higher than those from records review. This suggests that the presence of research assistants did not affect health worker practice. See tables 4 and 5.

The proportion of patients who receive ACT was quite high as 89.3% (375/420) o. The use of recommended first line drug dominated. This is in line with 90.8% of conformity to

prevailing first line drugs as observed by (Dodoo et al. 2009) and (Ansah et al. 2015) in Ghana. Studies elsewhere found contrasting results, (Juma and Zurovac 2011) in their study on Changes in health workers' malaria diagnosis and treatment practices in Kenya found that, AL which is the first line drug was prescribed for 63.6% of children aged <5 years and for 65.0% of patients aged  $\geq 5$  years. However, diagnose and treat as required by the national treatment guideline was low as only 41.0% (172/420) were diagnosed and treated with ACT. Parasitological testing which is the first step in malaria diagnosis and treatment was sub-optimal. Presumptive diagnosis and treatment of patients, as well as prescribing anti-malarials for patients who tested negative for malaria were quite common. Parasitological testing of all suspected malaria cases as the first step in compliance to malaria case management guideline has not been given the needed attention as only 67.1%(282/420) of the suspected malaria cases were subjected to parasitological testing just above the global malaria testing rate of 62% (WHO, 2014). This is also similar to the 67% testing rate found in a retrospective evaluation of the quality of malaria case management at twelve health facilities in four districts in Zambia(Chanda-Kapata et al. 2014). However a study in Uganda on Anti-malarial prescription practices among children admitted to six public hospitals in Uganda from 2011 to 2013, found higher testing rate for suspected malaria cases(Sserwanga et al. 2015). This contrast might be due to the fact that Sserwanger's study was on children who need special attention.

Treating only patients who tested positive for malaria with ACT as stated in the guidelines is the second step on compliance treatment guidelines. Proportion of patients who tested positive for malaria and treated with ACT according to the treatment guidelines was 41.0% (172/420) higher in health centres (45.8%) than in CHPS (34.8%).Treatment was higher among patients older than five years which contrasts the findings of Kwarteng et al

(2015) in Ghana who found treatment according to guidelines to be high among Children <5 years. The contrast may be that Kwarteng's study population of health workers were still adhering to the 2009 edition of the treatment guidelines which states "In young children, fever or history of fever in the absence of other causes of fever should be considered malaria and treatment commenced immediately without waiting for laboratory results. This is done in the context of IMCI. Confirmatory testing in this age group is not required, but may be considered where available" hence higher rates of ACT to <5." A systematic review and meta-analysis conducted in Africa on Health workers' compliance to rapid diagnostic tests (RDTs) to guide malaria treatment, they found that compliance to positive test results was 97%(95%CL 94-99)(Kabaghe et al. 2016) which syncs with finding in this study.

In compliance to treatment guidelines, health workers are to treat only confirmed cases with ACT but contrary to this, health workers in Tolon District treated over 57.5% (50/87) of patients who tested negative for malaria with ACT. Similarly a study in Zambia found 58.5% of blood smear negative patients being treated with antimalarial(Hamer et al. 2007). Ansah et al (2015) and Kwarteng et al (2015) in their recent studies in Ghana reported similar findings where health workers treated patients with negative test results with ACT. Presumptive diagnosis and treatment was also higher as over 75.9% (104/137) of patient who did not receive diagnosis testing were treated with ACT. Presumptive treatment and neglect for test negative results amounted to high over treatment which is similar to the findings of ( Steinhardt et al (2014), Ansah et al (2015), Kwarteng et al (2015).

In assessing factors that influenced treatment according to treatment guidelines, univariate analysis revealed that patient age, Years served, cadre of health worker and health worker being trained on test-based malaria case management did not have influence on treatment according to treatment guideline (compliance). Vomit and abdominal pain were found to

have influenced treatment according to guidelines; however bivariate analysis revealed that their associations were not statistically significant.

In line with findings in this study, a study conducted in Kenya by Wasunna et al (2010) on health worker performance in the management of pediatric fevers following in-service training and exposure to job aids showed that in-service training did not significantly improved case management compared to baseline. Similarly a study on health worker factors associated with prescribing of artemisinin combination therapy for uncomplicated malaria in rural Tanzania found that training on ACT use were not significantly associated with correct prescription (Selemani et al. 2013). However Bawate et al (2016) in their study on factors affecting adherence to national malaria treatment guidelines in management of malaria among public healthcare workers in Kamuli District of Uganda found that no attendance of facility malaria-specific continuing medical education (CME) sessions [PRR=1.9 (95% CI 1.29 2.78),  $p=0.001$ ] was significantly associated with adherence to treatment guidelines. This implies attendance of facility malaria-specific continuing medical education (CME) sessions will have decreased likelihood of adherence to treatment guidelines.

Contrary to the finding in this study that years served (experience) and cadre of health worker have no influence on compliance to treatment guidelines, Kabaghe et al, (2015) in their study found that cadre of health worker and experience to have influence on compliance to treatment guidelines. Similarly Ucacon et al (2011) in their study in Uganda found that less experienced (years served < 6) are 3.4 times more likely to comply with treatment guidelines. Contrary to findings of Ucacon et al (2011), Selemani et al (2013) found that more experienced health workers (three or more years) work experience

were significantly more likely than others to prescribe correctly ( (aOR) 2.9; 95% CI 1.2-7.1;  $p = 0.019$ ). This contrast may be due to the difference in their definition of experience. Also contrary to our findings is that, more qualified professional are less likely comply to treatment guidelines. (Zurovac et al. 2008) and(Bawate et al. 2016) also found Patient complains or symptoms presented did not have significant association with compliance to treatment guidelines however, a study on patient, health worker, and health facility level determinants of correct malaria case management at publicly funded health facilities in Malawi: results from a nationally representative health facility survey by Steinhardt et al (2014) found that patients who complain of cough are 0.27 times less likely to be treated with ACT.

Four predictor variables that have been found to have significantly influenced health worker diagnosis and treatment according to the new treatment guidelines are facility type, health worker being supervised, patient presenting with abdominal pain and vomit in univariate analysis. The type of facility was significantly associated with treatment according to guidelines, where CHPS compounds are 0.64 [OR: 0.64 95% CI (0.124,0.810)] less likely to treat according to the guideline compared to health centres. Also health workers who had been supervised regarding the new treatment guidelines were 2.13 times [OR: 2.13, 95%CI (1.055, 4.287)] more likely to comply compared to their counterparts who had not been supervised. Vomiting 1.68 times [OR: 1.68, 95% CI (0.908, 3.095)] and abdominal pain 0.50 times [OR: 0.50, 95% CI (0.238, 1.041)]. However only facility type and health worker being supervised were statistically significant

Multivariable logistic regression was performed adjusting for 3 factors that had been identified as showing statistical significant association with health workers' compliance to treatment guidelines in other studies. These are years served, cadre of health worker and age of patient. Years served was dichotomized to <5 years and  $\geq 5$  years. Facility type and health worker being supervised were still found to have a statistically significant association with health worker compliance. See table 8.

Patient age has been found to have influenced health worker treatment practice where younger children are more likely to be treated according to treatment guidelines, Ucaakon et al (2011). On the contrary, this study revealed that, patient age has no influence on treatment practice. A study in Uganda also found results contrary to our finding (Sserwanga et al. 2015). A study in Uganda found health worker profession (cadre) and duration of service less than six years to have significant association with health worker compliance to treatment guidelines (Ucaakon et al. 2011) contrary to findings in this study.

Facility type has significant association with treatment according to treatment guidelines. Compared to health centres, patients treated at CHPS compounds are 0.64 times less likely to be treated according to treatment guidelines. However, a study in Uganda found Higher adherence to treatment guidelines in HIII (lower facility) compared to HIV (Higher) HC III [115 (53%)] than at HC IV (29%) [PRR=0.28 (95% CI 0.148 0.52),  $p=0.000$  (Bawate et al. 2016).

Health worker being supervised on test-based malaria case management were found to be 2.5 times more likely to comply with treatment guidelines compared to those who have not been supervised. Similarly Zurovac et al (2008) in an earlier study found that

supervised health workers are 1.63 times (OR = 1.63; 95% CI: 1.06–2.50) more likely to treat patients according to treatment guidelines. Steinhardt et al (2015) also found that health worker supervision was associated with improved performance. However Bawate et al (2016) found that supervision was not associated with health worker compliance.

### **5.1 Limitations of the Study**

One of the sub-Districts was excluded in the study due to the fact that it was inaccessible as a section of it was “overseas”.

The study was limited to the government facilities in the District as the only private clinic in the district did not consent to participate in the survey.

There was no clinical or laboratory re-examination of the patients to provide a “gold standard” diagnosis of malaria, mainly due to cost implications.

Prescriptions were not assessed for weight and age appropriateness as the study was non interventional

## CHAPTER SIX

### 6.0 CONCLUSION AND RECOMMENDATIONS

#### 6.1 Conclusion

Malaria diagnosis and treatment practice in Tolon District is sub optimal as only 66.2% of suspected malaria cases received parasitological testing. Treatment of patients with ACT was 89.3% and only 41% of diagnosis and treatment confirmed to the national malaria treatment guidelines. Proportion of test negative patients who received ACT contrary to treatment guidelines was 57.5% and presumptive diagnosis and treatment was 75.9%. The factors that have significant association with malaria diagnosis and treatment practices were type of facility and supervision. Compared to health centres, CHPS are 0.64 times [AOR = 0.64, 95% CI: 0.43–0.95] less likely to comply to treatment guidelines and health workers who have been supervised on test-based malaria diagnosis are 2.5 times [AOR = 2.50, 95% CI: 1.15–5.41] more likely to comply with treatment guide lines compared to those who have not been supervised

## 6.2 Recommendations

Based on the findings in this study the following are recommended

- Government should establish more CHPS compounds and build structures for existing ones.
- District health directorate should provide accommodation for health workers especially those working in the “overseas” communities.
- The District health directorate should establish at least a laboratory in each sub-District to improved investigations into other causes of fever to reduce presumptive diagnosis and treatment of malaria.
- The DHMT should organize more test-based malaria management trainings
- The DHMT increase supervision to evaluate health worker performance against national malaria treatment guidelines.
- Health workers should indicate their ranks on patients treatment cards for easy identification

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## APPENDICES

### APPENDIX I: INFORMATION SHEET/ CONSENT FOR PARTICIPANTS

MALARIA DIAGNOSIS AND TREATMENT PRACTICES IN TOLON DISTRICT,  
NORTHERN REGION.

Principal Investigator: Tahiru Ukasha

Address: School of Public Health, University of Ghana, Legon

Tel: 0208233513 E-mail: tahiruukasha@yahoo.com

#### **General Information:**

The purpose of this study is to assess malaria diagnosis and treatment practices in Tolon district. The study will involve health workers in selected health facilities in the district. It is expected that the results will be used in planning health care delivery in the district. As part of this study, you have been selected to help in obtaining information for this study. If you agree to be part of this research, it will involve answering questions that will be posed to you by a member of the research team.

The expected duration of each process will be about 20 to 30 minutes

#### **Benefits:**

The results of this study will provide useful information that improves the quality of care of your patients.

#### **Risks:**

The study will pose no risk to you or your job.

**Reimbursement:**

You will not be paid for participating in the study.

**Right to refuse or withdraw participation:**

Your participation is entirely voluntary and you are free to respond or not respond to any question and you can withdraw your participation any time during or after the interview.

**Confidentiality:**

The information of the study will be kept strictly confidential and used only for research purposes. Your identity will be kept confidential in as far as the law allows. All information will be kept on coded form and your name will not appear on any of these forms.

**Contact Persons**

If you have any questions, you may ask them now. You may also contact the following people if you have any challenges relating to your participation in the study:

Tahiru Ukasha

Dr. Ernest Kenu

Tel: 0243461291

Tel: 0243592122

E-mail: [tahiruukasha@yahoo.com](mailto:tahiruukasha@yahoo.com)

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Hannah Frimpong

GHS Ethical review committee

Tel: 0507041223

**STATEMENT OF CONSENT**

I ..... have been told procedures, the risks, and the benefits involved in participation of this study. I am aware that I may withdraw from this study at any time. I understand that by signing this consent form I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate.

**Signature of participant/Thumbprint**.....

Age ..... Date.....

Signature of interviewer .....Date.....

**APPENDIX II: OBSERVATION CHECKLIST FOR HF/ HEAD OF FACILITY.**

Date.....

Serial number (Day/HF number) ...../.....

Name health facility.....

Level of Health facility

a) CHPS

b) Health centre

c) Clinic

Ownership

a)Government

b)Mission

c) Private

## EQUIPMENT

1) Is there at least one functional weighing scale at the Health Facility?

a) Yes b)No

2) Is there at least one functional thermometer at the Health Facility?

a) Yes b)No

3) Is there at least one microscope at the Health Facility?

a) Yes b)No

4) If yes, is the laboratory service functioning at the HF on the survey day?

a) Yes b)No

5) WALL CHARTS: ITEM (Recommended malaria drugs Artesunate-Amodiaquine dosage)

a) Yes b) No

6) Antimalarial drug stock out

a) Yes b) No

(If yes, enter total number of stock-out days that occurred in the last six months)

7) RDT stock out

a) Yes b) No

(If yes, enter total number of stock-out days that occurred in the last six months)

### APPENDIX III: QUESTIONNAIRE FOR HEALTH WORKERS

Date ..... Serial number (Day/HF number/HW number)

...../...../.....

Health facility name and level.....

1) Age of health worker.....

(Circle the correct alternative)

2) Sex of health worker

a) Male b) Female

3) Level of formal training

a) Medical assistant

b) Nurse

c) CH Nurse

d) Nurse aide

4) When did you complete your formal training / when did you qualify?

a) Less than a year ago.

b) More than 1 year ago but less than 5 years ago. c) Between 5 to 10 years ago.

d) More than 10 years ago.

5) Have you heard about the change of the antimalarial drug policy?

- a) Yes                      b) No

6) Have you had in-service training in malaria case management?

- a) Yes    b)No

7) If yes, who offered the training?

.....

8) Do you have access to the new treatment guidelines during the course of your work?

- a) Yes    b) No

9) If yes, the interviewer should ask to have a look at the treatment guidelines, and tick the appropriate box below.

- a) Didn't see the guidelines    b) Saw the guidelines

10) Have you been supervised regarding the new policy for treatment of malaria in the last 6 months?

- a) Yes    b) No

11) What is the name of the first line drug recommended for patient with uncomplicated malaria? (Write responses for each category)

a) Adults and children above 5 kg ..... [\_\_\_\_\_]

b) Children below 5 kg ..... [\_\_\_\_\_]

c) Pregnant women in first trimester ..... [\_\_\_\_\_]

d) Pregnant women in second and third trimester[\_\_\_\_\_]

12) Do Patients demand drugs even when test is negative? a) Yes      b) No

13) Do you sometimes prescribe antimalarial when test is negative?

a) Yes    b) No

14) Do you have confidence in RDT results?

a) Yes      b) No

15) Do patients trust RDT results?

a) Yes      b) No

## APPENDIX IV: CHECK LIST FOR RECORD EXTRACTION

Date.....

ID Number (Day-HF-HW).....

1) Age of patient.....

2) Gender

a) Male..... b) Female

3) Symptoms presented (Circle all that apply)

a) Fever

b) Headache

c) Vomit

d) Chills

e) Body pain

f) Abdominal pain

g) Cough /chest pain

4) Laboratory done

a) Yes b) No

5) Test results

a) positive

b) Negative

c) NA

6) Medicine prescribe

a) AA

b) ACT

c) Other antimalarial

**Table 9 APENDIX V: Additional analysis; Parasitological testing in Tolon District, 2015**

Facility	Variables						
	No. records	No. tested	Tested positive	Tested negative	Not tested	Testing rate	Positivity rate
Tolon	80	38	34	4	42	47.5	89.5
Nyankpala	76	69	32	37	7	90.8	46.4
Wantugu	80	69	49	20	11	86.3	71.0
Kasuliyili	62	46	31	16	15	74.2	67.4
Yoggu	60	19	19	0	41	31.7	100
Gbulahagu	62	41	31	10	21	66.1	75.6
<b>Overall</b>	<b>420</b>	<b>282</b>	<b>196</b>	<b>87</b>	<b>137</b>	<b>67.1</b>	<b>69.5</b>

**Table 10 APPENDIX VI: Additional analysis; Treatment of malaria with ACT in Tolon District, 2015**

Facility	Variables						
	No. records	No. ACT	No. AA	Diagnose & treat ACT	Rate ACT	Rate AA	Rate Diagnosed & treat ACT
Tolon	80	79	78	34	98.8	98.7	43.0
Nyankpala	76	56	54	31	73.7	96.4	55.4
Wantugu	80	78	72	43	97.5	92.3	55.1
Kasuliyili	62	55	50	28	88.7	90.9	50.9
Yoggu	60	52	15	8	86.7	28.8	15.4
Gbulahagu	62	55	52	28	88.7	94.5	50.9
<b>Overall</b>	<b>420</b>	<b>375</b>	<b>321</b>	<b>172</b>	<b>89.3</b>	<b>85.6</b>	<b>45.9</b>