

**UNIVERSITY OF GHANA**

**SCHOOL OF PUBLIC HEALTH**

**COLLEGE OF HEALTH SCIENCES**



**MANAGING MALARIA IN THE CHPS COMPOUNDS IN UNDER FIVE CHILDREN  
IN THE BRIM CENTRAL MUNICIPALITY OF THE EASTERN REGION**

**BY**

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**THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON  
IN PASTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF  
MASTER OF PUBLIC HEALTH DEGREE.**

**DECEMBER, 2018**

**DECLARATION**

I, Jones Abekah Baah, declare that except for other people's work which have been duly acknowledged, the study was the result of my own original research undertaken under supervision.

Jones Abekah Baah

.....

.....

(Student)

Signature

Date

Dr. Samuel Sackey

(Supervisor)

Signature

Date

**DEDICATION**

Dedicated to my wife, Mrs Gloria Freda Abekah Baah and my three daughters, Afia Obenewaa ,  
Ewurabena Nhyira Abekah and Nana Ama Konadu.

## **ACKNOWLEDGEMENT**

I owe all my appreciation to the Almighty God who has never failed me in my academic pursuits. I am grateful to all the authors and publishers whose scholarly work helped in writing this thesis. I am also highly indebted to my supervisor, Dr. S.O. Sackey, whose patience and supportive supervision made the completion of this work possible.

I am highly appreciative of the contribution of all the community health officers who were the main participants in the study, not forgetting Ms. Ernestina Ohenewaa, who assisted in the data collection. I am also grateful to all lecturers in the school of public health, not forgetting the head of department of the Epidemiology and Disease Control, Dr. Bismark Sarfo for his good sense of direction. To all the administrative staff of the department of Epidemiology, I say God bless you abundantly.

## ABSTRACT

**Background:** Malaria remains one of the major public health burdens in Africa in that it is one of the common diagnosis made by prescribers in all out patient departments across the African continent. The infection affects about 3.4 billion people worldwide and accounted for the deaths of 1.2 billion people across the world. The worrying situation about the infection is that of the over-diagnosis of the disease and over prescription of antimalarial to persons who have not been tested for the presence of the parasite before commencing treatment.

**Objective:** The objective of the study was to assess how community health officers manage malaria in children under 5 years at the CHPS compounds and to assess whether the use of malaria RDT has contributed to a reduction in over diagnosis of malaria.

**Method:** A cross sectional study involving simple random sampling method was used to select two or three CHOs from each of the 23 CHPS compounds in the Birim Central Municipality.

Data was collected using face to face interview and paper questionnaire. The data was then entered into MS excel 2013 package and transferred into Stata version 15 for analysis.

The Pearson's chi-square and Fishers' exact tests of association were used to determine the association or relationship between participants' background characteristics and the level of knowledge on malaria management. The simple and multiple logistic regression models were used to determine the crude and adjusted odds ratio respectively in quantifying the factors that influence participants level of knowledge on malaria management.

**Results:** The mean knowledge score on the scale of 0 to 1 was 0.64 with a standard deviation of 0.11. Also the median score of the overall knowledge of study participants was 0.67 also with an interquartile range of 0.11(thus 0.70 minus 0.59). While 25% of the study participants scored

below 0.59, the top 25% of the study participants scored at least 0.70 both on the scale of 0 to 1. With a score of 0.70 as the least threshold of the high knowledge on management of malaria cases, 36.4% (n=24) of the study participants had high knowledge on management of malaria cases with an estimated 95% confidence interval of 24.9% to 49.1%.

**Conclusion:** Testing with malaria RDT before commencing antimalarial treatment was 95.45% from the study. This was higher than the national prevalence rate of RDT testing which stood at 83.9% in 2017. Findings from the study also showed that the use of malaria RDT in managing malaria in the CHPS compounds has drastically reduced the over diagnosis of malaria and the over prescription of antimalarial drugs.

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### LIST OF ABBREVIATIONS

ACT -	Artemisinin based Combination Therapy
CDC -	Centre for Disease Control
CHPS -	Community based Health Planning Services
CHO -	Community Health Officer
FY -	Fiscal Year
GHS -	Ghana Health Service
GSS -	Ghana Statistical Survey
GMIS -	Ghana Malaria Indicator Survey
ITN -	Insecticide Treated Net
MOH -	Ministry of Health
NMCP -	National Malaria Control Programme
PMI -	President Malaria Initiative
RDT -	Rapid Diagnostic Test
RBM -	Roll Back Malaria
WHO -	World Health Organization

### **DEFINITION OF TERMS**

Community Health Officer – a community health nurse who has been trained on how to work in a CHPS compound and also within a certain catchment area.

Malaria – a mosquito – borne disease caused by a plasmodium parasite.

Presumptive treatment – treatment of clinically suspected cases without, or prior to, results from confirmatory laboratory tests.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

Malaria is endemic in Ghana and continues **to rank number one** of all OPD attendances in the under five children in Ghana. Almost half of the world's population is at risk of malaria (WHO, 2016). Increased prevention and control measures have contributed to bringing a reduction to 29% in mortality rates across the globe since 2010. Sub-Saharan Africa continues to carry a greater proportion of the malaria burden globally shouldering closed to 90% malaria cases and 92% of malaria deaths (WHO, 2016). Malaria is caused by parasites (plasmodium) through the bite of an infected female anopheles mosquitoes. The main parasite species causing malaria in Ghana are *Plasmodium falciparum* (80-90%),

*P. malariae* (20-36%), and *P. ovale* (0.15%). *P. vivax* has not yet been seen on blood films in Ghana (GHS, guideline for case management, 2014). Malaria is a major cause of illness and death in Ghana, particularly among children and pregnant women. In 2012, malaria accounted for 38.9% of all out-patient illnesses and 38.8% of all admissions (NMCP, 2014). Malaria parasite prevalence among children aged 6-59 months in the MICS 2011 report indicated a regional variation from as low as 4% in the Greater Accra region to as high as 51% in the Upper West region(GHS/NMCP, 2014). Since Ghana adopted the Roll Back Malaria Initiative in 1998/1999, the country has been implementing a combination of preventive and curative interventions as outlined in the Strategic Plan for Malaria Control in Ghana, 2014 – 2020. The country continues to implement strategies that are designed to enhance the attainment of the set

objectives. Additionally, Ghana subscribes to sub-regional and global initiatives such as the T3 (Test, Treat and Track) initiative which seeks to ensure that every suspected malaria case is tested, that every case tested positive is treated with the recommended quality-assured antimalarial medicine, and that the disease is tracked through timely and accurate reporting to guide policy and operational decisions. These processes if strictly adhered to, will enhance an accurate profiling of the malaria burden and also greatly contribute to appropriately managing other causes of febrile illnesses. It will additionally reduce the unnecessary exposure of patients to anti-malaria medicines, reduce consumption of ACTs and thus eliminate pressure on the medicines (GHS, 2014). Studies done by (Amexo, Tolhurst, Barnish, & Bates, 2004) suggest that, it is very effective when children suspected of having malaria are properly diagnosed and put on treatment within 24 hour period. This according to Amexo et al (2004) is not the case especially in low income countries such as those in Sub Saharan Africa. In the year 2012, the Child Survival Call to Action launched a “Renewed Promise” strategy aimed at further reducing the under- five mortality as a result of malaria by 20%. This was an initiative developed by the WHO to drastically reduce the burden of malaria in Sub Saharan Africa by the year 2035. The initiative according to (Ferrer et al., 2016) include making sure all children under –five will receive appropriate medication within 24 hours of the onset of symptoms of malaria. This was to prevent the malaria from progressing to complicated one or even death. In a sustained attempt to reduce the burden of malaria in Sub Saharan Africa, the WHO introduced the Community Case Management of malaria (CCMm), a strategy which according to (Akweongo et al., 2011) was meant to improve access to effective drug treatment through the training of community volunteers who live within the community and are easily accessible to by patients.

Community Health Compounds (CHC), which is also known as Community Health Based Planning and Services (CHPS) compounds or zones are the first line health facilities in the rural and hard to reach areas in Ghana. They are mostly manned by trained community health nurses called Community Health Officers (CHOs) and sometimes Enrolled Nurses (Nurse Assistants Clinical). There are also another group of staff found at the CHPS compounds called Health Extension Officers. These cadre of staff are employees of the Youth Employment Agency who are senior high school graduates with six months training in basic health care. They assist the CHOs in rendering health care services to the people. Mothers and caregivers present to these CHPS zones different medical conditions especially malaria in the in the under 5 children. CHOs in these primary care facilities have in the past depended solely on the clinical presentations and their judgment to treat malaria since the CHPS compounds lack the services of trained laboratory technicians. CHOs who work in the periphery of the country have managed malaria presumptively where they treated almost every case of fever as malaria until the introduction of the Rapid Diagnostic Tests (RDTs) by the WHO to assist in the diagnosis of malaria by detecting the existence of the malaria parasites (MPs) in human blood. RDTs assist in detecting cases of malaria infections particularly in rural areas that do not have access to laboratory/microscopy services

The research was carried out aimed to assess how malaria cases were managed in the under 5 children at the Community Health Compounds by CHOs in the Birim Central Municipality in the Eastern Region.

## 1.2 Problem Statement

Presumptive management of malaria has been practiced for many years in low-income countries like Ghana because of the lack of laboratory facilities to properly diagnose malaria (Baiden et al., 2012). This practice resulted in the over-diagnosing of malaria and over prescription of antimalarials **which may have contributed to** the development of resistant strains of the plasmodium parasites. As part of the strategy of home management for malaria, caregivers/mothers were encouraged by **Community Health Officers (CHOs)**/other prescribers in the past to initiate presumptive treatment for malaria at home before sending sick children to the health facility for further treatment (Baiden et al., 2012). Presumptive treatment thus became an integral part of managing malaria at the CHPS compounds and other lower health facilities and the prescription of anti- malaria medication became a part of the expectations of caregivers attending primary care facilities in endemic countries (Osman et al., 2010). This led to a situation whereby the sick child might have received additional prescription of antimalarial if the mother was unable to give a proper account of the type of the drug that had already been given at home. In the days of presumptive treatment of malaria, case management guidelines within the Integrated Management of Childhood Illnesses (IMCI) required that all under-five children with fever in high-transmission settings should be prescribed an antimalarial. In the year 2010, the WHO came out with a revised policy on malaria management which strongly recommended that all suspected malaria/fever cases should solely be managed on a test based management system for all persons. The WHO in 2010 recommended to all high malaria endemic countries to use rapid diagnostic tests as the main tool for implementing the test-based management of malaria. With the introduction of test-based management of malaria however, fewer febrile children will be confirmed to have malaria and therefore prescribed antimalarials.

Prescriptions for artemisinin-based combination treatments (ACT) could therefore be reduced by as much as 50– 70% according the NMCP. This means that test negative febrile children will not be prescribed any ACT. This meant that further investigations was needed to ascertain the cause of fever in children who tested negative to RDT.

Studies done by the NMCP in 2012 indicated that the entire area of Ghana is considered to be hyperendemic for malaria. Transmission is all-year round, but particularly high during the rainy seasons. According to facility based data from the Ghana Health Service (GHS), malaria is the leading cause of morbidity in the country. In the Ghana Health Service structure, the CHPS compounds are the lowest level of the health delivery system. By their geographical locations, they lack microscopy facilities as the placement of laboratory personnel was not part of the rational for establishing the CHPS concept. Management of malaria in the CHPS compounds was therefore based on presumptive treatment approach. In Ghana, the revised Integrated Management of Childhood Infection (IMCI) guidelines that incorporate RDT based diagnosis and management of malaria are currently being introduced, replacing those including the presumptive approach. The new guidelines are for the clinical care of under-five children in health centres and other lower care settings that similarly lack laboratory facilities like the CHPS compounds (Donovan, Siadat, & Frimpong, 2012). A study conducted in Enugu State, Nigeria in 2015 by (Osungbade & Oladunjoye, 2012) showed that the use of RDTs significantly reduced antimalarial prescriptions for patients and was more cost effective when compared to other diagnostic methods for malaria in endemic areas. Studies conducted in Tanzania and Ghana showed that RDTs utilization improved correct treatment more than microscopy (microscopy led to excessive ACT prescription). Rapid diagnostic tests for malaria can effectively be used in all

peripheral health facilities, they are sensitive and can be used with minimal training by all CHOs at the CHPS compounds to reduce the over prescription of antimalarial (Ansah et al., 2015).

Presumptive management of malaria has been practiced for many years in low-income countries like Ghana because of the lack of laboratory facilities to properly diagnose malaria (Baiden et al.). This practice resulted in the over-diagnosing of malaria and over prescription of antimalarials which was accompanied by the development of resistant strains of the plasmodium parasites. As part of the strategy of home management for malaria, caregivers/mothers were encouraged by CHOs/other prescribers in the past to initiate presumptive treatment for malaria at home before sending sick children to the health facility for further treatment (Baiden et al.). This led to a situation whereby the sick child might have received additional prescription of antimalarial if the mother was unable to give a proper account of the type of the drug that had already been given at home. Presumptive treatment thus became an integral part of managing malaria at the CHPS compounds and other lower health facilities and the prescription of anti-malaria medication became a part of the expectations of caregivers attending primary care facilities in endemic countries (WHO, 2010). In the days of presumptive treatment of malaria, case management guidelines within the Integrated Management of Childhood Illnesses (IMCI) required that all under-five children with fever in high-transmission settings should be prescribed an antimalarial. In the year 2010, the WHO came out with a revised policy on malaria management which strongly recommended that all suspected malaria/fever cases should solely be managed on a test based management system for all persons. The WHO in 2010 recommended to all high malaria endemic countries to use rapid diagnostic tests as the main tool for implementing the test-based management of malaria. With the introduction of test-based

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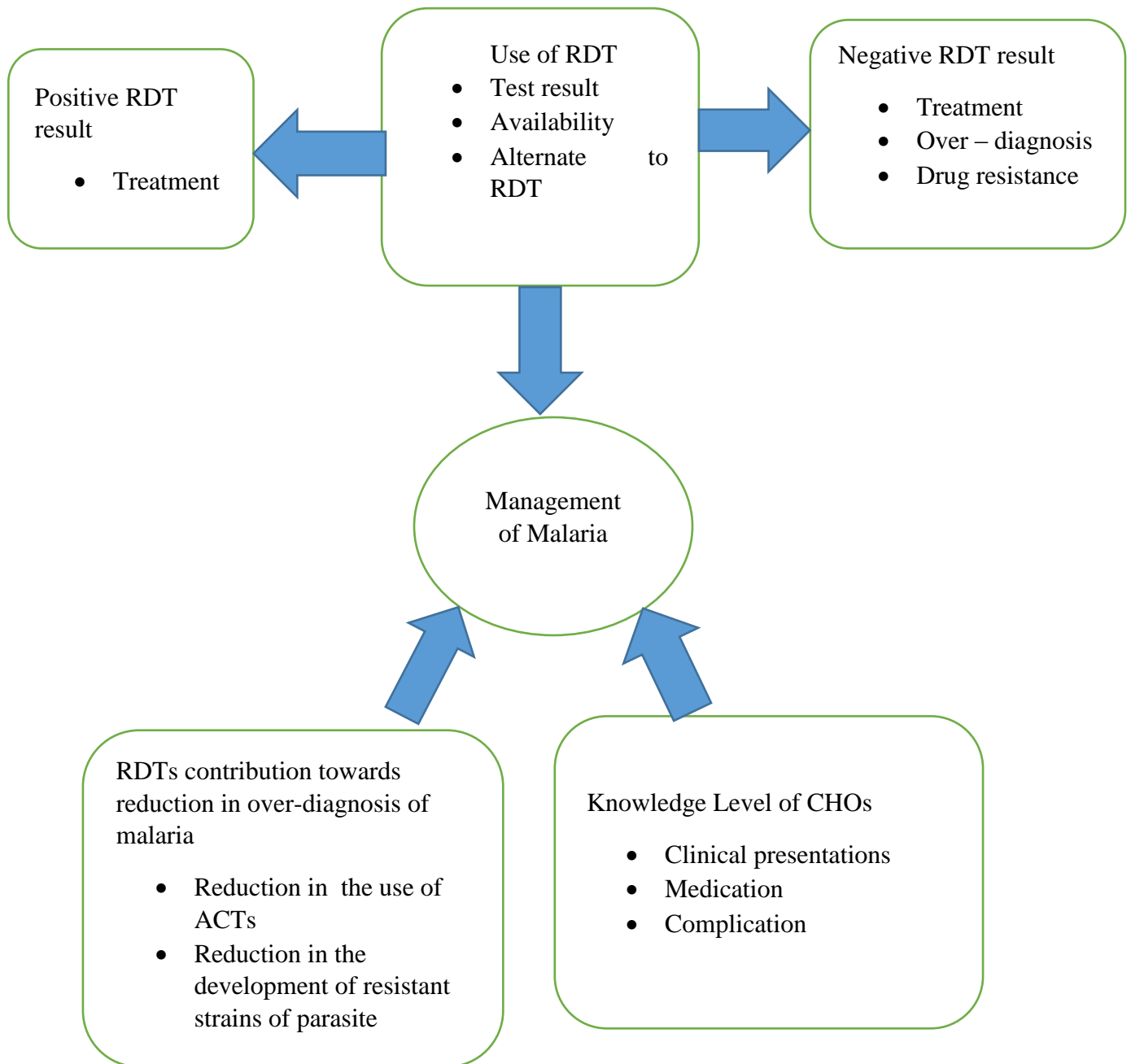
to excessive ACT prescription). Rapid diagnostic tests for malaria can effectively be used in all peripheral health facilities, they are sensitive and can be used with minimal training by all CHOs at the CHPS compounds to reduce the over prescription of antimalarials (Ansah et al., 2015).

### **1.3 Justification**

The Birim Central Municipality of the Eastern region is situated within middle forest belt of Ghana. It home to a number of virgin forests and the major occupations of the indigenes are farming and mining along the Birim River. Apart from Akim Oda, the municipal capital that is urban in character, more than 85% of the remaining communities are located in remote parts of the municipality. In addition, 19 out of the 23 CHPS compounds are stationed within remote areas, where some of the villages are not connected to the national electricity grid. This therefore makes it impossible to access laboratory services.

The CHPS compounds are mainly manned by CHOs and sometimes Enrolled Nurses. Few of the compounds have post basic enrolled midwives who render skilled services to maternal and child health cases. Treating malaria solely based on presenting clinical symptoms had been the order of the day for the CHOs in dealing with under five malaria cases brought to the facilities. This practice has led to serious consequences such as the emergence of resistant strains of the parasites and misdiagnosis of malaria. The use of RDTs has now caught up with almost all Ghana Health Service (GHS) facilities in the country but the issue is whether CHOs use the RDTs in diagnosing malaria cases or they continue to manage cases presumptively. Treating malaria alone may not yield much results without educating the mothers or care takers on prevention of the bites of the mosquitoes that transmit the parasite. The study will therefore examine how CHOs comprehensively manage malaria in under 5 children at the CHPS compounds in the Birim Central Municipality.

### 1.4 Conceptual Framework



**Figure 1: Conceptual Framework on Management of Malaria by CHOs at the CHPS compounds.**

#### **1.4.1 Narrative**

The conceptual frame as shown above depicts how malaria ought to be managed at the CHPS compound. The knowledge of the CHO on the presenting symptoms of malaria and the need to test all suspected cases of malaria before treatment will inure to the benefit of the patient. When test results are adhered to and treatment is given accordingly, it reduces the possibility of developing malaria resistant and this will also help reduce morbidity. A study conducted by (Harchut et al., 2013) has shown that testing before treatment has the potential of reducing the over prescription of antimalarial which eventually prevents the development of resistant strains of the parasites. This will also have a net reduction on the amount of money spent by the government in importing ACTs into the country.

#### **1.5 Research Questions**

1. To what extent do community health officers manage malaria based on the use of RDTs results?
2. How malaria cases are managed in the CHPS compounds by the CHOs?
3. To what extent has RDT usage contributed to the reduction in over diagnosis of malaria in the CHPS compounds?

#### **1.6 Main Objective**

To assess the use of RDT for malaria management among community health workers in children under- 5 years at the CHPS compounds.

### **1. 7 Specific Objective**

1. To determine the use of RDTs in diagnosing malaria.
2. To assess the knowledge of community health officers in the treatment of malaria.
3. To assess whether the use of RDT has contributed to a reduction in over diagnosis of malaria

## CHAPTER TWO

### LITERATURE REVIEW

#### **2.1 Managing Malaria based on the use of RDTs by Community Health Officers.**

Since the year 2010, the World Health Organization (WHO) has recommended to all countries where malaria is endemic to always test persons suspected to have fever or malaria who report to health facilities with Rapid diagnostic Test (RDT) or microscopy before commencing anti malaria treatment. Until the introduction of RDT, almost all the Community based Health Planning Services (CHPS) compounds and other lower health facilities practiced presumptive treatment of malaria in Ghana. Many patients with fever who might not have malaria were often given malaria treatment in many CHPS compound because the opportunity to test them for malaria had been non-existent. This led to the over prescription of anti-malaria drugs to patients who did not have malaria in malaria endemic countries like Ghana. Studies done by (Awoleye & Thron, 2016) indicated that the use of RDTs in testing for the malaria parasites significantly reduced antimalarial drug prescriptions and was more cost effective when compared to other diagnostic methods for malaria in endemic areas. Awoleye & Thron (2016) also found out that few studies conducted in Tanzania, Nigeria and Ghana showed that RDTs utilization improved correct treatment more than microscopy. Mokoulu et al (2018) posited that the mainstay of malaria case management in all primary health care facilities/CHPS is the availability of resources to identify the malaria parasites in blood films. The study by Mokoulu et al (2018) further revealed that, the use of malaria RDTs has reduced the unnecessary administration of anti- malarial medications and the early diagnosis of other conditions that produce fever but that are not caused by malaria.

According to the National Malaria Control Programme (NMCP), Ghana is making a lot of progress with the use of RDTs in diagnosing malaria as most primary care facilities without microscopy or laboratory services are embracing the use of RDTs as the surest of eliciting the existence of the plasmodium parasites before commencing treatment. The NMCP stated that health facilities diagnosing malaria based on laboratory test was less than 14%. This figure increased to 34.7% in 2012. However, the NMCP 2015 report on malaria situation in Ghana showed that almost all primary health care facilities including CHPS compounds have now embraced the concept of treating malaria based on RDTs results. In 2015, the number of OPD malaria cases tested before treatment was 74.3%. (GHS annual report, 2015). RDT for malaria management now is being proposed as the surest way to ensure that anti-malarial gets to those who really need it (Chandler, 2010). The GHS recommends that primary care facilities such as CHPS compounds and clinics where microscopy facilities are not available resort to the use of RDTs to diagnose malaria whiles district hospitals and other higher facilities use microscopy to test malaria (Tingle, 2014). In the report published by the Ghana Health Service division of National Malaria Control Programme, the country again saw a great improvement in the overall testing rate of malaria cases before treatment. The figure increased from 74.3% in 2015 to 83.9% in 2017. More importantly, data from the regions showed an appreciable increase in testing of malaria cases with the Northern Region recording 91.6% (DHIMS2, 2017). The sensitivity, reliability of RDT results have been studied by many researchers across the globe. One of such studies was carried out by Isa et al (2011) in Central Nigeria comparing test results of microscopy and RDT. The study revealed that the microscopy and RDT results of 160 (99%) out of 161 participants were in agreement. Microscopy testing is not available in almost all the CHPS compounds and many health centers in rural Ghana, the test results of RDT have proven

to be reliable (Baiden et al, 2012). Rapid diagnostic tests require less training and non- health staff can easily be given some few hours of training to use them. Malaria diagnostic accuracy may be strengthened by the use of RDTs where microscopy is not available due to the geographical locations of many primary health care facilities in low and middle income countries (Kyabayinze et al, 2008).

Many reports published by the WHO have also collaborated the reliability of the RDT in correctly identifying the plasmodium falciparum species especially in high endemic areas in Sub-Saharan Africa including Ghana. In a study done in South Africa to evaluate the effectiveness of RDT, Mouatcho, J. C., & Goldring, J. D. (2013) found out that the RDT commonly detect the plasmodium falciparum species in most parts of the world where malaria is endemic.

Research has shown precisely that the gold standard of diagnosing malaria is microscopy, however, microscopy has several notable limitations. Reliable diagnosis requires an experienced biomedical technician or laboratorian with adequate skills and training and highly functional equipments. The revised 2010 WHO policy guidelines on testing all suspected cases of malaria before commencing treatment thus make it worthwhile for all CHPS compounds to have access to malaria RDTs resources to aid in proper diagnosis and treatment (Boyce & O' Meara, 2017).

## **2.2 Malaria situation in Ghana**

Malaria infestation occurs in almost every part of Ghana and is the most common disease condition that is reported in both public and private health facilities in the country. There is however seasonal variations in certain parts of the country especially in the northern part of the country. The transmission season is influenced by geographical differences in the country and this is also hinged on the length of the dry season which usually occurs between December to February. According to the NMCP (2014), the transmission pattern in the country occurs in two

seasons. In most parts of northern Ghana, there is estimated 6 – 7 months of transmission whereas in the southern parts, malaria transmission occurs as much as 9 months. In both the coastal and the forest belts which invariably form the middle and southern zones of Ghana, the malaria prevalence peak twice in a year during the major and minor rainy seasons (Tiedje et al, 2017). All age groups are at risk of malaria and those who are more vulnerable are children under 5 years and pregnant women (Mba et al, 2010). According to a study conducted in 2007 by the United Nations Children Emergency Fund (UNICEF), about 3.7 million people are infected with the disease every year in Ghana and about 20, 000 children who are under the 5 die. Every household in Ghana spend money on one product of malaria or the other including mosquito repellent, sprays and coils (Mba et al, 2010).

The disease continues to rank number one of the top ten cases seen in the out-patient departments in all health facilities in Ghana. In the year 2012, the NMCP came out with a study to emphasize that the main species of plasmodium parasite that causes malaria in Ghana was the plasmodium falciparum (80-90%). In another research conducted, Tiedje et al (2017) opined that the plasmodium falciparum constitutes (95.0%) of the parasites that cause malaria in Ghana. The contribution of the other species include Plasmodium malariae (20-36%), Plasmodium ovale (0.15%) while Plasmodium vivax has not been seen yet in blood film in Ghana till date. Geographically, those regions that had the highest parasitemia prevalence in 2011 have seen large decreases, while most of the other regions have seen small increases.

Malaria has continued to remain a public health problem among pregnant women. It accounts for 28.1% of out-patient department (OPD) attendance of pregnant women, 13.7% of admissions, and 9.0% of deaths. Generally, studies have over the years that individuals who live

in areas of high transmission are known to acquire immunity to the disease over time. However, in pregnancy, a suppression of the immune system rather occurs especially for primigravidae who tend to have a higher risk of malarial infection (Helegbe et al, 2018). Malaria in the pregnant woman, even when asymptomatic, can be serious and a major contributor to low neonatal birth weight, maternal anaemia, infant mortality, spontaneous abortion, and stillbirths. Coinfections of malaria with other infectious diseases like tuberculosis, hepatitis have also been shown to have negative outcomes. For instance, individuals coinfecting with *Plasmodium* sp. and HBV present with lower parasitaemia and higher viremia. According to Helegbe et al (2018), malaria infection is associated with strong cluster of differentiation 4 (CD4<sup>+</sup>) cell activation and upregulation of pro-inflammatory cytokines, which provides an ideal microenvironment for the spread of the HIV-1 among the CD4<sup>+</sup> cells and thus for rapid viral replication.

### **2.3 Knowledge of Community Health Officers on the Appropriate Drug Treatment for Malaria**

Efforts geared towards conquering malaria depend on the ability of health providers to use the appropriate and effective drug treatment (NMCP, 2004).

In the year 2004, the first line antimalarial drug in Ghana was changed from chloroquine to the use of artesunate amodiaquine (Asante et al, 2010). In an attempt to streamline the treatment policy, the NMCP in the year 2009, came out with guideline for all health facilities irrespective of geographical locations to test all suspected malaria cases in all age groups by either microscopy or RDT, in conformity with WHO guidelines. Following this directive, the NMCP's agenda has been on ways of bringing improvement in the quality of microscopy testing at higher health care facilities and increasing the awareness on the use of RDTs in the rural settings especially the hard to reach areas where the CHPS compounds are located across

the country. In the guidelines, the NMCP estimates that 85% of all febrile cases should be tested using malaria RDT and 25% by microscopy in all health facilities.

The NMCP directives are meant to ensure fast and prompt access to an appropriate antimalarial drug treatment for all confirmed cases of malaria. The Ghana Health Service adopted first-line therapy for uncomplicated malaria to be artesunate-amodiaquine (NMCP, 2004). In 2009, artemether-lumefantrine and dihydroartemisinin-piperaquine were added as additional first-line treatment options. These additional Artemisinin Combination Therapy (ACT) were to be used for patients who cannot tolerate the Artesunate -Amodiaquine combination (NMCP, 2013).

Quinine and intramuscular artesunate are supported as therapies for severe malaria. The NMCP further stated that during the first trimester of pregnancy, Oral Quinine or a combination of oral quinine and clindamycin shall be used to manage such cases. Pregnant women with co-morbidities of HIV and sickle cell anaemia were also to be treated as above for malaria.

Artesunate-Amodiaquine had then been the combined drug of choice for treating uncomplicated malaria in the community or near-home setting for children below five (5) years of age. Integrated Management of Childhood Illness shall ensure that community based agents involved in home management of malaria are adequately supported, supervised and provided with essential skills in behaviour change communication. The anti-malaria drug policy in 2009 revised the protocol on how treatment failure in malaria should be managed. In the revised document, quinine shall be the drug of choice for the management of malaria in the event of treatment failure. In the case of pregnant women who are in the first trimester, ACTs should not be used except in situations where their use is considered as life- saving or where the use of other anti-malaria drugs are not suitable. Quinine or Artesunate-Amodiaquine or Artemether - Lumefantrine combination therapies shall be given depending on which medicine was used first

(Baiden et al., 2012). A treatment option other than what was first used shall be given where treatment failure is established. Management of severe/complicated malaria requires parenteral treatment to provide adequate blood-serum concentrations as quickly as possible initially; subsequently revert to oral treatment as soon as the patient's condition permits. The NMCP has also directed that all children who do not respond to treatment with Artesunate-Amodiaquine within 24 hours at the CHPS zone shall be referred immediately to the nearest higher health facility after tepid sponging. Such children shall be given an initial dose of an artemisinin-based suppository prior to referral to the nearest health facility.

#### **2.4 RDT usage towards the reduction in over- diagnosis of malaria in the various CHPS compounds**

A study conducted by (Kilonzo et al., 2014) on over-diagnosing of malaria by microscopy in the Kilombero Valley in southern Tanzania found out that treating malaria cases based on microscopic testing has led to the over-diagnosis of malaria compared to the use of RDTs. The study further indicated that there was as much as 64% over diagnosis of malaria with microscopy compared with rapid diagnostic testing. The introduction of RDTs at public health facilities has resulted in the net savings of huge sums of money for the Tanzanian government (Kilonzo et al., 2014). The use of RDTs to treat malaria could help to target antimalarials to true cases who actually need the medicine and this will prevent over prescription of antimalarial to anyone who presents fever and other symptoms suggestive of malaria to the health facility (Kamel et al., 2016). Testing patients with RDTs before commencing treatment has been well embraced in many countries where malaria is endemic. A study undertaken by (Burnett et al., 2016) in Uganda and Zambia indicated that when RDTs are used, it has the potential of improving treatment outcome for patients, reduce the overall cost of poor treatment and also avoid the over

prescription of antimalarial including irrational use of ACTs. In countries such as Zambia, health authorities have considered the idea of introducing RDTs at over the counter medicine outlets throughout the nation. This is to ensure that patrons of such outlets who go and purchase antimalarial will get tested before being dispensed any ACTs by (Burnett et al., 2016). This idea according to by (Burnett et al., 2016) was conceived out of the study that testing before treatment was the surest way of ensuring that ACTs are given to patients who actually need them.

Olatunji Joshua Awoleye and Chris Thron ( 2013) opined that symptomatic based treatment often failed and the challenges associated with the use of microscopy were some of the rationale behind the introduction of malaria RDTs which have proven to be very effective. In a study conducted in Tanzania and Ghana, Ansah et al (2013) posited that RDTs utilization has improved correct treatment more than microscopy (microscopy led to excessive ACT prescription). Similarly, improvement was recorded in Uganda, where 39 percent reduction in ACT prescription occurred due to introduction of RDTs .

## CHAPTER THREE

### METHODS

#### 3.1 Study Area

The Birim Central Municipality is one of the 26 District/Municipal Assemblies of the Eastern Region of Ghana. It is located in the southwestern corner of the Eastern Region. Akim Oda is the administrative capital. The municipal shares boundaries with Akyemansa and Denkyembour districts to the north, to the south with Birim South district, to the east with West Akim Municipal and the west with Assin North Municipal Assembly. It has a total land area of 1,090km<sup>2</sup> (GSS, 2014). The municipality has a population of 144, 869 with 47.83% (69304) being males and 52. 17% (75565) being females according to the 2010 housing and population census. It falls within the wet semi-equatorial climate zone and as such experiences substantial amount of rainfall in most parts of the year.

The major economic activities are agriculture (50.9%), trade and commerce (20.1%), industry (13.1%) and services (hotels, banking etc.). These figures show that agriculture is the mainstay of the district's economy employing about 60 percent of the active labour force (GSS, 2012). According to the district analytical report captured in the 2010 population and housing census report, 77% of the dwelling units in urban areas are connected to the national grid (electricity) for lighting and 17.3% use kerosene lamp. This pattern seen in the rural areas is the reverse of what pertains in the urban areas. In the rural areas of the municipality, majority of the people rely on Kerosene lamp (37%) as their main source of lighting and about 35.6 % are on the national grid whilst one-in every-four (25.6%) of households uses flash or touch light.

There is one municipal (government) hospital, three private hospitals, three health centres and 23 CHPS compounds in the municipality that take care of the health needs of the entire population. The CHPS compounds are manned by CHOs who are Community Health Nurses with special training on how to manage CHPS compounds. There are a total of 89 CHOs in the entire municipality. Each CHPS compound on the average has about two to five CHOs. Some of the CHPS compounds have trained midwife who attend to pregnancy, labour and delivery cases.

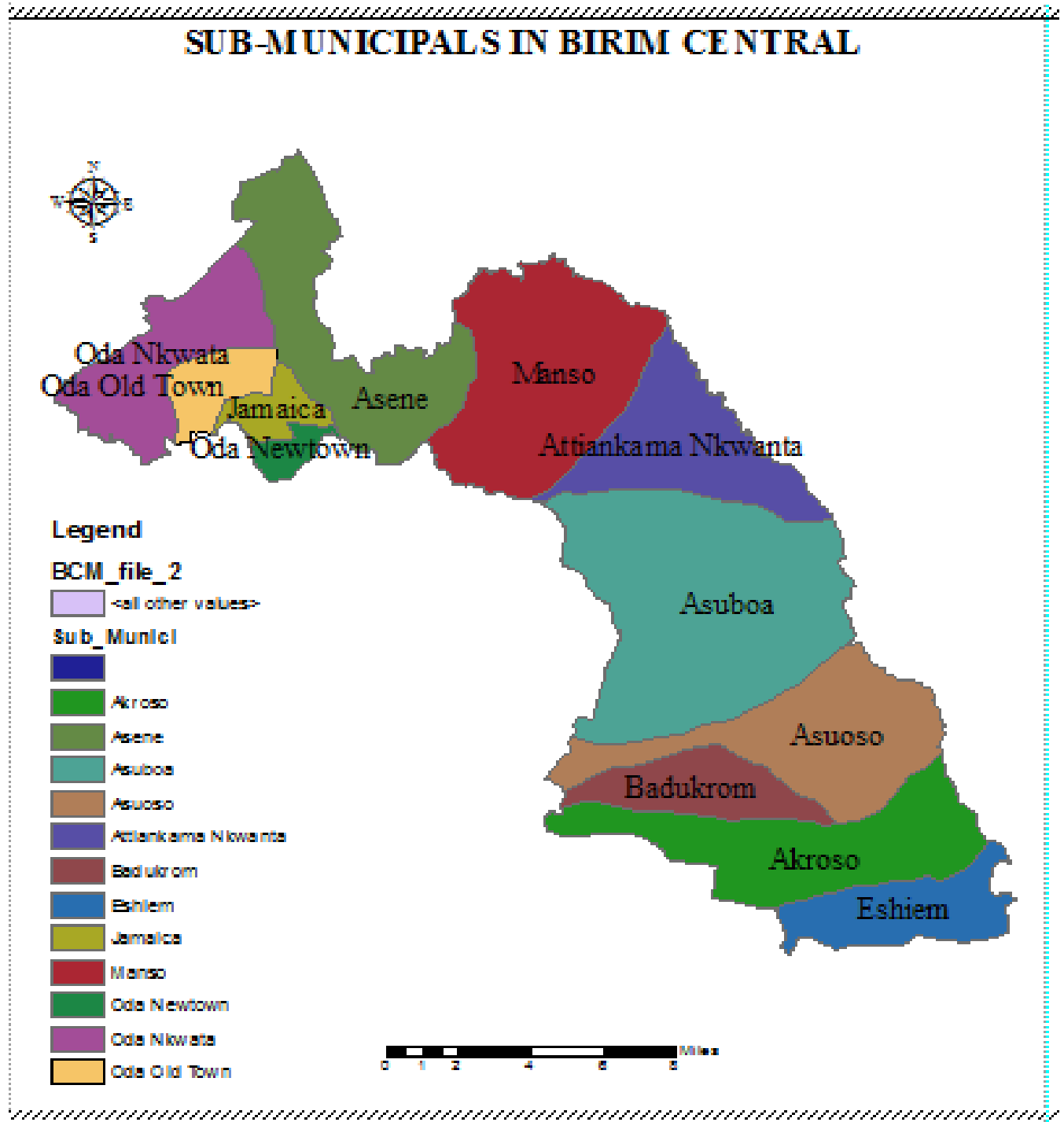
The government hospital has one gynecologist, five medical officers, six physician assistants and 96 nurses of varied backgrounds.

Figure 2: Map of the Birim Central Municipality



Source: Ghana Statistical Service, 2014

Figure 3. Sub- Municipals in Birim Central



Source: MHA, Birim Central

### **3.2 Study Design**

A quantitative cross sectional study was used to collect data from the study participants. The approach is described below.

Simple random sampling method was used to select two to three CHOs from each of the 23 CHPS compounds. This method was chosen in order to give each CHO an equal chance of being selected to be part of the study. All the 23 CHPS compounds were used in the study because all the CHOs in these peripheral facilities numbered up to 89. In each CHPS compound visited, participants selected were given the questionnaire to respond to.

### **3.3 Study Population**

The study population included community health officers (CHOs) and Enrolled Nurses who work in the CHPS compounds.

#### **3.3.1 Inclusion Criteria**

Community health officers and enrolled nurses who work at the CHPS compounds were eligible to partake in the study.

#### **3.3.2 Exclusion Criteria**

Other staff who work as assistants to the CHOs such as health extension workers, ward assistants, community health volunteers were not eligible to participate in the study.

### **3.4 Variables**

#### **3.4.1 Dependent variable**

Management of malaria.

### **3.4.2 Independent variables**

- Knowledge of community health officers in the treatment of malaria
- Use of RDTs
- Drug treatment

### **3.5 Sample Size Calculation**

The Birim Central Municipality had only 89 CHOs who work in 23 CHPS compounds.

All CHOs were given equal chances of taking part in the study using the simple random technique. A total of two or three CHOs were selected from each of the 23 CHPS compounds giving a total of 66 study participants. In the light of this, no sample size calculation formula was used.

### **3.6 Sampling Procedure**

Each CHPS compound in the Municipality has two to five CHOs manning the facility depending on the population characteristics of the community. Where the CHOs were only two, both were selected purposively to be part of the study. In facilities that the CHOs were more than two, a “Yes” and “No” were written on pieces of papers and shuffled. The CHOs were then asked to pick. Those who picked yes were included in the study. This procedure was repeated in all the 23 CHPS compounds until the sample size of 66 was obtained. One research assistant was trained to help in the data collection which lasted for four weeks.

### **3.7 Data Collection**

Quantitative data collected was entered into an excel sheet and coded. The data was cross checked by both the principal investigator and the research assistant.

### **3.8 Quality Control**

One way of ensuring the quality of any research work is to employ triangulation in data collection. Even though the research setting comprises all CHPS compounds in the municipality who treat cases of malaria, the CHPS compounds were located at different geographical areas. In addition, the research assistants were given some training on how to collect data as a way of ensuring reliability.

### **3.9 Data Analysis**

Data was collected using face to face interview and paper questionnaire. The data was then entered into MS excel 2013 package and transferred into Stata version 15 for analysis.

Frequency and percentages were used to describe characteristics of respondents from the study. The Pie chart was also used in describing responses from the study. All knowledge questions that were answered rightly were scored one (1) while those answered wrongly scored zero (0). In all, there was a total of 31 knowledge questions to be answered by each study participant. The composite mean score of knowledge questions was determined. A possible maximum mean score of one (1) and a possible minimum mean score of zero (0) could be scored by each study participant. All missing values in the knowledge section of the questionnaires were automatically scored zero (0) or wrongly. The composite mean knowledge scores was then dichotomized with those respondents scoring below 0.70 designated as low level of knowledge on malaria management and those that scored 0.70 and above designated as high level of knowledge on malaria management.

Mean and standard deviation, median, lower quartile and the upper quartile of the composite mean score of knowledge were used to describe the overall knowledge score of study participants in the study. The Pearson's chi-square and fishers' exact tests of association were

used to determine the association or relationship between participants' background characteristics and the level of knowledge on malaria management. The simple and multiple logistic regression models were used to determine the crude and adjusted odds ratio respectively in quantifying the factors that influence participants level of knowledge on malaria management. A 0.05 level of significant was used in determining statistical significance of results from the study.

### **3.10 Ethical Consideration**

Ethical clearance needed for the research was obtained from the Ghana Health Service Ethical Review Committee with reference number: GHS/RDD/ERC/Admin/App/18/311. Study participants were also assured of strict confidentiality of every information they would give out. In addition, an introductory letter was taken from the Head of Department of Epidemiology of the School of Public Health, University of Ghana. The letter was sent to the Birim Central Municipal Director of Health Services to seek permission to enable me carry out the study within the municipality. The consent of the CHOs who took part in the study was sought before proceeding with the study. They were assured of identity protection and confidentiality of any opinion expressed in the course of the interview.

### **3.11 Pilot Study**

The research was pretested in four CHPS compounds in Akyemansa District. Akyemansa District shares boundary with Birim Central Municipality in the north. This afforded the researcher to identify or refine some aspect of the research question and also figure out what methods were best pursuing in carrying out the study. This enabled the researcher to estimate how much time and resources needed to complete the main research.

## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1 Background Characteristics of Study Participants

A total of 66 CHPS compound health officers from 23 CHPS compounds were recruited into the study with a mean age of  $(29.23 \pm 5.95)$  years. About two-thirds (65.2%, n=43) of the participants were age between 19 and 29 years of age inclusive. Four out of every five of the participants were females. 62.1% (n=41) of them had a diploma certificate as their highest professional qualification, while only a few of them (4.6%, n=3) were ranked Principal Community Health Nurses (PCHN). Most (69.7%, n=46) of the participants have been on their current rank for at most 3 years. While only 3.0% (n=2) of the 66 participants have had no training on managing malaria with RDT, 95.5% (n=63) of them reported to use RDT to test for every suspected case of malaria. 81.8% of them reported to have received further training on management of uncomplicated malaria cases after completion of the college education. (Table 4.1).

**Table 4.1: Descriptive characteristics of respondents**

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Age</b> ( <i>mean ± SD</i> )	29.23 ± 5.95	
19-29 years	43	65.15
30-42 years	23	34.85
<b>Sex</b>		
Female	53	80.3
Male	13	19.7
<b>Highest professional qualification</b>		
Certificate	41	62.12
RCN	25	37.88
<b>Rank</b>		
CHN	22	33.33
SCHN	41	62.12
PCHN	3	4.55
<b>Years on rank</b> ( <i>mean ± SD</i> )	3.09 ± 1.90	
≤ 3 years	46	69.7
3years	20	30.3
<b>Followed protocol</b>		
No	33	50
Yes	33	50
<b>Received training on RDT</b>		
No	2	3.03
Yes	64	96.97
<b>Test every suspected case of malaria with RDT</b>		
No	3	4.55
Yes	63	95.45
<b>Easy to use RDT test kit</b>		
No	1	1.52
Yes	65	98.48
<b>Find RDT test reliable</b>		
No	15	22.73
Yes	51	77.27
<b>Trained on uncomplicated malaria management after college</b>		
No	12	18.18
Yes	54	81.82

SD: standard deviation.

### **Knowledge of Study Participants on Management of Malaria Cases**

In assessing the knowledge of participants on management of uncomplicated malaria question, a set of malaria related questions were asked of them. 69.7% (n=46) of the 66 participants answered rightly that when the malaria RDT shows a negative test results, they treat for other causes of fever. A 95% confidence interval estimated shows that between 57.2% and 80.4% of CHOs would treat for other causes of fever when the RDT test for malaria is negative. Also 90.9% (n=60) of the 66 participants knew that Falciparum is the parasite usually detected by the RDT test with a 95% confidence interval estimate of 81.3% to 96.6%.

**Table 4.2 Knowledge of CHO on malaria treatment**

<b>Statement of Knowledge</b>	<b>Yes (%)</b>	<b>95% CI of Yes</b>
Treat for other causes of fever when RDT result is negative	46(69.7)	(57.15, 80.41)
Falciparum is the parasite usually detected by RDT	60(90.91)	(81.26, 96.59)
Uncomplicated malaria is the form expected to be treated by CHO	63(95.45)	(87.29, 99.05)
Fever is the most common symptom of malaria in children	58(87.88)	(77.51, 94.62)
Poor feeding, Weakness and vomiting are common malaria symptoms in children	10(15.15)	(7.51, 26.1)
Oral history from mother/care giver is first action taken when a sick child is presented	42(63.64)	(50.87, 75.13)
AS-AQ, A-L, DHAP are the considered components of ACT used in primary care facilities	44(66.67)	(53.99, 77.8)
AS-AQ and A-L are the first line anti-malaria drugs used to treat malaria cases	52(78.79)	(66.98, 87.89)
A-L is not recommended for children less than 6 months old	22(33.33)	(22.2, 46.01)
50mg Artesunate, 150mg Amodiaquine is the recommended dose of A-A for children 0-59 months old	58(87.88)	(77.51, 94.62)
1/2 tablets of Amodiaquine, 1/2 tablet of Artesunate per day for 3 days is the recommended dosage of A-A for 2-11 months old child	62(93.94)	(85.2, 98.32)
1 tablet of Amodiaquine, 1 tablet of artesunate per day for 3 days is the recommended dose of tablet for 1 to 5 years olds	61(92.42)	(83.2, 97.49)
20mg Artemether and 120mg Lumefantrine is the recommended dose for 0-59 months olds	60(90.91)	(81.26, 96.59)
1 tablet in divided dose per day is the recommended dosage of A-L for 7-36 months old	63(95.45)	(87.29, 99.05)
2 tablets in divided dose per day is the recommended dosage of A-L for 3-5 years olds	57(86.36)	(75.69, 93.57)
The recommended dosing regimen for ACTs is 0, 8, 12 hourly for a total of 3 days	50(76.92)	(64.81, 86.47)
Mother should repeat drug again as soon as possible when child vomits 30 minutes after taking ACT	30(45.45)	(33.14, 58.19)

Convulsions, lethargic and unconscious, and dark coloured urine are 3 signs of severe malaria	12(18.18)	(9.76, 29.61)
Syrup paracetamol are supporting medications given to patients	54(81.82)	(70.39, 90.24)
Cocoanut water is used in managing malaria	51(77.27)	(65.3, 86.69)
Breast milk is used in managing malaria	50(75.76)	(63.64, 85.46)
Water is used in managing malaria	44(66.67)	(53.99, 77.8)
Fresh fruit juices are used in managing malaria	34(51.52)	(38.88, 64.01)
Oral rehydration salt (ORS) solution is used in managing malaria	35(53.03)	(40.34, 65.44)
Check for treatment adherence if a patient report back with treatment failure	18(27.27)	(17.03, 39.64)
Treatment failure may result when the presenting symptoms such as fever may be due to other causes other than malaria	38(57.58)	(44.79, 69.66)
Treatment failure may result when there is inadequate treatment	34(51.52)	(38.88, 64.01)
Treatment failure may occur when patient vomits medications	16(24.24)	(14.54, 36.36)
Treatment failure may occur when medication is of poor quality	16(24.24)	(14.54, 36.36)
Treatment failure may occur when malaria parasite is resistant to medication administered	24(36.36)	(24.87, 49.13)
Refer patients when reported symptoms are that of complicated malaria	15(22.73)	(13.31, 34.7)

ACT: Artemisinin-Based combination therapy. AS-AQ: Artesunate-Amodiaquine. A-L: Artemether-Lumefantrine. CI: confidence interval. %: Percentage.

#### 4.2 Summary on the knowledge level of participants.

On the overall knowledge of study participants, the mean knowledge score on the scale of 0 to 1 was 0.64 with a standard deviation of 0.11. Also the median score of the overall knowledge of study participants was 0.67 also with an interquartile range of 0.11 (thus 0.70 minus 0.59).

While 25% of the study participants scored below 0.59, the top 25% of the study participants scored at least 0.70 both on the scale of 0 to 1. With a score of 0.70 as the least threshold of the high knowledge on management of malaria cases, 36.4% (n=24) of the study participants had high knowledge on management of malaria cases with an estimated 95% confidence interval of 24.9% to 49.1%. (Table 4.3).

**Table 4.3: summary of knowledge of CHOs**

<b>Variable</b>	<b>Measure</b>
<b>Knowledge score</b>	
Mean ± SD	0.64 ± 0.11
Median (LQ, UQ)	0.67 (0.59, 0.70)
<b>Knowledge level</b>	
Low (n (%))	42 (63.64)
High (n (%))	24 (36.36)
<b>95% Confidence interval of high knowledge</b>	(24.87, 49.13)

SD: standard deviation. LQ: Lower quartile. UQ: Upper quartile. n: Frequency. %: Percentage

### **Association between background characteristics of study participants and their knowledge level**

In assessing the background characteristics of study participants that has an association or relationship with knowledge level, the Pearson’s chi-square test and Fishers ‘exact test of association were employed were applicable. The test showed that the perception of RDT reliability by study participants was the only background characteristics that showed significant association with the knowledge level.

Among those who had high level of knowledge on malaria management, a high 91.6% (22 out of 24) of them considers the RDT test to be reliable compared to the 69.1% (29 out of 42) of those with low knowledge on malaria who considers the RDT test to be reliable ( $\chi^2 = 4.45, p - value = 0.035$ ). Also among those with high level of knowledge on malaria management,

29.2% (7 out of 22) of them were males while 14.3% (6 out of 44) of those with low level of knowledge on malaria management were males ( $\chi^2 = 0.77, p - value = 0.38$ ). (Table 4.4).

**Table 4.4: Association between demographic characteristics and level of Knowledge**

**Low = poor response      High = good response**

Variables	Total (%)	Knowledge level		chi-square	P-value
		Low (%)	High (%)		
<b>Sex</b>				$\Phi$	0.2
Female	53 (80.3)	36 (85.71)	17 (70.83)		
Male	13 (19.7)	6 (14.29)	7 (29.17)		
<b>Age group</b>				0.77	0.38
20-29 years	43 (65.15)	29 (69.05)	14 (58.33)		
31-42 years	23 (34.85)	13 (30.95)	10 (41.67)		
<b>Qualification</b>				0.00	0.962
Certificate	41 (62.12)	26 (61.9)	15 (62.5)		
RCN	25 (37.88)	16 (38.1)	9 (37.5)		
<b>Rank</b>				2.65	0.103
CHN	22 (33.33)	17 (40.48)	5 (20.83)		
SCHN/PCHN	44 (66.67)	25 (59.52)	19 (79.17)		
<b>Number of years on current rank</b>				0.92	0.336
≤ 3 years	46 (69.7)	31 (73.81)	15 (62.5)		
3years	20 (30.3)	11 (26.19)	9 (37.5)		
<b>Considers RDT test reliable</b>				4.45	0.035*
No	15 (22.73)	13 (30.95)	2 (8.33)		
Yes	51 (77.27)	29 (69.05)	22 (91.67)		
<b>Trained to treat uncomplicated malaria after college</b>				$\Phi$	0.186
No	12 (18.18)	10 (23.81)	2 (8.33)		
Yes	54 (81.82)	32 (76.19)	22 (91.67)		

#: column percentages.  $\phi$ : Fisher's exact test. \*:p-value <0.05

### **Factors influencing the Knowledge Level of Study Participants on Malaria Management**

The simple and multiple logistics regression model was used to determine the crude and adjusted odd ratios respectively in quantifying the factors that influence the knowledge level of study participants. The perceptions of participants on the reliability of RDT test in diagnosing malaria cases showed significant influence in both the simple logistic and multiple logistic regression model. While the current rank of study participant did not show significant influence on knowledge level in the simple logistic regression model. It showed a significant influence in the multiple logistics regression model.

From the simple logistic regression model, those participants who consider the RDT test reliable in diagnosing malaria had a 4.93 times odds of having high knowledge on malaria management compared to those who do not consider the RDT test reliable (cOR: 4.93, 95% CI: 1.01-24.14,  $p = 0.049$ ). From the multiple logistic regression model, those participants who consider the RDT test reliable had a 4.35 times odds of having high knowledge in malaria management compared to those who do not consider the RDT test reliable (aOR: 4.35, 95% CI: 1.06-15.23,  $p = 0.034$ ).

Also from the simple logistic regression model, those participants who were currently ranked SCHN or PCHN had a 2.58 times odds of having high knowledge on malaria management compared to those currently ranked CHN (cOR: 2.58, 95% CI: 0.81-8.26,  $p = 0.109$ ). While from the multiple regression model, those participants currently ranked SCHN or PCHN had a 2.71 times odds of having high knowledge on malaria management compared to those currently ranked CHN (aOR: 2.71, 95% CI: 1.09-7.88,  $p = 0.044$ ). (Table 4.5).

**Table 4.5: factors influencing knowledge level of CHO**

Variable	Simple logistic		Multiple logistic	
	cOR (95% CI)	P-value	aOR (95% CI)	P-value
<b>Sex</b>				
Female	Ref		ref	
Male	2.47 (0.72, 8.48)	0.151	1.71 (0.43, 6.79)	0.448
<b>Age</b>				
19-29 years	Ref		ref	
30-42 years	1.59 (0.56, 4.52)	0.381	1.41 (0.37, 5.41)	0.615
<b>Qualification</b>				
Certificate	Ref		ref	
RCN	0.98 (0.35, 2.74)	0.962	1.05 (0.25, 4.39)	0.948
<b>Current rank</b>				
CHN	Ref		ref	
SCHN/PCHN	2.58 (0.81, 8.26)	0.109	2.71 (1.09, 7.88)	0.044*
<b>Years on current rank</b>				
≤ 3 years	Ref		ref	
>3 years	1.69 (0.58, 4.96)	0.338	1.36 (0.33, 5.61)	0.667
<b>Considers RDT test reliable</b>				
No	Ref		ref	
Yes	4.93 (1.01, 24.14)	0.049*	4.35 (1.06, 15.23)	0.034*
<b>Trained on uncomplicated malaria management after college</b>				
No	Ref		ref	
Yes	3.44 (0.69, 17.24)	0.133	3.79 (0.61, 23.4)	0.151

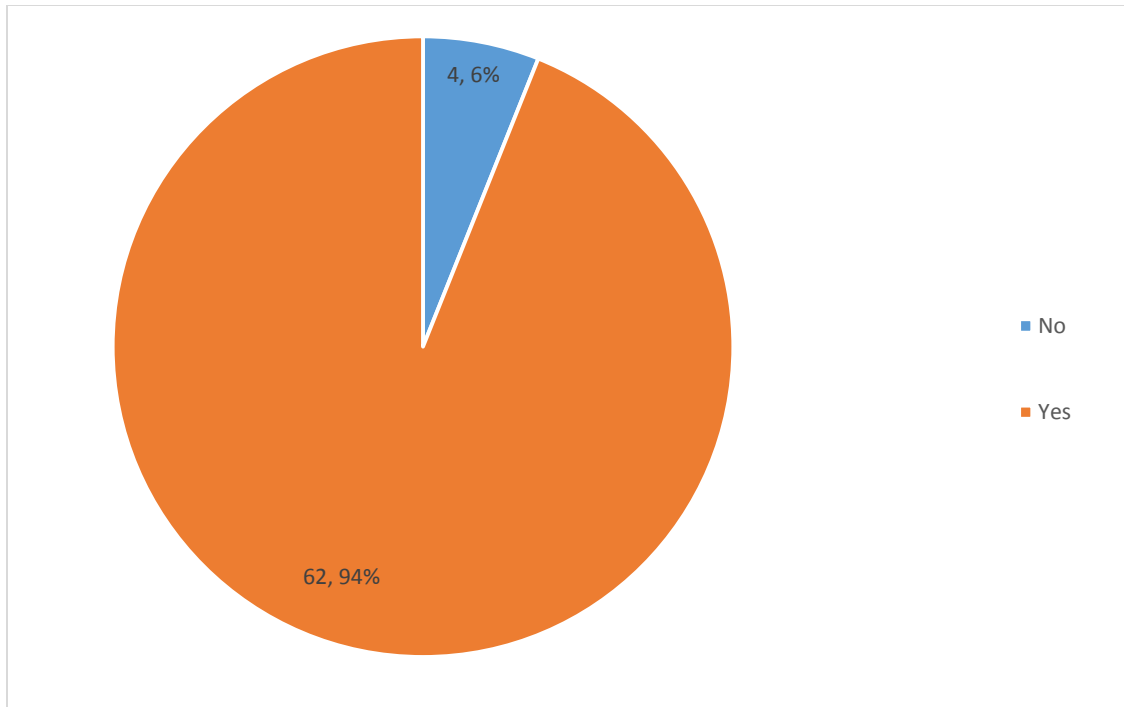
cOR: crude odds ratio. aOR: adjusted odds ratio. CI: confidence interval. ref: reference category.

\*: p-value < 0.05

### 4.3 Contribution of RDT to malaria management

From figure 4.1, 94% (n=62) of the 66 study participants claimed that the RDT testing protocol has led to a decrease in the over diagnosis of malaria cases in their respective health facilities.

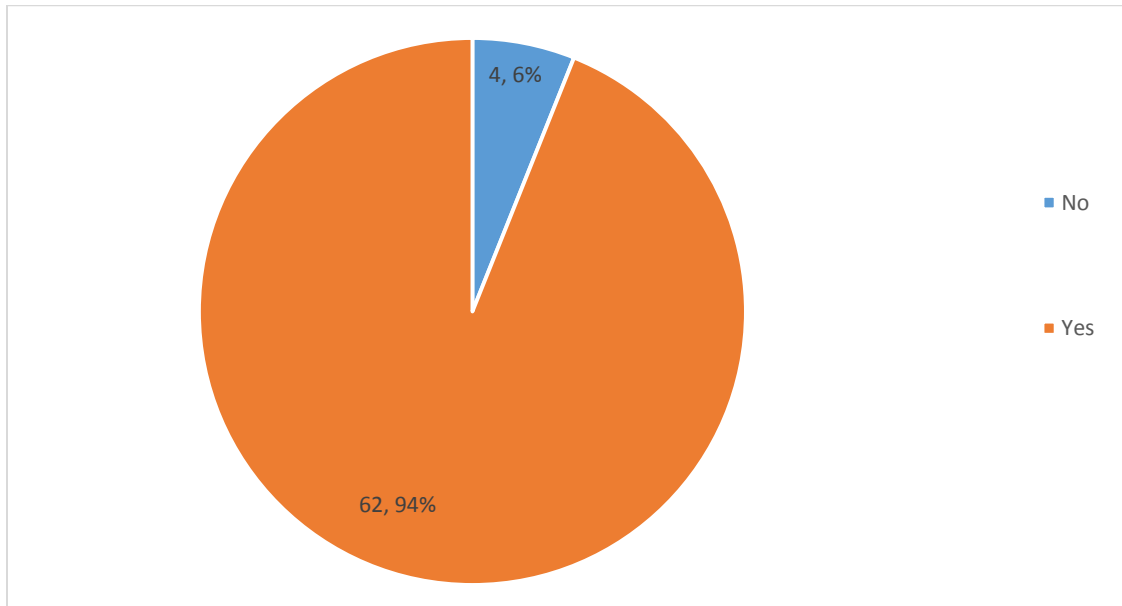
Also from figure 4.2, 94% (n=62) of the 66 study participants claimed that RDT testing protocol has led to a significant decreased in the prescription of ACT malaria medication to patients in their health facilities.



Yes = RDT has contributed in reducing over diagnosis of malaria

No = RDT has not contributed in reducing over diagnosis of malaria

**Figure 4.1: RDT contribution to decrease in over diagnosis of malaria**



**Figure 4.2: RDT contribution to decreased in the prescription of ACT in the facility**

Yes = RDT has contributed in reducing over prescription of ACTs

RDT has not contributed in reducing over prescription of ACTs

## CHAPTER FIVE

### 5.0 DISCUSSION

#### 5.1 Background Characteristics of Respondents

A total of 66 community health officers (CHOs)/nurses from 23 CHPS compounds were involved in the study. All study participants were from the Birim Central Health Directorate from the Municipality. About two-thirds (65.2%) of the participants were aged between 19 and 29 years. This age range of the CHOs is a reflection of very young nurses who completed their nursing programme within a period of three to five years interval. Four out of every five of the participants were females which also reflects the dominance of females in the nursing profession. As many as 41 out of the 66 participants had diploma certificate as their highest professional qualification serving in the CHPS compounds. This may have had a good influence on their capacity to manage malaria cases in the under- five who present to their facility. Most of the participants (69.7%) had been on their current rank within the last three years.

#### 5.2 Use of RDT in the treatment of Malaria

When asked if their facility **uses** RDT in diagnosing malaria before prescribing antimalarial, 50% of the participants responded in the positive. This lends support to some level of adherence to the guidelines issued by WHO (2010) for all suspected cases of fever to be tested before treatment. Only 2 of the 66 participants reported not having received training on the use of RDT. Having adequate knowledge and skills on proper use of RDT significantly affect treatment outcomes (Olatunji et Al, 2016). This also is supported by Counihan et al, (2008) who posited that one required less training and skills to use RDT to confirm diagnosis and community health

workers who were given a half day training were able to correctly interpret RDT test results in a community outreach programme. As a means of reducing presumptive treatment of malaria especially among cases that present with fever, the WHO recommended testing of all suspected cases before commencing antimalarial therapy (Burnett et al, 2016). As much as 95.45% of the study participants said all cases suspected to be malaria were tested with malaria RDT before commencing treatment if necessary. This is even higher than the national malaria testing rate. This is supported by the 2017 report released by the NMCP that stated that the testing rate for malaria increased from 75.3% in 2016 to 83.9% in all health facilities across the country. It can therefore be inferred that the CHOs have embraced the WHO policy guidelines on testing before treatment as a way of prescribing antimalarial medicines to persons who need it (Kamel et al, 2016). Participants who had high level of knowledge on malaria management, many 91.6% (22 out of 24) of them considered the RDT test to be reliable compared to the 69.1% (29 out of 42) of those with low knowledge on malaria who considered the RDT test to be reliable. Compared to microscopy, which needs special training and skilled personnel and also electricity to operate, participants found the RDT to be very easy to use irrespective of the location of the CHPS compound.

### **5.3 Knowledge of Participants on Drug Treatment/Management of Malaria**

On how malaria should be managed at the CHPS compounds, the study found out that, 69.7% of the participants knew that when patients test negative to malaria RDT, no ACTs should be prescribed but treat for other causes of fever. This is in agreement with the various protocols on malaria management that have been developed by the WHO and NMCP of the GHS.

Majority (69.7%, 95%CI- 57.15, 80.41) knew the treatment for other causes of fever when the test for RDT shows a negative result. Similarly, 66.67% (95%CI- 53.99, 77.8) of the participants

reported AS-AQ, A-L, DHAP as the components of ACT used in primary health care facilities for the treatment of malaria. However, almost all 95.45% (95%CI- 87.29, 99.05) of the participants stated uncomplicated malaria as a form of malaria expected to be treated by CHOs. As low as 18.18% (95%CI- 9.76, 29.61) of the respondents reported convulsions, lethargic and unconsciousness and dark coloured urine as three possible signs of severe malaria in children under five. Equally, only 15.15% (95%CI-7.51, 26.1) of the participants reported that poor feeding, weakness and vomiting as the common malaria symptoms among children in the Birim Central Municipality.

Many (90.9%) of the CHOs who participated in the study knew that plasmodium falciparum was the parasite usually detected by the malaria RDT test kits. This is in line with the 2012 report by the NMCP which stated that 80-90% of the plasmodium parasites that actually cause malaria in Ghana is transmitted by the plasmodium falciparum.

#### **5.4 Factors Influencing Knowledge of Level of CHO**

The multivariate logistics regression on the factors influencing knowledge level of CHOs showed that, SCHN/PCHN are 2.71 more knowledgeable in managing malaria in children under five years in the CHPS compounds than CHNs. [ 2.71 (1.09, 7.88) 0. 044]. Participants who considered malaria RDT reliable are 4.35 likely to be knowledgeable in managing malaria in children under five years in the CHPS compound [4.35 (1.06, 15.23) 0.034]. This is supported by Joel et al (2013) who had work on the reliability of malaria RDTs in previous studies.

#### **5.5 Contribution of RDT to Malaria Management**

The study showed significant contribution of malaria RDT to the management of malaria in the under 5 children by CHOs in all the participating CHPS compounds. Ninety four percent

(62/66) of the study participants alluded to the fact that RDT has drastically reduced the over diagnosis of malaria in the CHPS compounds compared to the initial diagnosis of every fever case as malaria. This finding is consistent with the outcomes of studies done by (Kamel et al, 2016 and Burnett et al., 2016). The findings of the study from the CHPS compounds further revealed that, over prescription of antimalarial drugs have also declined because the drugs are only prescribed for patients who test positive to the RDT test.

## CHAPTER SIX

### 6.0 CONCLUSIONS AND RECOMMENDATIONS

#### 6.1 Conclusions

Testing with malaria RDT before commencing antimalarial treatment was 95.45% from the study. This was higher than the national prevalence rate of RDT testing which stood at 83.9% in 2017. This can therefore be inferred that the CHOs who work in the CHPS compounds have embraced the concept of testing all of fevers and suspected cases malaria. Findings from the study also show that the use of malaria RDT in managing malaria in the CHPS compounds has drastically reduced the over diagnosis of malaria and the over prescription of antimalarial drugs.

#### 6.2 Recommendations

The recommendations that can be made in respect of the study include the following:

1. District health managers should use the monthly malaria RDT availability data to implement peripheral redistribution strategies to tackle facility stock outs in all CHPS zones/compounds.
2. There should be intense monitoring during supervisory visits by district health managers to ensure that testing of all suspected cases are done and results are also adhered to by CHOs.

#### **Implication for further research**

3. Further studies are needed to ascertain reasons for treating negative malaria RDT patients with antimalarial.

4. Further studies need to be conducted to investigate the causes of treatment failure of malaria among under 5 children and how such cases should be managed at the CHPS compounds.

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## APPENDICES

### **Appendix 1: Informed consent for study participants**

Management of malaria in children in community health compounds in the Birim Central Municipality of the Eastern Region.

#### **Background**

The principal investigator is Jones Abekah Baah, a student of School of Public Health of the College of Health Sciences, University of Ghana. He is conducting a research on the above topic.

#### **Procedures**

The study will involve answering some few questions from an interview guide on management of malaria at CHPS compounds by the Community Health Officers.

#### **Risk and benefits**

The study does not involve any invasive procedure, and as such will not cause any harm or pain to study participants. The outcome of the study will inform policy and decision makers on how the capacity of Community Health Officers ought to be developed in order to improve their performance at the CHPS zones. The results will also identify the gaps at the CHPS compounds for policy makers to make the appropriate interventions aimed at managing malaria well to reduce childhood morbidity and mortality.

#### **Right to refuse**

Participation in this research is voluntary, and if I should ask you any question which you are not comfortable with at any time, just let me know and I will go on to the next question; or you can stop the interview at any time.

**Anonymity and confidentiality**

The interview usually takes about 25 minutes to complete. Whatever information you provide will be treated with the confidentiality it deserves and will not be shown to anyone apart from members of the research team.

Before taking consent

At this time, do you want to ask me anything about the study? Yes/No

If yes, please write your question

.....

If you wish to ask me later, please contact me Jones Abekah Baah on 0244572319 or email:

         or the Ghana Health Service Ethical Review Committee Administrator, Ms. Hannah Frimpong  
on phone number 0507041223

**Consent**

I.....declare that the purpose, and benefits of the study have been thoroughly explained to me in English/Twi languages and I have understood. I hereby agree or disagree to participate in the study.

Signature/Thumbprint of mother/caregiver .....

Date.....

**Interviewer statement**

I.....the undersigned, have explained this consent form to the subject in the language he/she understands. The subject understands the purpose of the study as well as the procedures to be followed. The subject has freely agreed to participate in the study.

Signature of interviewer.....

**UNIVERSITY OF GHANA**

**SCHOOL OF PUBLIC HEALTH**

**DEPARTMENT OF EPIDEMIOLOGY**

**QUESTIONNAIRE FOR COMMUNITY HEALTH OFFICERS**

I am Jones Abekah Baah, a Master of Public Health Student of the above institution. I am conducting a research titled “Management of Malaria in under five Children in Community Health Compounds in the Birim Central Municipality of the Eastern Region”. You have been selected to be part of the study by responding to these questionnaire as your contribution towards the improvement of knowledge on effective management of malaria in under five children in the Municipality. It will take about 5 – 10 minutes of your time. Your responses will be treated with the confidentiality it deserves. You are kindly entreated to make a tick {√} to a response you deem appropriate or write in the spaces provided where specified or appropriate.

Thank you.

**Background Information of Respondents**

1. Sex.....
2. Age.....
3. Highest professional qualification.....
4. Current rank.....
5. How many years have you been on this rank?.....

**Use of RDT in the treatment of malaria**

6. Does your facility use RDT malaria diagnosis?
- a. Yes { }
  - b. Yes { }
7. Have you received any training on the use of RDT?
- a. Yes { }
  - b. No { }
8. Do you test every suspected case of malaria with RDT in your facility?
- a. Yes { }
  - b. No { }
9. Do you find the usage of the RDT kit easy?
- a. Yes { }
  - b. No { }
10. Do you find the RDT results reliable?
- a. Yes { }
  - b. No { }
11. What action do you take if the RDT result is negative?
- a. Treat for malaria { }
  - b. Test for other conditions { }
  - c. Ask patient to come later for retest { }
  - d. Treat for other causes of fever { }
  - e. Refer { }

12. Which of the plasmodium parasites is usually detected by the RDT?

- a. Vivax { }
- b. Falciparum { }
- c. Ovale { }
- d. Malariae { }
- e. Knowlesi { }

**Knowledge on Malaria Treatment**

13. Have you received training on case management for uncomplicated malaria after completing college?

- a. Yes { }
- b. No { }

14. If the response to q.13 is yes, what was the duration?

- a. A day { }
- b. 2 days { }
- c. 2-3 days { }
- d. 3-4 days { }

15. Which form of malaria is expected to be managed by the CHO at the CHPS compounds?

- a. Uncomplicated malaria { }
- b. Moderately uncomplicated malaria { }
- c. Severe malaria { }
- d. Others (specify).....

16. What is the most common symptom of malaria in children?

- a. Abdominal pains { }
- b. Fever { }
- c. Diarrhea { }
- d. Vomiting { }
- e. Inability to feed well { }

17. Apart from the response given in q. 15 above, mention three other signs and symptoms of malaria commonly seen in children.

- a. Fever { }
- b. Poor feeding { }
- c. Weakness { }
- d. Vomiting { }
- e. Convulsion { }

18. Which other common condition(s) may also present symptoms similar to malaria in children?

(You may select more than one response)

- a. Urinary tract infection { }
- b. Pneumonia { }
- c. Typhoid fever { }
- d. Measles { }
- e. Otitis media { }
- f. Others (specify) .....

19. What is the first action taken when a sick child is presented to you in your facility?

- a. Take oral history from mother/care giver { }
- b. Tepid sponge child if feverish { }
- c. Serve child with syrup paracetamol to reduce fever { }
- d. Examine child for other danger signs { }

20. Which of these drugs is/are considered components of the Artemisinin - Based Combination Therapy (ACT) used in primary care facilities?

(You may select more than one response)

- a. Artesunate-Amodiaquine (AS-AQ) { }
- b. Artemether-Lumefantrine (A-L) { }
- c. Dihydroartemisinin-Piperaquine (DHAP) { }
- d. Sulphadoxine Pyramethamine (SP) { }
- e. Coartem { }
- f. Others (specify) .....

21. What is the first line anti-malaria drug that you use to treat malaria cases?

( You may select more than one option)

- a. Artesunate Amodiaquine { }
- b. Artemether lumifantrine { }
- c. Quinine { }
- d. Sulphadoxine Pyramethamine (SP) { }
- e. Others (specify).....

22. Which of the above drugs is not recommended for children below 6 months?

- a. Artesunate Amodiaquine { }
- b. Artemether lumifantrine { }
- c. Quinine { }
- d. Sulphadoxine Pyramethamine (SP) { }
- e. Others (specify).....

23. Which of the following is the recommended dose of Artesunate Amodiaquine that should be administered to children 0-59 months?

- a. 50mg artesunate, 150mg amodiaquine { }
- b. 100mg artesunate, 150mg amodiaquine { }
- c. 150mg artesunate, 150mg amodiaquine { }
- d. 80mg artesunate, 150mg amodiaquine { }

24. What is the recommended dosage of Artesunate Amodiaquine (AA) for 2-11 months ( $\geq 4.5$ kg to  $< 9$  kg) old child?

- a.  $\frac{1}{2}$  tablet of amodiaquine/  $\frac{1}{2}$  tablet of artesunate per day for 3 days { }
- b.  $1\frac{1}{2}$  tablet of amodiaquine/  $1\frac{1}{2}$  tablet of artesunate per day for 3 days { }
- c.  $1\frac{1}{4}$  tablet of amodiaquine/  $1\frac{1}{4}$  tablet of artesunate per day for 3 days { }
- d. Others (specify).....

25. What is the recommended dosage of Artesunate Amodiaquine (AA) for (1 to 5 years)

( $\geq 9$ kg to  $< 18$  kg old child?)

- a. 1 tablet of amodiaquine/ 1 tablet of artesunate per day for 3 days { }
- b. 2 tablet of amodiaquine/ 2 tablet of artesunate per day for 3 days { }
- c. 2 ½ tablet of amodiaquine/ 2 ½ tablet of artesunate per day for 3 days { }
- d. 2 ¼ tablet of amodiaquine/ 2 ¼ tablet of artesunate per day for 3 days { }
- e. Others (specify).....

26. Which of the following is the recommended dose of Artemether- Lumefantrine that should be administered to children 0-59 months?

- a. 20mg Artemether and 120mg Lumefantrine { }
- b. 40mg Artemether and 120mg Lumefantrine { }
- c. 40mg Artemether and 240mg Lumefantrine { }
- d. 80mg Artemether and 480mg Lumefantrine { }

27. What is the recommended dosage of Artemether- Lumefantrine for children age 7 – 36 months (5-15kg)?

- a. 1 tablet in divided dose per day { }
- b. 1 ½ tablet in divided dose per day { }
- c. 1 ¼ tablet in divided dose per day { }
- d. Others (specify) .....

28. What is the recommended dosage of Artemeter Lumefantrine for children age 3-5 years (15-25 kg)?
- a. 2 tablet in divided dose per day { }
  - b. 2 ½ tablet in divided dose per day { }
  - c. 2 ¼ tablet in divided dose per day { }
  - d. Others (specify) .....
29. What is the recommended dosing regimen for ACTs?
- a. 0, 6 hours , 10 hourly for a total of 3 days { }
  - b. 0, 6 hours, 12 hourly for a total of 3 days { }
  - c. 0, 8 hours, 12 hourly for a total of 3 days { }
  - d. 0, 12 hours, 24 hourly for a total of 3 days { }
30. What would you tell the mother/caregiver if the child vomits within 30 minutes of administering an ACT?
- a. Ask her to repeat the drug again as soon as possible { }
  - b. Mother should not give again but wait for the next schedule { }
  - c. Mother should wait for the next 8 hours and repeat { }
  - d. Others (specify).....

31. Mention 3 signs of a child suspected with severe malaria

(multiple responses allowed)

- a. Child is not able to eat or breastfeed well { }
- b. Child vomits everything he/she takes in { }
- c. Child has convulsions { }
- d. Child is lethargic and unconscious { }
- e. Child has dark coloured urine { }
- f. Others( Specify).....

32. What supportive medication do you give to patients in addition to antimalarial?

- a. Syrup multivite { }
- b. Syrup paracetamol { }
- c. Antibiotics { }
- d. Dewormer { }
- e. Others (specify).....

33. Which of these meals/drinks would you ask a caregiver to the child being managed for malaria? (You may select more than one option

- a. Coconut water { }
- b. Breast milk { }
- c. Water { }
- d. Fresh fruit juices { }
- e. Coconut water { }
- f. Oral Rehydration Salt solution (ORS) { }

34. What action will you take if a patient reports back to your facility with treatment failure?

- a. Check for treatment adherence {    }
- b. Change treatment within the first line {    }
- c. Repeat treatment {    }
- d. Refer to the next level {    }
- e. Others (specify).....

35. Which of the following reasons may account for treatment failure?

- a. The presenting symptoms, such as fever, were due to a cause other than malaria. {    }
- b. The treatment was inadequate (the patient was not prescribed the full recommended dose; or did not take the medication as directed).
- c. The patient may have vomited the medication.
- d. The drug administered may have been of poor quality.
- e. The malaria parasite may be resistant to the medication administered.

36. What action do you take when a child reports with symptoms of complicated malaria?

- a. Test and treat {    }
- b. Treat and refer {    }
- c. Refer {    }
- d. Others (specify).....

**Contribution of RDTs in malaria Diagnosis**

37. In your view, how has the usage of RDTs contributed to the decrease in over-diagnosis of malaria in this facility?

a. Yes {    }

b. No {    }

38. Has the introduction of RDTs decreased the number of patients who are given ACT in your facility?

c. Yes {    }

d. No {    }

