



**UNIVERSITY OF GHANA
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF DISEASE CONTROL AND EPIDEMIOLOGY**

PROJECT TITLE:

**ASSESSMENT OF OVER-THE-COUNTER MEDICINE SELLERS' KNOWLEDGE ON
ARTEMISININ-BASED COMBINATION THERAPY (ACT) IN HO MUNICIPAL DISTRICT,
VOLTA REGION, GHANA**

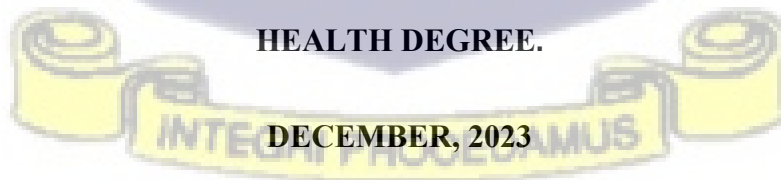
BY:

FREDERICK OWUSU-MENSAH

(109305227)

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

DECEMBER, 2023



DECLARATION

I, Frederick Owusu-Mensah, declare that this dissertation is the result of my own research work except for references made to the work of other authors which have been duly acknowledged and was undertaken under supervision. This work has not been presented for the award of another degree elsewhere partially or in whole.

Candidate's Signature:



Date: 14th December, 2023

Frederick Owusu-Mensah

Supervisor's Signature:



Date: 14th December, 2023

Dr. Bismark Sarfo



ABSTRACT

Malaria is a substantial public health concern associated with a high prevalence of sickness and mortality, especially among pregnant women and children below the age of five in Sub-Saharan Africa.

In response to the worsening of the pandemic due to the ineffectiveness of single-drug treatments like chloroquine, the World Health Organization (WHO) promptly recommended the use of Artemisinin-combination therapies (ACTs) in 2001 (World Health Organization, 2020).

In Ghana, private pharmaceutical retail businesses, namely Over-The-Counter (OTC) pharmacy shops, are the primary choice for treating malaria due to their simple accessibility and short waiting periods. However, the medication offered by Over-The-Counter (OTC) pharmaceutical stores often does not comply with the official criteria for Antimalarial drug treatment. Failure to comply with the prescribed measures might lead to the development of cerebral malaria and severe anemia. Hence, it is crucial to assess the expertise of over-the-counter medication vendors (World Health Organisation, 2018).

The main objective was to evaluate the level of knowledge among Over-The-Counter (OTC) pharmaceutical vendors about Artemisinin-Based Combination Therapies (ACTs) in the Ho Municipal District.

The study used a descriptive cross-sectional methodology, using a pretested, reliable, and validated semi-structured questionnaire to assess the understanding of antimalarial treatment (ACT) among over-the-counter medicine (OTCM) sellers.

The OTC medication vendors in the Ho municipal area made up the research population. The Pharmacy Council in the Volta Region has compiled a list of nearby over-the-counter (OTC) medicine retailers. The data was analyzed with STATA version 17. The statistical analysis was done correctly, and conclusions were drawn.

The study results reveal that a significant majority of OTC drug sellers possess a strong understanding of ACTs, as shown by 81% displaying competency. However, to stop resistance from developing in the future, it's critical to educate over-the-counter drug dealers thoroughly about Artemisinin-based Combination Therapies (ACTs).

CONTENTS

ABSTRACT.....	iii
CHAPTER ONE	1
1.0 INTRODUCTION	1
1.1 Background.....	1
1.2 Problem Statement	4
1.3 Justification	5
1.4 Research Questions	6
1.5 Main Objective.....	6
1.5.10 Specific Objectives	6
Figure 1.0 Conceptual framework	7
CHAPTER TWO	9
LITERATURE REVIEW	9
2.1 The etiology of Malaria.....	9
2.1.2 Recommendations and supporting implementation guidance.....	12
2.1.3 Strategic information to tailor programmatic response and selection of interventions.....	13
2.2 Prevalence, Incidence and Determinants of Malaria in West Africa	14
2.2.1 Management of Malaria in West Africa.....	15
2.3 Treatment of uncomplicated malaria per the WHO Guidelines for malaria.	15
2. Incomplete dosing.....	16
2.3.2 Appropriate approach to treatment.....	17
2.3.2.1 Artemisinin-Based Combination Therapies (ACTs).....	17
2.3.2.2 Duration of treatment.....	17
2.4 Dosing of Artemisinin-Based Combination Therapies (ACTS)	18
2.5 Self-medication and the risk.....	19
2.6 Self-medication with Over-The-Counter medicines	20
CHAPTER THREE	27
3.0 METHODOLOGY	27
3.1 Study Area	27
3.2 Over-The-Counter Medicine selling points in the Ho Municipal District	27
3.4 Sampling and sample size	28
Table 3.6 Summary of Dependent and Independent Variables.....	29
3.7 Validity and reliability of the instrument	31
3.8 Inclusion criteria	31

3.9 Exclusion criteria	31
3.10 Recruitment and training of research assistants/data collection.....	31
3.11 Ethical considerations	32
3.12 Data Analysis	32
CHAPTER FOUR.....	33
4.0 RESULTS	33
4.1 The sociodemographic features of OTC medicine sellers in the Ho Municipal District, Volta, are examined.	33
4.2 Level of Knowledge on the ACTs	34
4.3 Relationship between sociodemographic traits and ACT knowledge level	35
4.4 The relationship between OTC medication dealers' sociodemographic characteristics and their degree of expertise was examined using both univariate and multivariable regression analysis in the Ho Municipal District of Volta.....	36
Table 4.4: Univariate and multivariate logistic regression of the association between level of knowledge and characteristics of OTC medicine sellers in Ho Municipal District, Volta	37
CHAPTER FIVE	38
5.0 DISCUSSION	38
5.1 Association between level of knowledge and compliance to ACTs	38
5.2 Factors associated with level of knowledge.....	39
5.3 Study implications.....	40
5.4 Study limitations	40
6.0 CONCLUSION AND RECOMMENDATION.....	41
REFERENCES	42
APPENDIX I	53
PARTICIPANTS INFORMATION SHEET	53
APPENDIX II	56
CONSENT FORM.....	56
APPENDIX III.....	60
APPENDIX IV.....	61
INTERVIEWER- ADMINISTERED QUESTIONNAIRE.....	61



LIST OF TABLES

Table 3.6 Summary of Dependent and Independent Variables

Table 4.1: Socio-demographic characteristics of OTC medicine sellers in the Ho Municipal District, Volta (N=170).

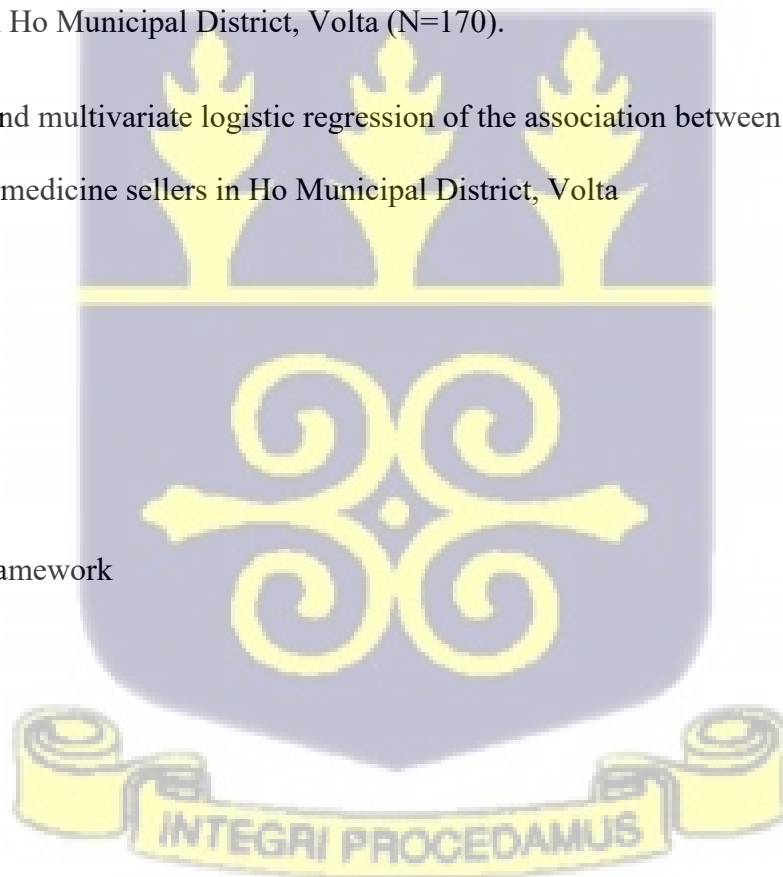
Table 4.2: Level of Knowledge on the ACTs in Ho Municipal District, Volta.

Table 4.3: Association between demographic characteristics of OTC medicine sellers and level of knowledge on ACTs in Ho Municipal District, Volta (N=170).

Table 4.4: Univariate and multivariate logistic regression of the association between level of knowledge and characteristics of OTC medicine sellers in Ho Municipal District, Volta

LIST OF FIGURES

Figure 1 Conceptual framework



CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Malaria is prevalent in several countries, including South America, Asia and Africa. It is linked to significant illness and death, particularly in children aged five and below. Malaria-endemic areas experience significant economic losses as a result of malaria infection. According to estimates, in some countries in Sub-Saharan Africa (SSA), it is possible that up to 10% of a person's monthly income is needed to purchase a full dosage of Artemisinin-based Combination Therapies (ACTs) for children (Nonvignon et al., 2016). The proliferation of malaria is being exacerbated by the prevalent resistance to affordable antimalarial medications such as chloroquine. Hence, it becomes imperative to transition from monotherapy to combined therapy in order to avert the emergence of resistance (WHO, 2021). In 2001, the World Health Organization (WHO) advised the use of artemisinin-based combination therapy (ACT) as the primary treatment for uncomplicated malaria. Subsequently, the implementation of ACT in countries with high malaria prevalence, particularly in Sub-Saharan Africa, has been hindered by a limited comprehension of the ACT concept, its core principles, and its significant expenses (World Health Organization, 2021). Additional issues are to the lack of suitable pediatric preparations and the inconsistent provision of ACTs in regions affected by the disease. The implementation of ACT as the primary treatment for uncomplicated malaria could yield beneficial outcomes for people, their families, and the community as a whole. This includes a decrease in the occurrence of complications, prevention of the emergence of malaria strains resistant to multiple drugs, and a reduction in the socioeconomic impact of malaria infection. Furthermore, ACT indirectly mitigates the morbidity and mortality associated with malaria by impeding the advancement of simple malaria to severe malaria. Artemisinin-based combination therapies (ACTs) are effective not only in treating malaria but also in preventing and controlling the disease. They are capable of reducing the capacity of mosquitoes to transmit malaria, particularly in regions with low to moderate levels of spread of malaria (International Artemisinin

Study Group, 2004). There are several combinations of ACT (Artemisinin-based Combination Therapy) available, including artemether-lumefantrine (AL), artesunate-amodiaquine (AS/AQ), artesunate-mefloquine (AS/MQ), artesunate-chlorproguanil-dapsone (AS/CD), artesunate-sulphadoxine-pyrimethamine (AS/SP), dihydro-artemisinin-piperaquine (DA/PQ), artesunate-piperazine (AS/PZ), and artesunate-atovaquone-proguanil (A/AP) (Whegang et al., 2010). The World Health Organization (WHO) suggested the use of AL, AS/MQ, AS/AQ, and AS/SP as combinations of ACT (Artemisinin-based Combination Therapy) (World Health Organisation, 2018). ACTs are currently the primary drugs used to treat uncomplicated malaria in some countries (Bosman, 2007). Private medicine retail stores, which include facilities for selling over-the-counter medication, are widely acknowledged as significant participants in the healthcare sector worldwide, particularly in poor and underdeveloped nations (Hanson and Berman, 1998, Goodman et al., 2007 & Brieger et al., 2005). These centers are currently recognized as facilities for treating common diseases such as malaria, diarrhea, and respiratory infections. In the majority of countries with low or middle incomes, they are the primary healthcare providers for the treatment of ailments (Smith, 2009 & Agblevor et al., 2016). As a result, there is an increasing need for policymakers to recognize their crucial role in shaping health policies that seek to improve access to services and enhance the public's health (Smith et al., 2001 & Cabe, 2009). The growing demand for private healthcare providers can be attributed to various factors including easy access, suitability, prompt service delivery, flexible terms of payment, and also adaptive choices for purchasing and hours of operation (Smith, 2009, Chuc et al., 2001, Van-Der-Geest, 1987, Stenson et al., 2001 & Mayhew et al., 2001). Private medicine merchants have gained more prominence due to their shorter waiting times and cost-effective services compared to clinics and hospitals (Saradamma et al., 2000). The extent of private medicine stores varies across different countries (Wafula, 2012), while their primary focus is on trading pharmaceuticals, drug-related products, and non-drug things. In Ghana as a whole private medicine sellers consist of community pharmacies, which may be run by pharmacists, non-pharmacists, or a combination of both, as well as over-the-counter medication seller (OTCMS) facilities. The primary legislation governing pharmacy operations in Ghana comprises the Health Professions Regulatory Bodies Act, Act 857, 2013. However, there are other rules that are also applicable within the pharmaceutical business. Inspectors from these regulatory authorities oversee and enforce regulations for pharmacies and over-the-counter drug seller facilities. During their visits,

they perform regular inspections of the premises and provide technical and supporting guidance to practitioners or staff members present. OTCMS facilities are permitted to sell non-prescription drugs or over-the-counter drugs in rural and peri-urban areas where pharmacists are not easily accessible to provide pharmaceutical services (Jacobs et al., 2004, Battersby et al., 2003 & Health Professions Regulatory Bodies Act, 2013). Their sales are limited to over-the-counter medications, which are pharmaceuticals considered safe for consumers to use while following the prescribed label instructions and cautions. They may be acquired over-the-counter. The private healthcare providers are required to comply with the minimal regulatory requirements outlined in the Health Professions Regulatory Bodies Act of 2013 and the standards specified for medication retail shops as stated in the studies conducted by Attanayake and Siyambalagoda in 2003, Saradamma et al. in 2000, and Williams and Jones in 2004. The level of knowledge among over-the-counter (OTC) medicine vendors globally varies significantly. In Ghana, the Pharmacy Council is responsible for regulating Over-the-Counter Medicine Sellers (OTCMS) and ensuring they adhere to professional standards. This includes providing training on common ailments like malaria for OTC vendors, as well as renewing their licenses yearly (Afari-Asiedu et al., 2021). Also, the National Malaria Elimination Programme (NMEP) in Ghana collaborates with Over-the-Counter (OTC) medicine sellers to improve malaria control at the community level. NMEP aims to ensure prompt and effective treatment for all confirmed malaria cases, and OTC vendors play a crucial role in providing access to malaria testing and treatment, especially in areas with limited healthcare infrastructure (Oladebo et al., 2019). While some Over-the-Counter (OTC) medicine sellers demonstrate a good understanding of OTC medications, including their proper use and potential risks, others exhibit significant knowledge gaps (Nirmani et al., 2024).

There are several factors that influence the level of knowledge of over-the-counter (OTC) medicine vendors. For example, lack of regulatory compliance among OTC medicine vendors is linked to inadequate knowledge and training. For example, a study in Ghana found that only a small percentage of OTC medicine sellers were compliant with regulations, and this was correlated with factors like staff training and location (Frempong et al., 2021). Also Staff training, particularly in areas like drug interactions, contraindications, and proper dosage, is crucial for ensuring vendors have the necessary knowledge to provide safe and effective advice to

consumers(Addai-mensah, 2017). Furthermore, lack of awareness regarding the specific regulations governing OTC drugs can also contribute to knowledge gaps(Frempong et al., 2021).

The OTCMS facilities are quite prevalent within the Volta Region as well as serve as the primary destination for the majority of its residents. Evaluating the level of knowledge of over-the-counter medicine sellers to established standards regarding Artemisinin-based Combination Therapies (ACTs) provides valuable information on their regulatory compliance(Akande-Sholabi & Akinyemi, 2023). This data can have significant implications for public health interventions, given the growing popularity of these sellers in the region. This research aims to evaluate the level of knowledge among Over-The-Counter (OTC) pharmaceutical vendors about Artemisinin-based Combination Therapies (ACTs) within the Volta Region. Additionally, it seeks to identify the extent to which OTC medicine dealers are familiar with the current recommended treatment recommendations for uncomplicated malaria. This will aid in determining the need for further educational initiatives aimed at enhancing knowledge regarding the accessible treatment options for simple malaria in both the area and the whole nation, particularly in rural regions where over-the-counter malaria treatments are prevalent.

1.2 Problem Statement

In Ghana, patients have access to private pharmaceutical shops known as Over-the-Counter (OTC) drug vendors especially when it comes to the treatment of uncomplicated malaria using Artemisinin-based combination treatments (ACTs) (Addai-Mensah, 2017). Nevertheless, a key problem is the potential for over-the-counter (OTC) vendors to have inadequate knowledge about the ACTs, leading to incorrect advice, misuse, or even harm to consumers(Hatabu et al., 2025). This lack of knowledge extends to understanding drug interactions, contraindications, proper dosage, and potential side effects, particularly when dealing with patients with pre-existing conditions or taking other medications(Aborah et al., 2013).

Many OTC vendors, especially in informal settings, lack formal training on the use of ACTs in the management of malaria. They may not be adequately regulated or overseen by health authorities, leading to inconsistent advice and practices(Pfizer, 2014). Also, OTC vendors may not always be up-to-date on the latest information regarding drug interactions, contraindications, and potential side effects on ACTs which can lead

to the spread of misinformation and incorrect advice to customers(Simister et al., 2023). A lack of knowledge among vendors can exacerbate the problem of self-medication, where individuals rely on the advice of OTC vendors for conditions that require professional medical attention. This can lead to delayed diagnosis, inappropriate treatment, and potential complications(Chiappini et al., 2020). In many areas, particularly in resource-limited settings, OTC vendors may be the first point of contact for individuals seeking healthcare advice. This can lead to an over-reliance on their knowledge, even when it is limited leading to potential harm to patients(Simister et al., 2023).

If artemisinin resistance is not prevented, it will hinder the progress made in combating malaria in Africa. This is because the ACT (Artemisinin-based Combination Therapy) is now the only effective and extensively used therapy for malaria in most medical institutions in Africa and other tropical nations.

Although there has been an improved training by pharmacy council and other public campaign programs like the NMEP on the case management of malaria with ACTs, there is still low level of knowledge on the national antimalarial medication treatment recommendations among most sellers of over-the-counter (OTC) medicine(Nirmanani et al., 2024).

Therefore, it is necessary to evaluate the knowledge of OTC medicine sellers regarding Artemisinin-based Combination Therapies (ACTs) in the Volta region of Ghana, where malaria is prevalent (Addai-Mensah, 2017).

1.3 Justification

Artemisinin-based Combination Therapies have proven important to the recent success of malaria control internationally, and safeguarding the effectiveness of the ACT for malaria therapy is a public health priority. OTCMS' expertise in accurately prescribing the appropriate dose and duration is a crucial factor in the effectiveness of ACT therapy. In Ghana, numerous studies have examined the effectiveness of malaria treatments, the compliance of OTCMS facilities with regulatory standards, and patients' understanding of Artemisinin-Based Combination Therapy (ACT) treatment and its impact on adherence. However, there has been a lack of research on the knowledge of OTCM sellers regarding ACTs and the current proposed treatment guidelines for uncomplicated malaria. This knowledge is crucial in the fight against malaria in areas with high

malaria prevalence, such as the Ho Municipal District in the Volta region of Ghana. Therefore, this study aims to address this gap in the existing literature. Further research may be done using the results of this study to promote knowledge, education, and awareness on the available therapy for simple malaria among OTCMS in other regions of the nation as well.

1.4 Research Questions

Research questions were undertaken to discover the level of knowledge of OTC medicine Sellers on the ACTs.

1. Are OTC medicine Sellers aware of the current recommended treatment guidelines for uncomplicated malaria?
2. What is the level of knowledge of OTC Medicine Sellers on the recommended treatment guidelines for uncomplicated malaria?
3. Is there a need for further educational initiatives aimed at enhancing knowledge and understanding of the treatment options for uncomplicated malaria?

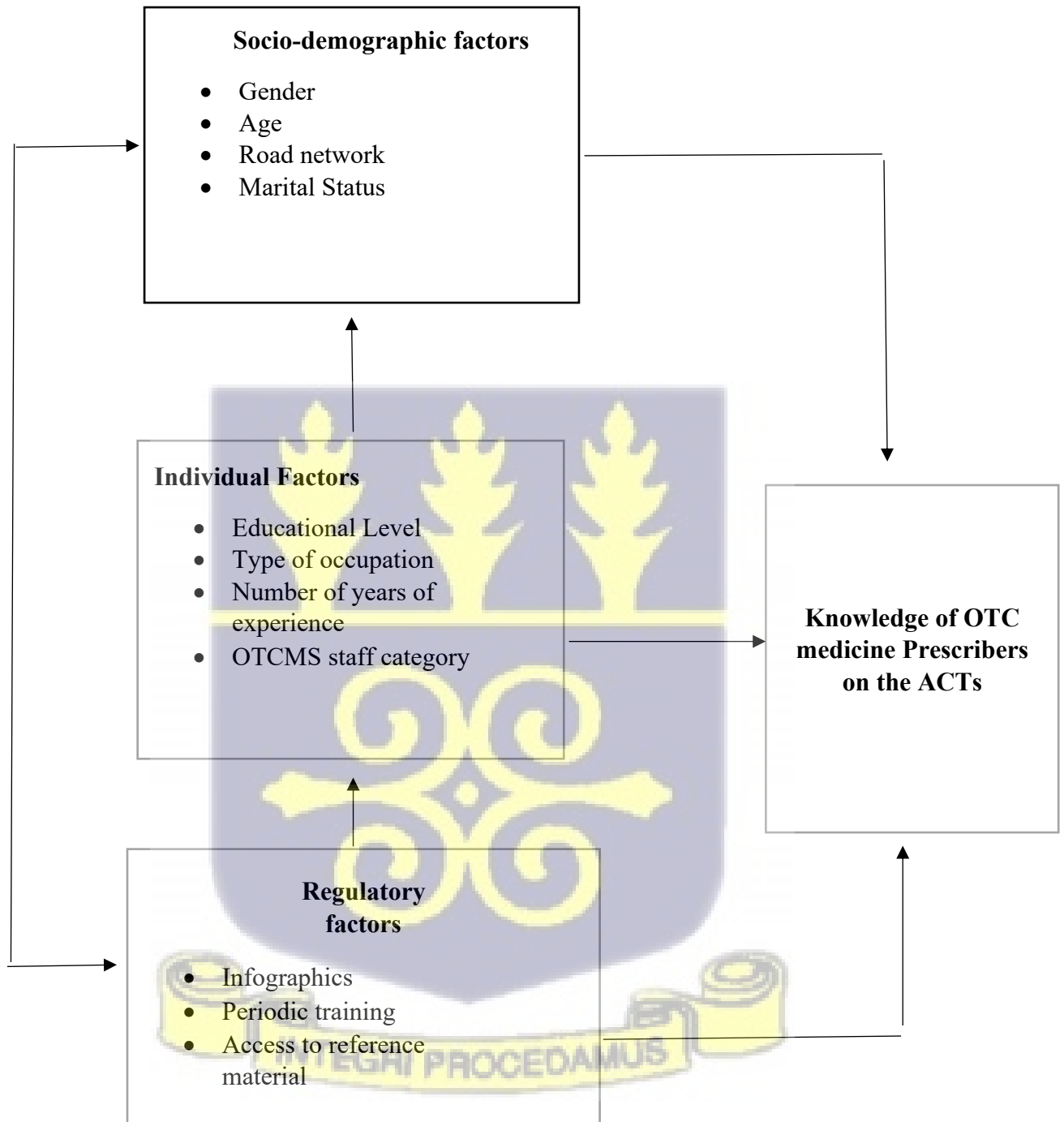
1.5 Main Objective

The research aimed to assess the level of knowledge of Over-The-Counter medication Sellers (OTCMS) on Artemisinin-Based Combination Therapies (ACTs) in the Ho Municipal District.

1.5.10 Specific Objectives

1. To determine the number of years of experience of Over-The-Counter (OTC) Medicine Sellers staff in the management of malaria.
2. To determine the type of occupation of Over-The-Counter (OTC) Medicine Sellers and its impact on their level of knowledge.
3. To determine the educational qualification of Over-The-Counter (OTC) Medicine Sellers.

Figure 1.0 Conceptual framework



Source: Author's Construct, 2023

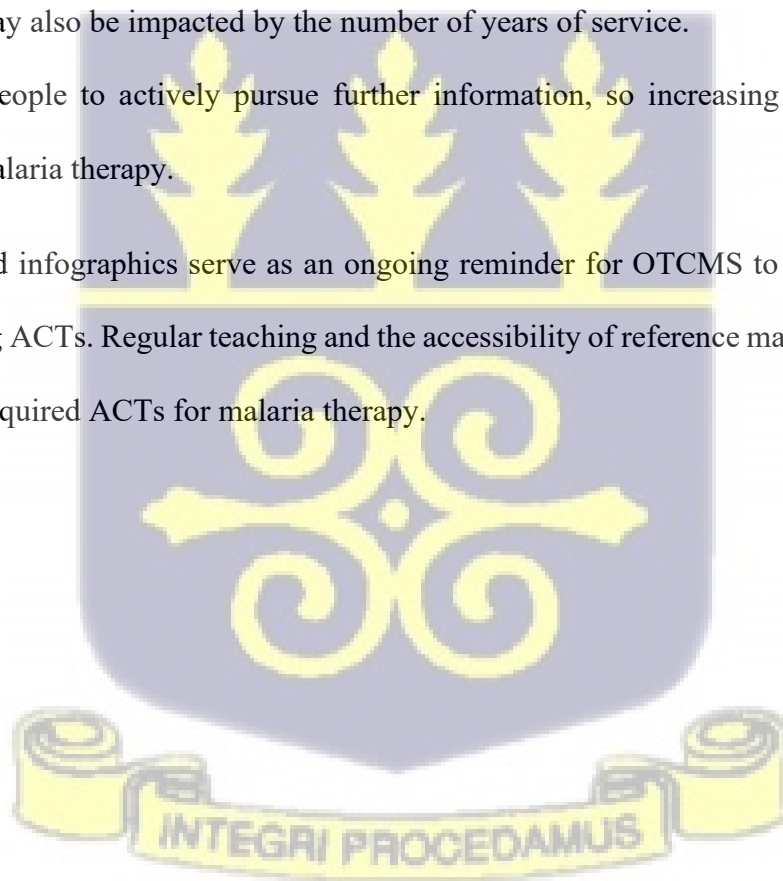
Figure 1. Conceptual framework of Knowledge of OTC medicine Sellers on the ACTs.

The level of knowledge of OTC medicine sellers was examined across three major areas to see how they relate to one another. Sociodemographic, individual, and regulatory factors are the topics being researched. The sociodemographic category will include gender, age, marital status and road network. Knowledge level, type of occupation, number of years of experience are considered individual factors, whereas regulatory factors are determined by periodic training on the ACTs, availability of infographics and access to reference materials.

The level of education of the OTC medicine seller may have a direct impact on their interest in current medication recommended for the treatment of malaria. It can be crucial for the OTCMS to comprehend the perceived benefit of treatment and the need of following them. Their interest in their line of work may also be impacted by the number of years of service.

This will encourage people to actively pursue further information, so increasing their knowledge of the suggested ACTs for malaria therapy.

Strategically positioned infographics serve as an ongoing reminder for OTCMS to undertake the necessary action while dispensing ACTs. Regular teaching and the accessibility of reference materials also enhance their understanding of the required ACTs for malaria therapy.



CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The etiology of Malaria

Malaria is a potentially fatal illness resulting from the invasion of red blood cells by protozoan parasites belonging to the Plasmodium genus. These parasites are transferred to humans by the bites of female Anopheles mosquitoes that are infected. The most prevalent Plasmodium species that infect people are P. falciparum, followed by P. vivax, P. malariae, and P. ovale. P. falciparum as well as P. vivax constitute the predominant species, with P. falciparum being the most hazardous. P. knowlesi, a Plasmodium species primarily infecting non-human primates, is becoming more prevalent in humans residing in forested areas of certain countries in South-East Asia and the Western Pacific regions, particularly on the tropical island of Borneo (WHO Guidelines on malaria, 2022). Malaria in humans is caused by four species of the plasmodium protozoa, namely the parasites falciparum, plasmodium vivax, plasmodium ovale, and plasmodium malariae. Plasmodium falciparum is responsible for nearly all of infections and is particularly deadly among these species. Multiple research has been conducted on various facets of the illness, ranging from parasitology to the development of drug-based treatments (chemotherapy) and the elimination of the infection by the employing of insecticide-treated nets and insecticides.

2.1.1 Malaria transmission, acquisition of immunity, and clinical manifestations of disease.

The transmission intensity is contingent upon elements associated with the parasitic organism, its vector, the human host, and the environment. Transmission is often more concentrated in areas with longer mosquito lifespans and where female mosquitoes have a preference for biting people over other animals. The survival and lifespan of female mosquitoes play a crucial role in the transmission of malaria, since the malaria parasite typically needs 7-10 days to mature within the mosquito before it becomes capable of infecting people. The lifespan of female mosquitoes is determined by both inherent genetic elements and external environmental

variables such as temperature and humidity. The high propensity of African vector species to bite humans is a key factor contributing to the prevalence of about 90% of global malaria infections in Africa. Transmission intensity is often evaluated by measuring the occurrence of episodes or the prevalence of illness. The majority of countries possess data regarding the annual parasite incidence, which refers to the number of newly identified cases of malaria per 1000 individuals in a given population per year. This information is typically obtained through routine surveillance systems or surveys, which are often carried out during or immediately following periods of high malaria transmission rates (WHO Guidelines for malaria, 2022).

The provided classifications of transmission intensity serve as a guide for each nation to perform a stratification exercise, enabling the classification of geographical units based on local malaria transmission.

High transmission areas are defined as having a yearly parasite incidence of 450 or more infections per 1000 residents and a *P. falciparum* prevalence rate of 35% or more (World Health Organization, 2020).

1) Areas with moderate transmission have an annual parasite infection rate of 250–450 cases per 1000 residents and an average prevalence of *P. falciparum*/*P. vivax* malaria infections ranging from 10% to 35% (World Health Organization, 2020).

2) Regions with low transmission rates have an annual parasite incidence ranging from 100 to 250 cases per 1000 people and a prevalence of *P. falciparum*/*P. vivax* malaria between 1% and 10%. The incidence of episodes or infections is a more reliable indicator in geographical areas with low prevalence, since reliably quantifying prevalence at low levels is challenging (World Health Organization, 2020).

3) Areas with very low transmission have an annual parasite incidence of less than 100 cases per 1000 people and a prevalence of *P. falciparum*/*P. vivax* malaria which is more than 0 but less than 1%.

Models may be used to predict the correlation between parasitic incidence, parasite prevalence, and the number of patients presenting to health institutions each week (Siddique & Kumar, 2019). Variances in transmission between different regions can be attributed to geographical factors, including elevation,

temperature, humidity, precipitation patterns, proximity to bodies of water, land utilization, distribution of vector species, socio-demographic characteristics, availability of antimalarial treatment, and implementation of vector control measures. Periodic trends in infection are often found in most endemic locations, characterized by a period of high transmission during a certain section of the year. Both the magnitude and temporal distribution of transmission are crucial factors to consider when devising eradication measures.

The clinical presentation of illness is heavily influenced by the pre-existing degree of acquired immune protection, which is determined by the frequency and severity of the transmission of malaria in the specific geographic location of residency. In regions with moderate to high transmission rates, children gain partial immunity to clinical sickness and have a decreased likelihood of having severe malaria throughout their early years of life (World Health Organisation, 2018). In the Sahel subregion, there is a consistent pattern of acquired immunity, characterized by severe malaria transmission within the two- or four-month rainfall period and minimal transmission throughout the rest of the year. In all of these scenarios, the occurrence of clinical illness is mostly limited to young infants, who may have a fast progression to severe malaria due to the development of large parasite densities. In contrast, in these environments, teenagers and adults possess a certain level of immunity and experience clinical illness less often, while being commonly infected with low levels of blood parasites. Pregnancy alters immunity and diminishes over time, particularly when people reside outside of regions with high disease prevalence for extended durations (e.g. one year or more). In regions characterized by low and extremely low malaria transmission rates, such as those seen in many parts of Asia, Latin America, and other locations with a high prevalence of malaria, the transmission of the disease varies significantly depending on the season, year, and even across short distances. *P. vivax* is a significant contributor to the prevalence of malaria in certain areas. The often short transmission delays result in a delayed development of immunity, leading to both adults and children experiencing acute clinical malaria. If left untreated, there is a significant risk of the disease progressing to severe malaria. Epidemics may arise in regions with low or extremely low transmission rates when there is a quick increase in the incidence of infection due to a sudden rise in the ability of disease-carrying vectors to transmit the disease. Epidemics may

lead to a significant surge in cases across all age demographics, potentially overwhelming healthcare systems.

In areas with moderate and high transmission rates of malaria, where there is consistent and widespread use of methods to control the mosquito population and access to treatment, the reduced exposure to malaria infection can lead to a shift in the population's acquired immunity. This shift would resemble the immunity levels seen in areas with low or very low transmission rates. As a result, the clinical patterns and spread of malaria could change, increasing the likelihood of epidemics if preventive measures are not maintained.

2.1.2 Recommendations and supporting implementation guidance

Evidence-informed recommendations play a crucial role in facilitating the formulation of national malaria strategy plans since they provide clear guidance on the necessary actions to be taken. Another crucial factor is the tactical use of regional data. This enhances comprehension of the varied circumstances inside each nation where malaria is prevalent. Local statistics provide insights into the many categories or layers present in each nation. Identifying the ideal combination of treatments and the most effective methods of delivering them in various subnational groups is a crucial need, as stated in the WHO Guidelines for malaria in 2022.

The Global Malaria Plan collaborates with countries to enhance the production and use of indigenous data for the categorization of regions, the determination of the most effective combinations of measures, and the logical, secure, and morally sound allocation of resources to optimize effectiveness. Local data is crucial for comprehending the effects of implemented methods, allowing for the improvement of regional plans and the enhancement of global knowledge. The World Health Organization (WHO) also creates implementation guidelines, including operational and field manuals, to assist in the practical execution of the suggested instruments and methods. Operational guides and other guidelines include practical information aimed at enhancing the target population's accessibility to treatments. These papers are cited and interconnected with these Guidelines. The Global Malaria Initiative is striving to synchronize its implementation advice with the recommendations outlined in the World Health Organization's Guidelines for malaria. Nevertheless, in cases of discrepancies, the Guidelines shall serve as the primary reference for national determinations. Countries

can implement the implementation advice to establish effective methods for implementing a recommendation. For instance, the implementation of intermittent preventative medication for malaria in pregnancy might be carried out via prenatal services and/or community distribution. The purpose of the guideline is to facilitate implementation, rather than to dictate the specific methods of execution (World Health Organization, 2021).

2.1.3 Strategic information to tailor programmatic response and selection of interventions

With the improvement of malaria control measures, the transmission and danger of malaria grow more varied, both within different nations and within individual countries. Consequently, using a uniform strategy to make program choices on treatment selection becomes ineffective. The current scenario necessitates the division of the country into several categories based on historical, current, and prospective malaria risk, as well as the organization and operation of the healthcare system, and other relevant considerations. Stratification offers a logical foundation for identifying tailored sets of treatments to focus on certain populations within various subnational groups. Local data are crucial for achieving stratification and guiding the choice of the most effective combinations of treatments to optimize their impact. In order to make the most effective use of limited resources, it is necessary to prioritize interventions in regions of malaria risk. This prioritizing process ensures that resource allocation is optimized to have the greatest impact by combining treatments in the most effective way. WHO's guidelines should guide the selection of treatments in each strata. Nevertheless, due to the intricate nature of malaria, which involves variations in risk and the specific circumstances that each program must take into account, worldwide advice is neither designed nor should it be employed to provide specific instructions on what actions should be taken in every circumstance. The Guidelines represent a significant change in approach, emphasizing the use of local information to identify suggestions that are applicable at a national level and tailored to the local context. They involve creating targeted intervention packages for specific groups to maximize their effectiveness and prioritize resource allocation. This change entails a departure from excessively rigid guidelines and will effectively differentiate evidence-based recommendations from contextual factors (World Health Organization, 2021). The application of suggestions and the development of measures to enhance access for those who are targeted will be influenced by contextual

factors at both national and subnational levels. Precise categorization of the severity of malaria transmission is crucial for efficiently directing treatments. In order to achieve eradication, governments need to do more detailed mapping at a smaller scale, preferably focusing on individual locations or the catchment regions of health facilities (Balikagala et al., 2021). As the transmission intensity decreases, stratification must include both sensitivity and receptivity to malaria. This refers to the risk of importing malaria cases and the intrinsic capacity of the vector-human environment to transmit malaria.

2.2 Prevalence, Incidence and Determinants of Malaria in West Africa

Epidemic malaria arises from the interplay between vectors, parasites, and a range of environmental and anthropogenic factors. Malaria epidemics affect people with weakened immune systems, putting a load on healthcare services and causing the number of deaths to rise by at least five times during outbreaks. The demographic characteristics may result in significant economic ramifications, however the whole economic effects of epidemic malaria are yet uncertain.

A research was undertaken in Benin to investigate the conception and establishment of the significance of economic elements that led to the spread of malaria (Mensah and Kumaranayake, 2004). The research revealed a lack of comprehension about the economic elements that play a significant role in the transmission of malaria in places where the illness is prevalent, despite its endemic nature. According to the study, some features of household heads, including age, awareness of malaria, education, and household size, have a considerable impact on the occurrence of malaria, as predicted by economic theory.

A study conducted by Asenso – Okyere (1994) in the Greater Accra Region of Ghana examined the causes of malaria in four specific districts: Kojo Ashong, Barekese, Barekuma, and Oyereko. The study identified several factors that were perceived to contribute to the occurrence of malaria, including stunted growth, mosquitoes, high temperatures, drunkenness, flies, tiredness, unsanitary surroundings, unsafe water, poor air quality, and inadequate hygiene. The research revealed that during that period, the majority of teenagers lacked knowledge about the transmission of the illness between individuals. Additionally, the symptoms often associated with clinical malaria, such as chills, yellowish eyeball and headache, shivering, yellowish urine and a bitter taste, were frequently seen.

2.2.1 Management of Malaria in West Africa

In 1997, Yeboah-Antwi and his colleagues conducted a study to assess the ability of district health personnel in Kintampo, which is within the Brong Ahafo region of Ghana, to alleviate the impact of malaria. Malaria is a significant cause of both death and illness, and the study was conducted in conditions of limited resources. It was discovered that compliance increased by roughly 20% in children as well as adults. However, there was a significant improvement of nearly 50% in areas such as cost to patients, time wasted at dispensaries, and medication wastage at facilities. A further research conducted in Ghana aimed to analyze and contrast household data on immediate illness and the actions taken to seek medical care in two specific areas, using health facility data as a reference (Agyepong and Kangeya-Kayonda 2004). Based on their findings, the researchers concluded that for each incidence of febrile illness that was seen in health facilities, there were around 4-5 instances in the community. Therefore, they recommended treating every feverish episode, particularly in children, with an anti-malarial medication. Given that several nations include community and home-based malaria treatment via both public and private, official and informal sectors, there is an urgent need for more complete estimations. Apawu et al. (2004) investigated the dynamics of malaria transmission within Kassena Nankana District (KND), a location in northern Ghana that was suggested as a potential site for testing malaria vaccines. A comprehensive mosquito sample was conducted over the course of one year utilizing human landing captures in three distinct micro-ecological sites: irrigated, lowland, and rocky highlands. Transmission exhibited strong seasonality, with the peak occurring between June and October. Transmission was more intense among those residing in irrigated areas compared to those in non-irrigated communities. Around 60% of transmission of malaria in KND took place inside throughout the latter part of the night, reaching its highest point around sunrise from 04.00 to 06.00 hrs.

2.3 Treatment of uncomplicated malaria per the WHO Guidelines for malaria.

An individual who exhibits symptoms associated with malaria and tests positive for the presence of parasites using microscopy or RDT, but does not display any signs of severe malaria, is categorized as having simple malaria. The primary clinical goals in managing simple malaria are to promptly eradicate the infection and to prevent the development of severe illness. The World Health Organization (WHO) defines "cure" as the

complete eradication of all parasites within the body. The primary goals of therapy in public health are to halt the transmission of the illness to others and to avoid the development and dissemination of antibodies that resist antimalarial medicines.

2.3.1 Incorrect approaches to treatment

1. The use of monotherapy

Utilizing artemisinins or other of the accompanying medications in isolation will undermine the effectiveness of ACT by promoting the development of drug resistance. In order to cater to the unique needs of certain patient populations, such as pregnant women, it may be necessary to provide them with combination regimens that are specifically tailored for their condition. However, the use of single artemisinin derivatives should be completely discontinued in private and informal healthcare sectors, as well as in peripheral public hospitals and clinics (Mannan et al., 2015). These derivatives will only be utilized in selected referral centers within the public sector. Likewise, the ongoing accessibility of amodiaquine, mefloquine, and SP as individual treatments in several areas is anticipated to reduce their effective lifespan as companion medications for ACT. Therefore, they should be discontinued whenever feasible (Camara et al., 2019).

2. Incomplete dosing

In areas where malaria is prevalent, some individuals with partial immunity to the disease may be successfully treated with a shortened course of antimalarial medications or a treatment plan that would not work for those without immunity. Previously, this resulted in distinct recommendations for individuals classified as semi-immune and those classified as non-immune. Due of significant variations in individual immunity, even in regions with moderate-to-high transmission rates, this practice is no longer advised (World Health Organisation, 2018). Regardless of the patient's semi-immunity status, a complete therapy regimen using a very potent ACT is necessary. Another potentially hazardous practice is administering just the first dosage of a treatment regimen to individuals who are believed to have malaria but have not yet received a confirmed diagnosis, with the aim of providing the whole therapy once the diagnosis is established. This approach is

considered hazardous, since it has the potential to generate opposition, and is not advisable (Balikagala et al., 2021).

Certain individuals may have difficulty tolerating oral medicine and may need the use of parenteral or rectal therapy for a period of 1-2 days, until they are able to consistently swallow and maintain oral medication. While these individuals may not exhibit other indicators of severity, it is advisable to provide the same first antimalarial medicines that are typically suggested for severe cases of malaria. Following the first rectal or parenteral therapy, it is essential to complete a complete 3-day course of ACT (Mannan et al., 2015).

2.3.2 Appropriate approach to treatment

2.3.2.1 Artemisinin-Based Combination Therapies (ACTs)

Artemisinin-Based Combination Therapy (ACT) is a treatment method recommended by the World Health Organization (WHO). It involves combining an artemisinin compound with another longer-acting antimalarial drug that works in a different way. Administer one of the following Artemisinin-based Combination Therapies (ACTs) to individuals, including children and adults, who have uncomplicated *P. falciparum* malaria (Siddique & Kumar, 2019). However, it is important to note that pregnant women in the first trimester of pregnancy should not be treated with these medications.

- 1) artemether + lumefantrine
- 2) artesunate + amodiaquine
- 3) artesunate + mefloquine
- 4) dihydroartemisinin + piperaquine
- 5) artesunate + sulfadoxine–pyrimethamine (SP)
- 6) artesunate + pyronaridine (WHO Guideline for malaria, 2022).

2.3.2.2 Duration of treatment

A 3-day treatment that uses the artemisinin component of ACTs targets two rounds of parasite reproduction, leaving just a limited number of parasites for the partner medicine to eliminate. This approach minimizes the risk of the partner drug developing resistance. It is not advisable to take shorter courses (1-2 days) since they

are less efficient, have a weaker impact on gametocytes, and provide less defense for the companion medicine that is cleared slowly (Addai-mensah, 2017).

2.4 Dosing of Artemisinin-Based Combination Therapies (ACTS)

As per the 2022 WHO Guideline for malaria, ACT regimens should be administered in a way that maximizes their effectiveness in treating the disease, reduces the chances of transmission, and slows down the development of drug resistance. This may be achieved by ensuring appropriate dose, which increases the possibility of quick clinical and parasitological cure (World Health Organization, 2021).

To guarantee high cure rates, it is crucial to attain optimal levels of antimalarial drugs for a significant duration (exposure) in every target population. The dosage recommendations provided here are based on a comprehensive knowledge of how the dose of the medicine affects the levels of exposure in the body (pharmacokinetics), as well as the consequent effectiveness of the treatment (pharmacodynamics) and safety considerations. Certain patient demographics, particularly younger patients, are not receiving the prescribed dosage regimens from manufacturers, resulting in compromised effectiveness and increased development of resistance. These recommendations altered dosage regimens to provide similar exposure throughout all patient groups where there was pharmacological data indicating that specific patient groups were not getting optimum doses (Balikagala et al., 2021).

The dose recommendations depending on weight are shown below. Although age-based dosing might prove more convenient for children, the correlation among age and weight varies across various groups. Using age as the only factor for determining dosage might lead to inadequate or excessive dose in some individuals, unless comprehensive weight-for-age information unique to the location are accessible to provide guidance for dosing (Afaya et al., 2018).

Additional factors, apart from the dosing regimen, may also influence the level of medication exposure and hence impact the effectiveness of therapy. The medication exposure of a patient is influenced by several variables, including the drug's quality, formulation, adherence, and, in some cases, concurrent administration with fat. Inadequate compliance is a primary factor leading to treatment ineffectiveness and contributes to the development and dissemination of medication resistance. Fixed-dose combinations promote adherence and are favored over separate pills (Report on Antimalarial Drug Efficacy, Resistance and Response, 2019).

Prescribers should allocate sufficient time to clarify to patients the rationale of completing the whole antimalarial regimen (Malik et al., 2014).

2.5 Self-medication and the risk

Occasionally, the act of self-medicating using over-the-counter (OTC) drugs is termed as 'responsible' self-medication, in order to differentiate it from the act of acquiring and taking prescription medicines without a doctor's prescription. The citation is from Belachew et al. (2011). The practice of self-medication has a long history and has had a considerable impact on developing nations such as India (Ahmad et al., 2015). The World Health Organization defines self-medication as the practice of people using medical items to treat their own recognized illnesses or symptoms, or the ongoing use of a medicine recommended by a doctor for chronic or recurrent diseases or symptoms (WHO, 2000). Self-medication refers to the act of obtaining medications without a prescription, reusing previous prescriptions to buy medications, sharing medications with family members or friends, or utilizing leftover medications kept at home (Loyola et al., 2004). Self-medication is an integral component of self-care, which refers to the main public health asset in the healthcare system. The concept encompasses self-administration of medicine, non-pharmaceutical self-care, social assistance during sickness, and basic emergency care in daily situations. The healthcare administrative situation in many developing countries, as identified by WHO in 2000, has resulted in an excess supply and easy availability of many drugs, including some with insufficient evidence to support their safe use. This, together with limited community awareness on pharmaceutical safety and proper dosage, exacerbates the problem of medication misuse and overuse in developing nations. As a result, this may lead to negative health outcomes, public health challenges including antibiotic resistance, and increased poverty within the community (Porter & Grills, 2016). Medications intended for self-administration are often referred to as Non-Prescription or Over the Counter (OTC) drugs. These medications may be obtained from pharmacies without the need for a doctor's prescription (S. et al., 2018). Self-medication offers a more affordable option for those who are unable to bear the expenses associated with professional medical services. Appropriately used, self-medication has the potential to reduce the burden on physicians and promote greater health awareness among individuals. Nevertheless, if misused, it has the potential to impede timely identification and suitable therapy, as well as

induce toxicity, adverse reactions, medication interactions, and undue financial burden. In contemporary times, individuals are more eager to assume greater personal accountability for their state of health and seek comprehensive information from authoritative sources to aid them in making informed choices on healthcare. Pharmacists play a crucial role in offering support, guidance, and information on over-the-counter medications (Simister et al., 2023). Furthermore, OTC medication prescribers are increasingly becoming a primary resource for health information, particularly in rural areas. They have significant potential in assisting individuals with self-care, provided that suitable regulation is in place (Chiappini et al., 2020). The prevalence and extent of self-medication, as well as the underlying motivations, might differ among nations. Hence, it is crucial to understand the knowledge, attitude, and practices of rural residents who sell over-the-counter (OTC) medicines. This understanding will help in developing suitable educational, regulatory, and administrative strategies to mitigate the risks to public health associated with incorrect medication practices. The present research attempted to produce data on the current state of OTC drug dealers' knowledge on ACTs in the management of simple malaria, although no such data is currently accessible (Aborah et al., 2013).

2.6 Self-medication with Over-The-Counter medicines

Over-the-counter (OTC) drugs, often called nonprescription medicines, are pharmaceuticals that may be bought without a prescription. They are considered safe and effective when used as instructed on the label and as prescribed by a healthcare professional (Food and Drug Administration, 2018). The practice of self-medication is gaining popularity worldwide. Studies have found that self-medication is prevalent globally, with rates ranging from 11.2% to 93.7%. The prevalence varies depending on the specific population and country being studied (Balbuena et al., 2009; Kasulkar and Gupta, 2015; Arrais et al., 2016; Håkonsen et al., 2016; Prado et al., 2016; Gama and Secoli, 2017; Helal and Abou-ElWafa, 2017; Abdi et al., 2018; Kassie et al., 2018; Lei et al., 2018; Tesfamariam et al., 2019). Consequently, a substantial percentage of the global population consumes medications without seeking prior advice from a medical practitioner or healthcare expert. Both individuals and the healthcare industry may get advantages from the implementation of effective self-medication techniques. For instance, by reducing the number of employees being absent from work due to minor illnesses, there will be a decrease in the time and money spent on doctor visits. Additionally, this will

help in minimizing the burden on governments caused by health expenditure related to the management of minor illnesses (Hughes et al., 2001; Ruiz, 2010; Sarahroodi, 2012). According to recent research, two primary factors that contribute to self-medication are the ease of visiting a pharmacy instead of seeing a doctor and the desire to avoid hospital visits for medical care (Kassie et al., 2018; Lei et al., 2018). Nevertheless, the improper use of over-the-counter (OTC) medications may result in drug-related issues and potentially fatal outcomes (Ruiz, 2010; Eickhoff et al., 2012; Sarahroodi, 2012; Asseray et al., 2013; Oliveira et al., 2014). The increasing prevalence of improper self-administration of medicine is emerging as a significant public health issue worldwide, specifically due to the wrong use of antibiotics leading to antimicrobial resistance (Watkins and Bonomo, 2016).

2.7 Theoretical Review

2.7.1 The Health Belief Model (HBM)

The Health Belief Model (HBM) was among the initial models formulated to elucidate the process of health behaviour modification. When utilised correctly, it yields structured evaluative data regarding clients' capabilities and willingness to alter their health condition (Sanaeinasab et al., 2022). Health education programs can be tailored to more effectively address the needs of clients. The Health Belief Model posits that individuals' motivation to engage in health-promoting or disease-preventing behaviours is grounded in:

1. Their conviction of their susceptibility to the sickness in question.
2. The potential severity of the disease's impact on their life if contracted.
3. The proposed health intervention is beneficial.
4. Assessing the value of the treatment in terms of its expense.
5. What obstacles must individuals surmount to establish and sustain particular behaviours?
6. Influence from a nearby individual, potentially afflicted by the same ailment, indicates the necessity for intervention (Sanaeinasab et al., 2022).

The model comprises three principal components:

1. The individual's perceptions regarding health.
2. The modifying elements encompass demographic, socio-psychological, and structural variables.
3. The advantages of using preventive measures (Ghorbani et al, 2021).

The current study applies the Health Belief Model (HBM) to explain the perception of Over-the-Counter (OTC) medicine vendors toward their understanding and execution of malaria treatment prescription, specifically Artemisinin-based Combination Therapies (ACTs). In that regard, the third goal, an assessment of the extent to which the knowledge of OTC sellers would promote awareness and understanding of the existing options concerning uncomplicated malaria, overlaps with various critical constructs demonstrated in the HBM, the most opposable ones being perceived severity, perceived susceptibility, perceived benefits, and self-efficacy (Glanz et al., 2021).

Empirical data shows that among OTC sellers, who feel that malaria is both severe and common, there is a disproportionately high likelihood of seeking the right knowledge and observing the recommended treatment protocols. These providers are more inclined towards adopting the knowledge once they have understood the benefits of Artemisinin-based Combination Therapies (ACTs) in reducing treatment failure and drug resistance (Aidoo et al., 2024). The level of self-efficacy as the measure of confidence in the capability to disperse and advise clients on the application of ACTs is determinant in the development of treatment precision and the results (Wolfe, 2022).

In low resource settings including Ho Municipal District where over-the-counter (OTC) distributors often act as the front-line encounter, the health belief model (HBM) explains how knowledge acquisition depends both on internal beliefs as well as external factors, with the most significant being certification, supervision, and advocacy on behalf of the health of the population. The HBM, when used as such, provides a subtle understanding of the operationalisation of perceptions among sellers, and, thus, it provides a theoretical framework of interventions that can be used in strengthening the practices of malaria case management in informal health sectors.

2.8 Empirical Review

2.8.1 The Degree of knowledge of Over-The-Counter (OTC) Medicine Sellers About Artemisinin-Based Combination Therapies (ACTs)

Soniran et al. (2022) aimed to improve the implementation of the T3 policy among OTCMS by interventions that could be easily scaled nationally. Seven OTCMS in the intervention group and five OTCMS in the control

group from the identified towns participated in the study. Five interventions were executed only in the intervention group. The findings revealed that notable enhancements in compliance with the “test, treat, track” strategy, vendors increasingly utilised rapid diagnostic tests (RDTs) and accurately administered ACTs based on negative/positive outcomes. Post-intervention, knowledge and awareness of ACTs as the primary therapeutic approach significantly increased.

Goodman et al. (2024) also synthesise research about the efficacy of treatments aimed at enhancing malaria case management in private medicine retailers (PMR) in sub-Saharan Africa. The study employed quantitative methodologies to assess interventions that facilitate RDT and/or ACT sales by PMR personnel, utilising either a historical or contemporaneous control group, and measuring outcomes pertinent to the treatment provided. Robust data indicated that both small and large-scale ACT subsidy programs (excluding RDTs) augmented the market share of quality-assured ACT in PMRs, particularly among rural and economically disadvantaged populations, with increases exceeding 30 percentage points in most contexts.

Further, O’Boyle et al. (2020) investigated the non-prescription of antimalarials for patients with malaria infections indicated by positive mRDT findings, focusing particularly on populations most susceptible to adverse outcomes if antimalarials are not administered. Analysis of data from 562,762 patients across eight studies co-designed by the ACT Consortium, conducted between 2007 and 2013 in children and adults in Cameroon, Ghana, Nigeria, Tanzania, and Uganda. Among 106,039 patients with positive mRDT results (median age 6 years), 7,426 (7.0%) were not administered an ACT antimalarial. The percentage of mRDT-positive individuals who were not prescribed ACT varied between 1.3% and 37.1% across different sites. Among patients under 5 years of age, 3473 out of 44,539 (7.8%) were not prescribed an ACT, and 3833 out of 60,043 (6.4%) of patients aged 5 years and over were similarly untreated. The percentage of children under 5 years old not prescribed ACT varied up to 41.8% across different sites. The likelihood of not receiving an ACT was 2 to 32 times greater for patients in environments with lower transmission intensity (using test positivity as a proxy) compared to those in areas with higher transmission. Children who tested positive for mRDT in low-transmission environments were particularly unlikely to receive ACT, with untreated proportions reaching as high as 70%.

Moreover, Ocan et al. (2023) evaluated the availability, pricing, and market share of quality-assured artemisinin-based combination treatments (QAACTs) in private drug stores following more than a decade of copayment mechanisms in Uganda's private sector. The study was a cross-sectional survey of anti-malarial drugs in private drug shops located in high malaria transmission areas (Tororo and Apac districts) and low malaria transmission areas (Kabale and Mbarara districts). The findings revealed that a total of twenty-eight (28) private drug outlets, comprising pharmacies and drug shops, were incorporated in the survey. One in seven Artemisinin-based combination treatments (ACTs) available in pharma stores were quality assured (QAACTs). At the time of the survey, Artemether-lumefantrine (AL) was present in 8.9% (11/124) of drug outlets, while Artesunate-Amodiaquine (AQ) was found in 7.3% (9/124) of outlets, making them the sole QAACTs available. Of the antimalarial agents available in stock at the drug shops, 86.1% (124 out of 144) were based on artemisinin. The predominant ACT at the drug outlets, at 38.9% (56/144), was Dihydroartemisinin-Piperaquine (DHP). A majority, 69.4% (100/144), of the antimalarial agents were located in areas of significant malaria transmission.

2.8.2 OTC Medicine Sellers' knowledge on the Current Recommended Treatment Guidelines for Uncomplicated Malaria

Soniran et al. (2020) assess compliance with malaria diagnostic protocols among Over-the-Counter Medicine Sellers (OTCMS). A descriptive census was utilised in the study to assess adherence to Rapid Diagnostic Test (RDT) diagnoses among OTCMS practitioners. The findings indicated that 38.1 per cent of participants were proprietors of OTCMS, while 61.9 per cent were assistants. Approximately 9.5 per cent attained Junior High School level, 71.4 per cent completed Senior High School level, and 19.1 per cent possess tertiary education. 8.3 per cent of facilities exhibited malaria RDT posters. 21.8 per cent of OTCMS providers utilise malaria RDT kits. Approximately 7.1 per cent of the providers conducted malaria testing. Overall, there was 2.8 per cent full adherence, 25 per cent moderate adherence, and 72 per cent non-adherence to the malaria diagnosis recommendations among OTCMS.

Mensah et al. (2014) also evaluated the knowledge and practices about malaria control among over-the-counter drug vendors in the Pru, Sene West, Sene East, and Atebubu-Amantin districts of the Brong Ahafo

region in Ghana. A cross-sectional descriptive study was performed utilising a standardised questionnaire. The study indicated a substantial understanding of malaria transmission vectors, symptoms, and prevention, with 63% of OTC medicine dealers having participated in at least one malaria workshop conducted by the Pharmacy Council and/or partners in the preceding two years. Merely 26.2% of over-the-counter pharmaceutical vendors utilise the malaria rapid diagnostic test (RDT) kit for the detection and confirmation of probable malaria cases. A majority (65.6%) of over-the-counter medicine vendors frequently recommend Artemether Lumefantrine (AL) for the treatment of uncomplicated malaria, while 26% to 43.5% offer alternative antimalarial options, including herbal preparations, sulphadoxine pyrimethamine (SP), monotherapies (such as artesunate, amodiaquine, artemether, or lumefantrine), and quinine. The majority of over-the-counter medicine vendors fail to adhere to the national requirements for antimalarial drug therapy.

Lastly, Soniran et al. (2021) conducted a mixed-method study to identify variables hindering test-based management of probable malaria cases among carers of feverish children and over-the-counter drug vendors in eight rural areas in Ghana. The health providers most commonly sought by carers of febrile children, in descending order, were Community Health-Based Planning Services (CHPS) compounds, medicine dealers, and OTCMS. The rate of parasitological testing for malaria among feverish children was highest at the CHPS compound (94.9%) and lowest at the OTCMS stores (10.5%). 28.3% of febrile children were not administered a malaria blood test. Among carers who did not request a malaria blood test, 15.2% indicated that the healthcare practitioner did not propose the test; 21.7% were financially constrained from visiting the Health Centre; and 63% were uninformed about the malaria blood test and its availability. From the perspective of OTCMS, factors hindering compliance with WHO-recommended policies for testing before treating uncomplicated malaria include clients' inability to afford malaria blood tests, the community's perception of OTCMS as unqualified to conduct these tests, financial losses incurred from expired unused RDT kits, clients' requests for half doses of ACT, and the activities of drug peddlers.

2.8.3 The Level of OTC Medicine Sellers' Knowledge in Enhancing and Understanding the Existing Treatment Options for Uncomplicated Malaria

Ihesie et al. (2019) aimed to investigate the determinants affecting the malaria treatment practices of patent medicine vendors for children under five in Akwa Ibom State. A cross-sectional survey utilising an interviewer-administered questionnaire was executed among 176 PMVs chosen by simple random sampling from two local government areas (LGAs). Artemisinin Combination Therapy (ACT) was the predominant antimalarial medication suggested by PMVs (75.6%) for children, in contrast to chloroquine (17%) and Sulphadoxine/Pyrimethamine (2.8%). Nonetheless, merely 39.2% of PMVs endorsed the correct antimalarial treatment (ACTs at the proper dosage for age), but 71% advocated for referral in cases of severe malaria. Factors identified as correlating with effective malaria management through quantitative analysis were educational qualifications, participation in malaria training, and understanding of malaria.

Oyeyemi et al. (2015) also assessed the reaction of Patent Medicine Vendors (PMVs) to the new policy. A mixed-method strategy, incorporating a questionnaire survey of 180 PMVs and four key informant interviews, was employed. Over 80% of responders recognised the policy change regarding malaria treatment; nevertheless, merely 23.9% dispensed an ACT for the most recent case of malaria treated in a child under five. The primary determinant of the specific AMD sold was PMV's individual preference (70.6%). Approximately 58.9% of the stores carried ACTs, the newly endorsed antimalarials.

Lastly, Kodaolu et al. (2020) ascertain the stocking pattern for anti-malarial medications, the awareness of recommended anti-malarial drugs among PPMVs in Akinyele Local Government Area (LGA) of Oyo State, Nigeria, and their perceptions on strategies to enhance PPMV compliance in stocking ACT medicines. A cross-sectional study was performed with 320 PPMVs utilising a mixed-method approach for data collection. The findings indicated that the majority of PPMVs stocked artemether-lumefantrine (90.9%), followed by dihydroartemisinin-piperaquine (5.3%) and artesunate-amodiaquine (2.8%). Drugs in violation of the policy, including sulfadoxine-pyrimethamine, chloroquine, quinine, halofantrine, artesunate, and artemether, were stocked by 93.8%, 22.8%, 0.6%, 1.3%, 6.6%, and 7.8% of the PPMVs, respectively. Approximately 96.3% of PPMVs possessed proficient knowledge of artemether-lumefantrine as the primary treatment for malaria, while 2.8% demonstrated adequate understanding of artesunate-amodiaquine as the secondary treatment for the disease. The primary determinants affecting stocking decisions were government recommendations (41.3%) and consumer demand (40.30%).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

The research was conducted inside the Ho Municipal District. The municipality is classified as one among the 261 Metropolitan, Municipal and District Assemblies (MMDAs) in Ghana. Specifically, it is categorized as one of the 18 Municipalities and Districts under the Ho Municipal District. Ho, the administrative headquarters of the Municipality, functions as the primary economic center for the residents in Ho Municipal District.

The Municipality is next to the Republic of Togo to the east, the Ho West District to the north and west, and the Agotime-Ziope and Adaklu District to the south. The district has a geographical area of 2,361 square kilometers, which accounts for 11.5 percent of the whole region's land area. The Municipality's population, as reported in the 2021 demographic and housing census, is 180,420, including 84,843 men and 95,577 females. The municipality consists of elevated and low-lying regions, with an average monthly temperature varying between 22°C and 32°C. Essentially, temperatures remain consistently elevated throughout the year, which is advantageous for cultivating crops. Furthermore, the chosen region exhibits clear demarcations between urban and rural areas, enabling comparisons to be made between results in these different contexts.

3.2 Over-The-Counter Medicine sellers in the Ho Municipal District

There are about 301 Over-The-Counter Medicine Shops registered in the region. The Ghanaian Pharmacy Council oversees the stores. Annually, the Pharmacy Council bears responsibility for the registration of stores. Additionally, the Council certifies ongoing professional development programs for practitioners of over-the-counter medicine and the personnel who assist them. The Pharmacy Council additionally conducts regular surveillance of these establishments.

3.3 Study Design

To evaluate OTCM Sellers' level of knowledge on artemisinin combination therapy (ACT) in cross-sectional research design. An initial survey was conducted to identify and collect data on all the Over-The-Counter-Medicine shops (OTCMS) in the Ho Municipal District. Despite an estimated total of 301 registered OTCMS in the district, subsequent follow-ups were carried out to ensure comprehensive coverage.

Two data collection tools were used to collect the data, comprising of a semi-structured questionnaire and a check list (Appendix iv).

3.4 Sampling and sample size

The Pharmacy Council in Ho, Ghana provided a list of 301 registered OTCMS in the Ho Municipal area. To ensure consistent representation, a complete enumeration method was chosen since all of them were being included in the study. All the staff at post who participated in the study were explained clearly about the purpose and nature of the study in the language they could understand. They were included in the study only after obtaining a written Informed Consent Form. A total of 301 OTCMS are registered by pharmacy council in Ho Municipal but only 170 registered OTCMS were operating at the time of the study.

The research used OTC medicine sellers who were easily accessible at the shops. A participants per site were used during data collection. The majority of shops had a staffing level of one or, at most, two employees each shift.

3.5 Variables

3.5.1 Dependent Variables

The outcome variable was the level of knowledge of OTCMS on ACTs. The assessment of knowledge was made based on responses given the questions on the WHO recorded guidelines on promoting access to high-quality, relevant, and targeted information to improve health outcomes and reduce health inequalities. These questions were adapted from Malik et al. (Malik et al., 2014)

3.5.2 Independent variable

The independent variable of the current study were socio-demographic factors; age and gender, road network and marital status, individual factors; educational level, type of occupation, number of years of experience and OTCMS staff category, regulatory factors; infographics, periodic training and access to reference material. These variables are summarized in Table 1

Table 1.0 Summary of Dependent and Independent Variables

Variables		Operational Definition	Scale Of Measurement	Variable Type
Independent variables	Age	Age of respondent as at last birthday	Years	Continuous
	Sex	Biological make-up	Male or female	Binary
	Marital status		Single, married, divorced, widowed or cohabiting	Nominal
	Road Network	The road that leads to the community	Tarred or Untarred	Binary
	Level of education	Highest educational level attained	JHS, SHS, degree, diploma, Masters	Ordinal
	OTCMS staff category	Professional background of staff	Medicine counter assistant, dispensing technician, pharmacist.	Nominal
	Length of service	Number of years in service	Years	Continuous
	Infographics	Posters and pictorial material on how to dispense the ACTs	Yes, No	Binary

	Access to reference materials		Yes, No	Binary
	Periodic Training	Training on recommended ACTs	Yes, No	Binary
Outcome variable	Knowledge	Knowledge on the recommended ACTs	Low, Intermediate, High	Ordinal



3.6 Validity and reliability of the instrument

The research team (comprising four individuals including the principal investigator) was trained on data collection tools and techniques to eliminate biases. In order to test the content and validity, the questionnaire was pretested amongst 10 OTCMS outlets in Volta Region, outside the study site. Following which modification was made to questionnaires, where necessary.

3.7 Inclusion criteria

- All OTCM Sellers operating outside hospitals, clinics, health centers and CHPS compounds who were willing to participate was included in the study.
- OTCM sellers above 18 years of age was included in the study.
- OTCMS with stable mental conditions at the time of enrollment

3.8 Exclusion criteria

- The research did not include OTCM Sellers operating inside hospitals, clinics, health centers, and CHPS zones. These participants were selected from registered OTC medicine shops who dispense pharmaceuticals over the counter.
- Minors, defined as those under the age of 18, were excluded from the research.
- OTCM sellers who declined to take part in the research due to a medical condition.

3.9 Recruitment and training of research assistants/data collection

Three complimentary methodologies were used to identify OTCMS facilities during the study. The first tactic used the different district and municipal health directorates to hire public health and demography personnel who live in the designated regions. Utilizing facility owners or employees of recognized stores to locate other retail establishments nearby was the second tactic. The last strategy was to assemble a field team in each of the districts to help identify OTCM facilities and administer questionnaires. The term "over-the-counter medicine seller outlet" refers to establishments that do not fall under the community pharmacy category,

operate outside of a hospital, clinic, health center, or Community-based Health Planning and Services (CHPS) zone, and meet the requirements for a physically and structurally permanent location as well as suitability for the intended use of the space.

3.10 Ethical considerations

The Ghana Health Service Ethics Committee's approval was requested ethically. The study's objectives and aims were clearly communicated to all participants. Prior to administering each questionnaire, both written and verbal agreement were collected from the respondents. The respondents were guaranteed privacy and secrecy.

3.11 Data Analysis

With the use of a Microsoft Excel spreadsheet and STATA statistical analysis software (version 17.0), both descriptive and inferential statistics in the form of frequencies, percentages, mean values, standard deviations, and Pearson's chi-square test were produced after anonymity was coded and cleaned. For each demographic, cross tables showing the distribution's frequency and percentages were created. The statistical significance of the link was determined using inferential statistical analysis utilizing Binary Probit Regression models. The values were derived by conducting a comparison of OTCMS knowledge scores against the ACTs recommendations and compliance, with a significance level of 95%. The name of the prescribed antimalarial medication, the recommended dosage, the efficacy of the medication, any side effects, the benefits of finishing the treatment course, the length of time for taking the medication, the interval between each dose of the medication, and the consequences of not taking the prescribed antimalarial medication were all factors used to calculate the respondents' knowledge score on the treatment of malaria (ACT). Respondents who correctly answered each knowledge component were given a score. The aggregate score of the knowledge components was calculated for each of the respondents. The results were processed using computer algorithms to determine the knowledge score, which was presented in a descriptive format including percentages, mean, standard deviation, and other relevant statistics.

4.0 RESULTS

4.1 The sociodemographic features of OTC medicine sellers in the Ho Municipal District, Volta, are examined.

Table 4.1 presents a summary of one hundred and seventy (170) sampled from 301 OTC medicine shops. A majority of them, 109 (63.7%) and 140 (81.9%) were females and married, respectively. A little over half, 94 (55.0%) were within the 25-29 years' age bracket. A greater portion of them, 113 (66.1%) were Medicine Counter Assistants while half, 88 (51.5%) held MCA certificates as their highest qualification. Most of them, 74 (43.3%) had worked for 3-4 years in OTC medicine shop settings.

Table 4.1: Socio-demographic characteristics of OTC medicine sellers in the Ho Municipal District, Volta (N=170).

Characteristics	Frequency (170)	Percentage (%)
Age		
≤ 24	36	21.1
25-29	94	55.0
30-34	27	15.8
≥ 35	14	8.2
Sex		
Female	109	63.7
Male	62	36.3
Marital status		
Single	140	81.9
Married	31	18.1
Highest qualification		
Secondary	23	13.5
Certificate	88	51.5
Diploma	26	15.2
Bachelors	30	17.5
Masters	4	2.3
Type of health professional		
Administrative staff	4	2.3
Dispensing technician	21	12.3
Medicine Counter Assistant	113	66.1
Other	33	19.3
Work experience (years)		
<3	28	16.4
3-4	74	43.3
>4	69	40.4
Area		

4.2 Level of Knowledge on the ACTs

A greater portion of study participants knew about different brand of ACT (62.0%), knew ACTs are sold over the counter (92.4%), asked elapsed time since patient took ACT (93.6%), ask how often patient takes ACT (88.3%), label ACT in an indelible ink (78.4%) and ask patient reason for purchasing ACT (89.5%)

Table 4.2: Level of Knowledge on the ACTs in Ho Municipal District, Volta.

Characteristics	Response	Frequency (171)	Percentage (%)
Knowledge on different brand of ACTs	No	65	38.0
	Yes	106	62.0
Access to ACTs	No	145	84.8
	Yes	26	15.2
ACTs are sold over-the-counter	No	13	7.6
	Yes	158	92.4
Ask Elapsed time since patient took ACT	No	11	6.4
	Yes	160	93.6
Ask how often a patient takes ACT	No	20	11.7
	Yes	151	88.3
Label ACT in an indelible ink	No	37	21.6
	Yes	134	78.4
Ask patients reason for requesting ACT	No	18	10.5
	Yes	153	89.5



4.3 Relationship between sociodemographic traits and ACT knowledge level

Table 4.3 revealed a strong correlation between the kind of health professional (Pearson chi-square = 8.90, p-value = 0.034), highest qualifications (Pearson chi-square = 9.60, p-value = 0.049), and knowledge level.

Table 4.3: Association between socio-demographic characteristics of OTC medicine sellers and level of knowledge on ACTs in Ho Municipal District, Volta (N=170).

Characteristics	Total (%)	knowledge		²	p-value
		No	Yes		
Chi					0.296 a
Age				3.67	
≤ 24	36 (21.05)	6 (16.67)	30 (83.33)		
25-29	94 (54.97)	22 (23.40)	72 (76.60)		
30-34	27 (15.79)	2 (7.41)	25 (92.59)		
≥ 35	14 (8.19)	3 (21.43)	11 (78.57)		
Sex				0.15	0.697
Female	109 (63.74)	22 (20.18)	87 (79.82)		
Male	62 (36.26)	11 (17.74)	51 (82.26)		
Marital status				0.24	0.621
Single	140 (81.87)	28 (20.00)	112 (80.00)		
Married	31 (18.13)	5 (16.13)	26 (83.87)		
Highest qualification				9.60	0.049*a
Secondary	23 (13.45)	6 (26.09)	17 (73.91)		
Certificate	88 (51.46)	23 (26.14)	65 (73.86)		
Diploma	26 (15.20)	2 (7.69)	24 (92.31)		
Bachelors	30 (17.54)	2 (6.67)	28 (93.33)		
Masters	4 (2.34)	0 (0.00)	4 (100.00)		
Type of health professional				8.90	0.034*a
Administrative staff	4 (2.34)	0 (0.00)	4 (100.00)		
Dispensing technician	21 (12.28)	2 (9.52)	19 (90.48)		
Medicine Counter Assistant	113 (66.08)	29 (25.66)	84 (74.34)		
Other	33 (19.30)	2 (6.06)	31 (93.94)		
Work experience (years)				1.85	0.397
<3	28 (16.37)	8 (28.57)	20 (71.43)		
3-4	74 (43.27)	13 (17.57)	61 (82.43)		
>4	69 (40.35)	12 (17.39)	57 (82.61)		
Area				0.24	0.624
Rural	46 (26.90)	10 (21.74)	36 (78.26)		
Urban	125 (73.10)	23 (18.40)	102 (81.60)		

a – denotes p-value calculated from fisher's exact test, * - represents significance at p-value < 0.05.

4.4 The relationship between OTC medication dealers' sociodemographic characteristics and their degree of expertise was examined using both univariate and multivariable regression analysis in the Ho Municipal District of Volta.

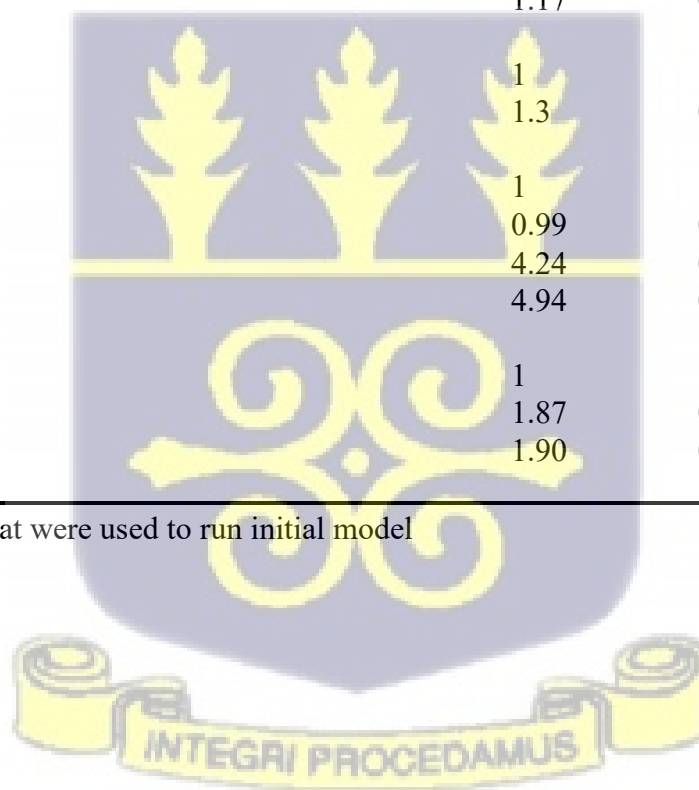
The correlation between level of knowledge and all relevant characteristics was examined using both univariate and multiple logistic regression; the results are shown in table 4.4.



Table 4.4: Univariate and multivariate logistic regression of the association between level of knowledge and characteristics of OTC medicine sellers in Ho Municipal District, Volta

Characteristics	Unadjusted model		
	OR	95% CI	p-value
Age			
≤ 24	1		
25-29	0.65	0.24 – 1.78	0.405
30-34	2.5	0.46 – 13.49	0.287
≥ 35	0.73	0.16 – 3.45	0.695
Sex			
Female	1		
Male	1.17	0.52 – 2.61	0.698
Marital status			
Single	1		
Married	1.3	0.46 – 3.69	0.622
Highest qualification			
Secondary	1		
Certificate	0.99	0.35 – 2.83	0.996
Diploma	4.24	0.76 – 23.57	0.099
Bachelors	4.94	0.89 – 27.32	0.067
Work experience (years)			
1-2	1		
3-4	1.87	0.68 – 5.18	0.224
5 and above	1.90	0.68 – 5.31	0.222

*Showing all variables whether significant or not that were used to run initial model



CHAPTER FIVE

5.0 DISCUSSION

The main aim of this research was to evaluate the level of knowledge of over-the-counter drug vendors on artemisinin-based combination therapies (ACTs) in Ho Municipal, Volta Region. A review of the literature revealed that there had been few or no studies conducted in OTC medicine shops; instead, most previous research had concentrated on patients, clinics and hospitals. This makes this study one of the most innovative studies conducted in Ghana and the world because it focuses on assessing the knowledge on ACTs in the most assessable community health setting—OTC medicine shops, where most patients seek healthcare due to their accessibility, convenience, and affordability; additionally, this study went one step further to include mystery clients in order to validate the self-answered questionnaires and mitigate potential biases in the questionnaires for the cross-sectional study.

5.1 Association between level of knowledge and compliance to ACTs

Although knowledge was good, compliance to ACTs among the OTC medicine sellers was high (81%). Among OTC drug vendors, there was a correlation between knowledge level and ACT compliance. This finding is consistent with previous research showing that high levels of knowledge are associated with high levels of ACT compliance among healthcare professionals. From the study it was revealed that the level of knowledge was influenced by periodic training of OTC medicine sellers, availability of reference materials, the media, level of education, professional qualification, number of years of experience, road network and area of residence.

5.2 Factors associated with level of knowledge

5.2.1 Socio-demographic factors

Age, gender, marital status showed no association with the level of knowledge in the Ho Municipal District. Area of residence, nonavailability of resources and road network have been reported as some main factors influencing the level of knowledge (Alhumaid et al., 2021).

5.2.2 Individual factors

Individual factors like highest level of education, professional qualification and number of years work experience in the OTC medicine settings have effect on level of knowledge on ACTs when it come to the management of malaria. Individuals with high level of education who are able to read and write find it easier to read instructions produced in reference materials on ACTs.

These finding support that of (Ireye et al., 2019) who indicated that the high qualifications of health workers allows them to communicate better to patients when it comes to treatment.

5.2.3 Organizational factors

Raising awareness and sensitizing people to the necessity and proper methods of carrying out specific activities can be achieved through training. It provides a roadmap or guide that people can use to complete tasks, therefore it usually works well to increase the level knowledge since it provides responders with sufficient information about guidelines in the treatment of malaria with the ACTs. As opined by (Atack & Luke, 2008; Tamang et al., 2020) participants who received training on the management of malaria with the ACTs had adequate knowledge and engaged in appropriate practices in the treatment of malaria.

5.3 Study implications

The results of this study will have a significant influence on stakeholders in conducting workshops and educational programs on the management of malaria especially on ACTs. It is always important to capitalize on factors that have a strong correlation with increasing the level of knowledge on the ACTs in the management of malaria in order to prevent resistance in future. The above statement was confirmed by (Addai-mensah, 2017) who revealed that over-the-counter drug vendors would greatly benefit from periodic malaria training that emphasizes efficient diagnosis and treatment. This would increase their understanding of malaria management and aid in the fight against malaria in communities. Regulatory organizations like the Food and Drug Authority and the Pharmacy Council need to take these findings into consideration in order to make sure that OTC drug vendors get regular training on the ACTs, therefore raising their level of knowledge about the treatment of malaria.

The study reported a greater portion of study participants knew about different brand of ACT (62.0%), knew ACTs are sold over the counter (92.4%), asked elapsed time since patient took ACT (93.6%), ask how often patient takes ACT (88.3%), label ACT in an indelible ink (78.4%) and ask patient reason for purchasing ACT (89.5%). This highlights the importance of training programs organized by stakeholders like pharmacy council and other public campaigns by national malaria elimination program (NMEP).

This study will also provide researchers the reason to find out more about the about the level of knowledge of OTC medicine sellers concerning the ACTs in the management of malaria since research in this area is lacking.

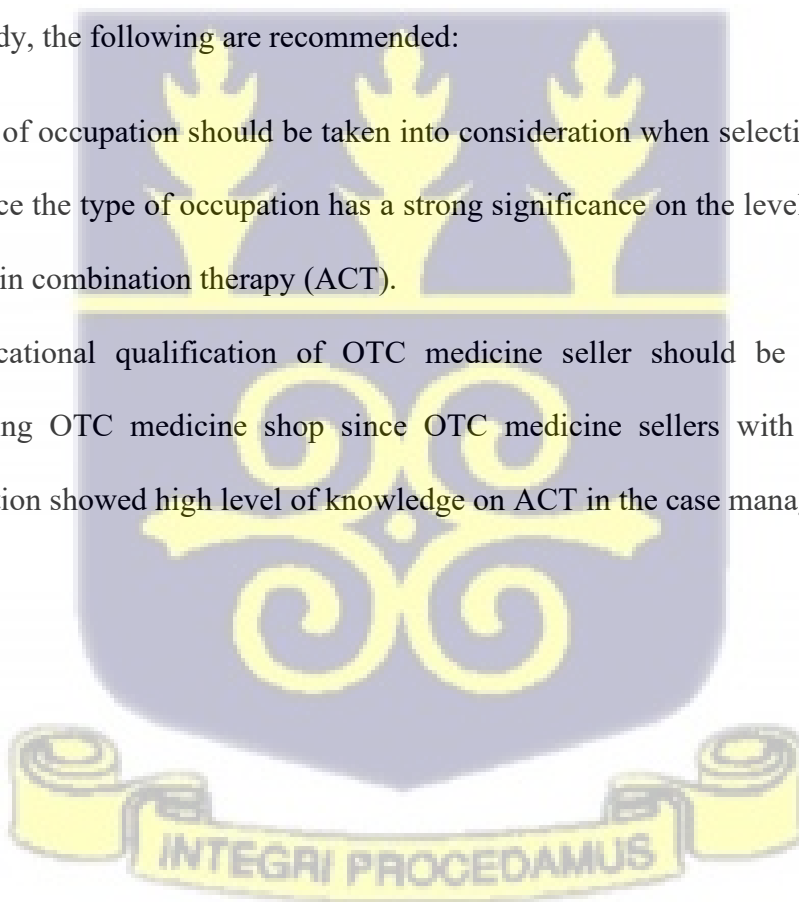
5.4 Study limitations

The questionnaire could have been interpreted subjectively because it was an online form.

6.0 CONCLUSION AND RECOMMENDATION

This study sought to assess the level of knowledge of OTC medicine sellers on artemisinin combination therapy (ACT) in Ho Municipal District. In conclusion, the level of knowledge of OTC medicine sellers on artemisinin combination therapy (ACT) was high (81%). Factors that showed significant association with level of knowledge on artemisinin combination therapy (ACT) were educational qualification and the type of occupation of OTC medicine sellers. Following the results of the study, the following are recommended:

1. The type of occupation should be taken into consideration when selecting OTC medicine seller since the type of occupation has a strong significance on the level of knowledge on artemisinin combination therapy (ACT).
2. The educational qualification of OTC medicine seller should be considered when establishing OTC medicine shop since OTC medicine sellers with high educational qualification showed high level of knowledge on ACT in the case management of malaria



REFERENCES

- Abdi, A., Faraji, A., Dehghan, F., and Khatony, A. (2018). Prevalence of SelfMedication Practice Among Health Sciences Students in Kermanshah, Iran. BMC Pharmacol. Toxicol; 19 (1), 36. doi:10.1186/s40360-018-0231-4
- Addai-mensah, O. (2017). Malaria control : Knowledge and Practice among Over-the-Counter Medicine Sellers in the Pru , Sene and Atebubu-Amantin Districts , Brong Ahafo Region , Malaria control : Knowledge and Practice among Over-the-Counter Medicine Sellers in the Pru , Sene and January.
- Agblevor, E., Missodey, M., Baxerres, C., and Arhinful, D., (2016). Drugstores, self-medication and public health delivery: assessing the role of a major health actor in Ghana: Assessing the Role of a Major Health Actor in Ghana. Pp:202–209.
- Aguwa, C.N, Ukwe,, C.V, and Ekwunife, O.I. (2008). Effect of pharmaceutical care programme on blood pressure and quality of life in a Nigerian pharmacy. Pharm World Sci: 30(1):107–10.
- Agyapong, I. A., (2005). “Malaria. Ethnomedical Perceptions and Practice in Adangbe Farming community and implications for control” in Social Science and Medicine, p35.

- Agyapong. I. A. and Kangeya-Kayonda. J. (2004). ‘Providing Practical Estimates of Malaria Burden for Health Planners in Resource—Poor Countries’, in American Journal of Tropical medicine and Hygiene, pp.162-7.
- Ahmad, A, Khan, M.U, Srikanth, A.B, Kumar, B., Singh, N.K, Trivedi N, and Patel I. (2015). Evaluation of knowledge, attitude and practice about self-medication among rural and urban north Indian population. International Journal of Pharmaceutical and Clinical Research, 7(5):326–332.
- Amedoe, E., (1998). “Background of the Volta Region”, in Ghana Health Service Regional Report, p6.
- Amponsah, A. O., Vosper, H., and Marfo, A. F. A., (2015) “Patient related factors affecting adherence to antimalarial medication in an urban estate in Ghana,” Malaria Research and Treatment, vol. 8
- Apawu. M. et al., (2004). “Malaria Transmission Dynamics At A Site In Northern Ghana Proposed For Testing Malaria Vaccine” in Tropical Medicine for International Health. pp.160-70.
- Arrais, P. S., Fernandes, M. E., Pizzol, T. D., Ramos, L. R., Mengue, S. S., and Luiza, V. L., (2016). Prevalence of Self-Medication in Brazil and Associated Factors. Revista de saude publica 50 (Suppl. 2), 13s. doi:10.1590/s1518-8787.2016050006117
- Asenso-Okyere. W.K., (1994). “Socioeconomic Factors”, In Malaria Control”, World Health Organization Forum, pp. 265-8.
- Asseray, N., Ballereau, F., Trombert-Paviot, B., Bouget, J., Foucher, N., and Renaud, B.,(2013). Frequency and Severity of Adverse Drug Reactions Due to SelfMedication: a Cross-

- Sectional Multicentre Survey in Emergency Departments. *Drug Saf.*: 36 (12), 1159–1168.
doi:10.1007/s40264-013-0114-y
- Attanayake N, and Siyambalagoda, L. (2003). An inquiry into the regulation of pharmaceuticals and medical practice in Sri Lanka. London: Health Economics and Financing Program (HEFP) working paper 05–03.
- Balbuena, F. R., Aranda, A. B., and Figueras, A. (2009). Self-Medication in Older Urban Mexicans. *Drugs & Aging* 26 (1), 51–60. doi:10.2165/0002512- 200926010-00004.
- Banek, K, Lalani, M., Staedke, G.S., and Chandramohan, D. (2014) “Adherence to artemisinin-based combination therapy for the treatment of malaria: a systematic review of the evidence,” *Malaria Journal*, vol. 13, no. 1, article 7.
- Battersby A, Goodman C, Abondo C, and Mandike R., (2003). Improving the supply distribution and use of antimalarial drugs by the private sector in Tanzania. Report prepared for the National Malaria Control Programme, United Republic of Tanzania.
- Belachew, G. G, Alemayehu, G.D., Fikadu, B. D, Hadgu, B. A., Ghezu, H. M, Solomon, H. G., Abebe, K. Z. (2011). Self-Medication Practices among Health Sciences Students: The Case of Mekelle University. *Journal of Applied Pharmaceutical Science*, (1):183–189.
- Bosman, A., and Mendis, K. N., (2007) “A major transition in malaria treatment: the adoption and deployment of artemisinin-based combination therapies,” *American Journal of Tropical Medicine and Hygiene*, vol. 77, supplement 6, pp. 193–197
- Brieger, W.U.A, Greer, G, and Meek S., (2005). Interventions to Improve the Role of Medicine Sellers in Malaria Case Management for Children in Africa. The Malaria Consortium and

BASICS for the United States Agency for International Development; prepared for Roll Back Malaria's Sub-group for Communication and Training and Malaria Case Management Working Group.

Bruce-Chwatt, L. J. (1967). Malaria in Africa. *British Medical Journal*, 2(5547), 311. <https://doi.org/10.1136/bmj.2.5547.311-a>

Cabe, A. (2009). Private sector pharmaceutical supply and distribution chains: Ghana, Mali and Malawi.

Chuc, N.T., Larsson M., Falkenberg T., Do, N.T, Binh, N.T, Tomson, G.B., (2001). Management of childhood acute respiratory infections at private pharmacies in Vietnam. *Ann Pharmacother*. 35(10):1283–8.

Chuks J. Mba¹ and Irene K. Aboh². (2005). Prevalence and Management of Malaria in Ghana: A Case Study of Volta Region Chuks J. Mba ¹ and Irene K. Aboh ². *American Journal of Tropical Medicine and Hygiene*, 22 n° 1, pp.1-15.

Coene.J., (1991). “Prospects for Malaria Control in Urban and Rural Kinshasa”, *Ann Soc Belg Med Trop*, p71.

Eickhoff, C., Hämmerlein, A., Griese, N., and Schulz, M. (2012). Nature and Frequency of Drug-Related Problems in Self-Medication (Over-the-counter Drugs) in Daily Community Pharmacy Practice in Germany. *Pharmaco-epidemiol. Drug Saf.* 21 (3), 254–260. doi:10.1002/pds.2241

- Food and Drug Administration, U.S. (2018). Understanding Over-the-counter Medicines. Date accessed: Oct 24, 2022. Available from: <https://www.fda.gov/drugs/buying-using-medicinesafely/understanding-over-counter-medicines>.
- Foster, S., (1995). Treatment of malaria outside the formal health services. *J Trop Med Hyg.* 98(1):29–34.
- Frempong, B. K., Anthony, A., Nina, D., and Kwadwo, O. A, (2021). Regulatory compliance among over-the-counter medicine sellers’ facilities within the Upper East Region of Ghana, In *Journal of Pharm Policy and Pract.* 14:72. Pp 1-14
- Ghana Social Marketing Foundation, (1999). Public-Commercial Partnership for the Sustainable Marketing of ITNs in Ghana, GSMF-Ghana.
- Goodman, C., Kachur, SP, Abdulla, S., Bloland, P., and Mills, A., (2007). Drug shop regulation and malaria treatment in Tanzania—why do shops break the rules, and does it matter? *Health Policy Plan.* 22(6):393–403.
- Goodman, C.A., (2004). An economic analysis of the retail market for fever and malaria treatment in rural Tanzania. In: *PhD Thesis. Department of Public Health and Policy, London School of Hygiene and Tropical Medicine.*
- Håkonsen, H., Sundell, K. A., Martinsson, J., and Hedenrud, T. (2016). Consumer Preferences for Over-the-counter Drug Retailers in the Reregulated Swedish Pharmacy Market. *Health Policy* 120 (3), 327–333. doi: 10.1016/j.healthpol.2016.01.016
- Hanson, K., and Berman, P., (1998). Private health care provision in developing countries: a preliminary analysis of levels and composition. *Health Policy Plan*; 13(3):195–211.

- Health Professions Regulatory Bodies Act, (2013), (Act 857) Part four. Date accessed: 24th October, 2022. From: <https://www.pcghana.org/wp-content/uploads/2017/02/Health-Professions-Regulatory-Bodies-Act.pdf>.
- Helal, R. M., and Abou-ElWafa, H. S. (2017). Self-Medication in University Students from the City of Mansoura, Egypt. *J. Environ. Public Health* 2017, 9145193. doi:10.1155/2017/9145193
- Hughes, C. M., McElnay, J. C., and Fleming, G. F. (2001). Benefits and Risks of Self Medication. *Drug Saf.* 24 (14), 1027–1037. doi:10.2165/00002018-200124140-00002
- International Artemisinin Study Group, (2004) “Artesunate combinations for treatment of malaria: meta-analysis,” *The Lancet*, vol. 363, no. 9402, pp. 9–17
- Jacobs, B, Whitworth J, Kambugu, F., and Pool, R., (2004). Sexually transmitted disease management in Uganda’s private-for-profit formal and informal sector and compliance with treatment. *Sex Transm Dis.* 31(11):650–4.
- Kassie, A. D., Bifftu, B. B., and Mekonnen, H. S. (2018). Self-medication Practice and Associated Factors Among Adult Household Members in Meket District, Northeast Ethiopia, 2017. *BMC Pharmacol. Toxicol.* 19 (1), 15. doi:10.1186/s40360-018-0205-6
- Kasulkar, A., and Gupta, M. (2015). Self-Medication Practices Among Medical Students of a Private Institute. *Indian J. Pharm. Sci.* 77 (2), 178–182. doi:10.4103/0250-474x.156569
- Khalil, N. (2016). Medical Students' Knowledge and Attitudes towards Self-Medication in Al-Iraqia University, Baghdad, Iraq. *British Journal of Medicine and Medical Research*, 12(8): 1–9.

- Lei, X., Jiang, H., Liu, C., Ferrier, A., and Mugavin, J. (2018). Self-Medication Practice and Associated Factors Among Residents in Wuhan, China. *Int. J. Environ. Res. Public Health* 15 (1). doi:10.3390/ijerph15010068
- Loyola, F. A. I, Lima-Costa, M.F, Uchoa, E. (2004). Bambui Project: A qualitative approach to self-medication. *Cadernos de Saude Publica*, 20(6):1661–1669.
- Mayhew S, Nzambi K, Pépin J, and Adjei S., (2001). Pharmacists' role in managing sexually transmitted infections: policy issues and options for Ghana. *Health Policy Plan*;16(2):152–60.
- Mensah, O. and Kumaranyake. L., (2004). 'Malaria Incidence in Rural Benin: Does Economic Matter' in *Benin Health Policy*. pp.92-102.
- Mutabingwa, K.T, (2005). "Artemisinin-based combination therapies (ACTs): best hope for malaria treatment but inaccessible to the needy," *Acta Tropica*, vol. 95, no. 3, pp. 305–315.
- Nonvignon, J., Aryeetey, G. C., Malm, K. L., Agyemang, S. A., Aubyn, V. N. A., Peprah, N. Y., Bart-Plange, C. N., and Aikins, M. (2016). Economic burden of malaria on businesses in Ghana: A case for private sector investment in malaria control. *Malaria Journal*, 15(1), 1–10. <https://doi.org/10.1186/s12936-016-1506-0>
- Ntambwe, M., Luwombo, I., and Djurna, O. (1994) Who sells drugs in rural Zaire: World Health Forum. 15(1):62–3.
- Ojuawo, A., and Oyaniyi, O.T. (1993). Treatment of diarrhoea by proprietary-medicine vendors. *Niger J Paediatr*. 20(2):41–4.

- Oliveira, A. V. C. d., Rocha, F. T. R., and Abreu, S. R. d. O. (2014). Acute Liver Failure and Self-Medication. *Abcd, Arq. Bras. Cir. Dig.* 27 (4), 294–297. doi:10.1590/s0102-67202014000400016
- Paulos, C.P, Nygren CE, Celedon C, and Carcamo, C.A.,(2005). Impact of a pharmaceutical care program in a community pharmacy on patients with dyslipidemia. *Ann Pharmacother*;39(5):939–43.
- Porter G, Grills N. 2016. Medication misuse in India: A major public health issue in India. *Journal of Public Health (United Kingdom)*, 38(2):e150–e157.
- Prado, M. A. M. B. d., Francisco, P. M. S. B., Bastos, T. F., and Barros, M. B. d. A. (2016). Uso de medicamentos prescritos e automedicação em homens. *Rev. Bras. Epidemiol.* 19 (3), 594–608. doi:10.1590/1980-5497201600030010
- Ross-Degnan, D. Soumerai, S.B, Goel, P.K, Bates, J. Makhulo, J., Dondi, N. Sutoto, Adi D, Ferraz-Tabor L, and Hogan, R (1996). The impact of face-to-face educational outreach on diarrhoea treatment in pharmacies. *Health Policy Plan*;11(3):308–18.
- Ruiz, M. (2010). Risks of Self-Medication Practices. *Cds* 5 (4), 315–323. doi:10.2174/157488610792245966.
- Saradamma, R.D, Higginbotham, N, and Nichter, M., (2000). Social factors influencing the acquisition of antibiotics without prescription in Kerala State, South India. *Soc Sci Med*;50(6):891–903
- Sarahroodi, S. (2012). Self-medication: Risks and Benefits. *Int. J. Pharmacol.* 8 (1), 58–59

- Sarahroodi, S., Arzi, A., Sawalha, A. F., and Ashtarinezhad, A. (2010). Antibiotics self-medication among southern Iranian university students. *International Journal of Pharmacology*, 6(1):48–52.
- Sharma. S. K., Pradham. P., and Pradhi. D. M., (2001). ‘Socioeconomic Factors Associated with Malaria in a Tribal Area of Orissa, India’ in *Indian Journal of Public Health*, pp93-98
- Siddique, S., and Kumar, S. (2019). The Greater Mekong Subregion. *The 2nd ASEAN Reader*, 117–122. <https://doi.org/10.1355/9789812305299-028>
- Smith, E. Brugha, R., and Zwi, A., (2001). Working with private sector providers for better health care: an introductory guide: London Options and London School of Tropical Medicine London, UK
- Smith, F., (2009). The quality of private pharmacy services in low and middle-income countries: a systematic review. *Pharm World Sci*;31(3):351–61.
- Stenson, B, Syhakhang, L, Eriksson, B, and Tomson, G., (2001). Real world pharmacy: assessing the quality of private pharmacy practice in the Lao People’s Democratic Republic. *Soc Sci Med.*;52(3):393–404
- Tanzanian National Bureau of Statistics, (2001). Household Budget Survey, <http://www.nbs.go.tz/tnada/index.php/ddibrowser/1>.
- Tesfamariam, S., Anand, I. S., Kaleab, G., Berhane, S., Woldai, B., and Habte, E., (2019). Self-medication with over-the-Counter Drugs, Prevalence of Risky Practice and its Associated Factors in Pharmacy Outlets of Asmara, Eritrea. *BMC Public Health* 19 (1), 159. doi:10.1186/s12889-019-6470-5

- Tren, R. Bate, R., Hess K, Ayodele, T., and Cudjoe., F (2011): The global fund's malaria medicine subsidy: a nice idea with nasty implications. Africa Fighting Malaria Policy Paper.
- Van, Der Geest S. (1987). Self-care and the informal sale of drugs in South Cameroon. Soc Sci Med.;25(3):293–305.
- Wafula, F.P.N (2012). Understanding the operation and regulation of specialized drug shops in Kenya. London: Open University (Milton Keynes) and Department of Public Health and Policy, London School of Hygiene and Tropical Medicine.
- Watkins, R. R., and Bonomo, R. A. (2016). Overview: Global and Local Impact of Antibiotic Resistance. Infect. Dis. Clin. North America 30 (2), 313–322. doi: 10.1016/j.idc.2016.02.001
- Whegang, S.Y., Tahar, R., and Foumane, V.N., (2010) “Efficacy of non-artemisinin- and artemisinin-based combination therapies for uncomplicated falciparum malaria in Cameroon,” Malaria Journal, vol. 9, no. 1, article 56.
- Whitty. C. J. and Allan. R., (2004). ‘Averting a Malaria Disaster in Africa – Where does the Buck-up Stop’ in the Bulletin of the World Health Organisation, pp.381- 4.
- WHO Guidelines for the regulatory assessment of medicinal products for use in self-medication (2000). WHO Drug Information, 14(1):18–26.
- WHO, (2017). “Artemisinin and artemisinin-based combination therapy resistance. Global Malaria Programme,”. Date accessed: 25th October, 2022. From: <https://www.apps.who.int/iris/bitstream/10665/255213/1/WHO-HTM-GMP2017.9-eng.pdf>

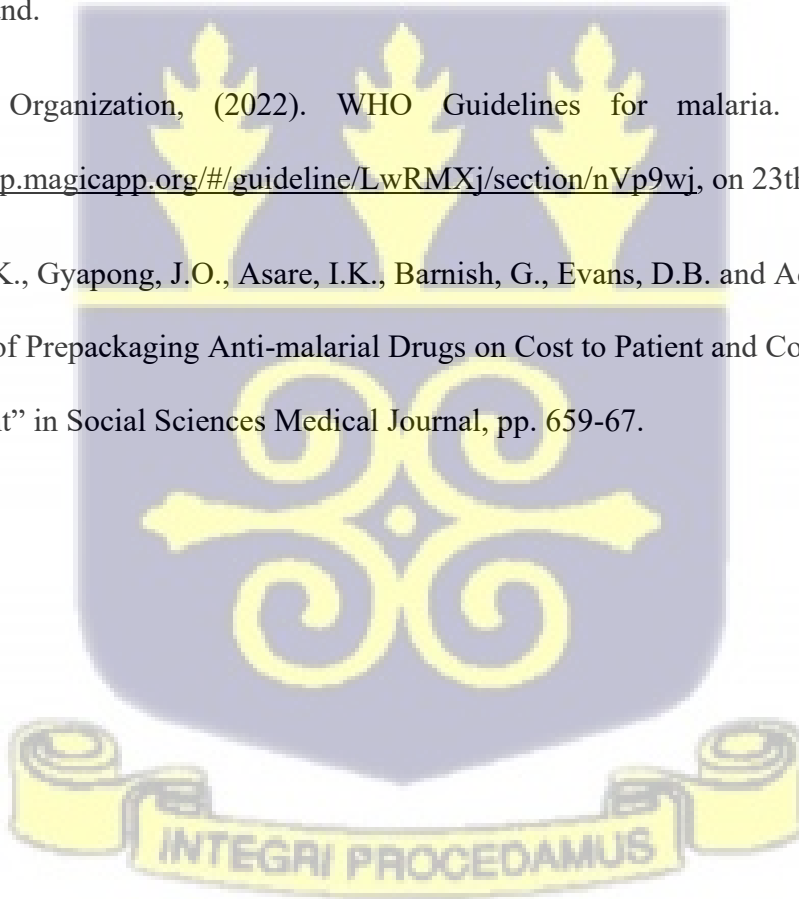
Williams, H.A, and Jones, C.O., (2004). A critical review of behavioral issues related to malaria control in sub-Saharan Africa: what contributions have social scientists made? Soc Sci Med;59(3):501–23

World Health Organisation. (2018). Artemisinin resistance and artemisinin-based combination therapy efficacy, Global Malaria programme, August 2018 Status Report. 2018(December).

World Health Organization, (2001) “Antimalarial drug combination therapy. Report of a WHO technical consultation,” WHO/CDS/ RBM 2001.35, World Health Organization, Geneva, Switzerland.

World Health Organization, (2022). WHO Guidelines for malaria. Accessed from: <https://app.magicapp.org/#/guideline/LwRMXj/section/nVp9wj>, on 23th Oct, 2022.

Yeboah-Antwi. K., Gyapong, J.O., Asare, I.K., Barnish, G., Evans, D.B. and Adjei, S., (1997). “Impact of Prepackaging Anti-malarial Drugs on Cost to Patient and Compliance with Treatment” in Social Sciences Medical Journal, pp. 659-67.



APPENDIX I

PARTICIPANTS INFORMATION SHEET

Title of study:

Assessment of over-the-counter medicine sellers' knowledge on Artemisinin-based combination therapy in Ho municipal district, Volta region, Ghana

Introduction:

My name is Frederick Owusu-Mensah, a pharmacist and student at School of Public Health, University of Ghana, Legon. I can be reached on 0206914586, through email on owusumenshfederick@gmail.com and my postal address is C/O Georgina Akuoku, PMB KA 36, Airport, Accra

Background and Purpose of research:

Artemisinin-based Combination Therapy (ACT) is the first-line therapy recommended by the World Health Organization (WHO) for the Management of uncomplicated malaria. However, malaria treatment received from the OTC medicine shops often do not comply with the national Antimalarial drug treatment guidelines which sometimes leads to cerebral malaria and severe anemia. This study seeks to assess the knowledge level of Over-The-Counter (OTC) medicine Sellers on the Artemisinin-Based Combination Therapies (ACTs) in Ho Municipal District, Volta Region, Ghana.

Nature of research:

This study is interested in assessing the knowledge of Over-The-Counter Medicine Sellers on Artemisinin-based Combination therapy (ACT) and the factors that may influence their knowledge on the ACT. The study will include Over-The-Counter Medicine Practitioners including MCAs and other support staff within the Ho Municipal District.

Participants involvement:

- **Duration /what is involved:** data collection during this study will be in April. You are expected to fill out questionnaires that will be read out by researcher. Filling out the questionnaire is to last not more than 15 minutes.
- **Potential Risks:** there is no anticipated risk of discomfort, emotional upset, psychological or adverse event to you. However, you have the right to withdraw in case of the occurrence of any of the above mentioned.
- **Benefits:** this study will give more understanding on the ACT and factors that influence their knowledge on the ACT. Based on the findings, training programs on the

ACT can be made for the Over-The-Counter (OTC) practitioners to ensure adequate and quality information is passed on to patients who seek treatment of uncomplicated malaria in OTC shops.

- **Costs:** there will be no cost incurred by you for participation in this study.
- **Compensation:** there will be no compensation for participation in this study.
- **Confidentiality:** your identity will be coded during data collection and analysis and under no circumstance will your real identity be made reference to during this study or in future.
- **Voluntary participation/withdrawal:** participation in this study is solely voluntary. You have the right to decline or withdraw even after initial consent at any point during this study and do not have to give reasons to the researcher.
- **Outcome and Feedback:** all data collected will be safely kept during and after analysis. The data collected during this study will be stored such that it will be impossible for any third party to have access to them apart from the principal investigator, and members of the Ghana Health Service Ethics Review Committee based upon request.
- **Feedback to participants:** findings from this study will not be communicated to you.

However, you are at liberty to request for findings from the principal investigator.

- **Funding information:** this study is solely funded by the principal investigator.
- **Sharing of participants Information/Data:** data collected during this study belongs solely to the principal investigator.
- **Provision of Information and Consent for participants:** you will be given a copy of this information sheet and the consent form after signing to keep.

Who to Contact for Further Clarification/Questions:

1. Frederick Owusu-Mensah

Department of Epidemiology and Disease Control

School of Public Health, University of Ghana.

0206914586/ owusumensahfrederick@gmail.com

2. Nana Abena Apatu,

Administrator, Ghana Health Service Ethics Review Committee

0503539896/ ethics.research@ghs.gov.gh

(Further clarification on ethical issues and rights of participants)



APPENDIX II

CONSENT FORM

STUDY TITLE:

Assessment of over-the-counter medicine sellers' knowledge on Artemisinin-based Combination Therapy (ACT) in Ho Municipal District, Volta Region, Ghana

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand (English/Twi). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name of Participant.....

Participants' SignatureOR Thumb Print.....

Date.....

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (English/Twi) language to his proper understanding.

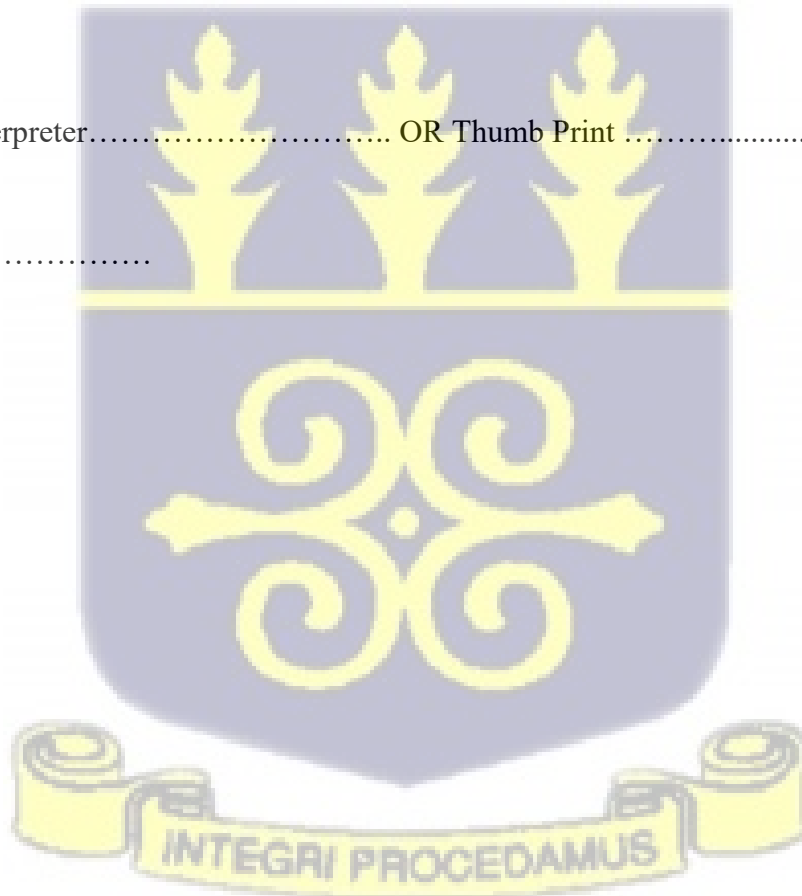
All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter.....

Signature of Interpreter..... OR Thumb Print

Date:

Contact Details



STATEMENT OF WITNESS

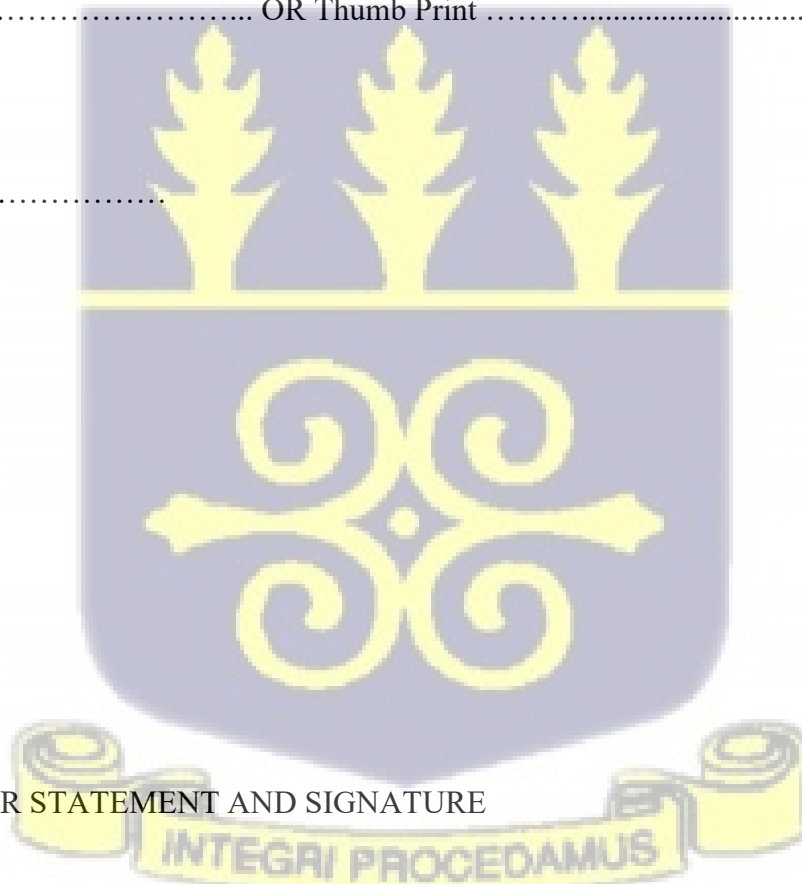
I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (English/Twi)

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name.....

Signature..... OR Thumb Print

Date.....



I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name:

Signature

Date.....



APPENDIX III

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

*In case of reply the
number and date of this
Letter should be quoted.*



Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Digital Address: GA-050-3303
Mob: +233-50-3539896
Tel: +233-302-681109
Email: ethics.research@ghs.gov.gh
16th May, 2023

My Ref. GHS/RDD/ERC/Admin/App/23/261
Your Ref. No.

Frederick Owusu-Mensah
C/O Georgina Akuoku
PMB KA 36
Airport, Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	GHS-ERC: 047/04/23
Study Title	Assessment of Over-The-Counter Medicine Sellers' Knowledge on Artemisinin-Based Combination Therapy in Ho Municipal District, Volta Region, Ghana
Approval Date	16 th May, 2023
Expiry Date	15 th May, 2024
GHS-ERC Decision	Approved

This approval requires the following from the Principal Investigator

- Submission of a yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why.
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

You are kindly advised to adhere to the national guidelines or protocols on the prevention of COVID -19

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....

Dr. Naa-Korkor Allotey
(Ag. Head, Ethics & Research Management Department)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

APPENDIX IV

INTERVIEWER- ADMINISTERED QUESTIONNAIRE

Study title: Assessment of over-the-counter medicine sellers' knowledge on artemisinin-based combination therapy (act) in Ho Municipal District, Volta Region, Ghana

A. SOCIO-DEMOGRAPHIC AND INDIVIDUAL CHARACTERISTICS OF RESPONDENT

Questionnaire number.....	Respondent code.....
Date	

NO	QUESTION	RESPONSE	CODE
Q1	How old were you on your last birthday?	Age in completed years.....	
Q2	Sex	Male [] Female []	0 1

Q3	What is your highest level of education?	No formal education [] Junior High School [] Secondary [] Diploma [] Bachelor's [] Master's []	0 1 2 3 4 5
Q4	What is your professional qualification?	None [] Medicine counter assistant [] Other []	0 1 2
		specify.....	
Q5	Number of years of professional practice?	Less than 2 [] 2 to 5 years [] 5 to 10 years [] More than 10 years []	0 1 2 3
Q6	What is your marital status?	Married [] Single [] Divorced [] Widowed [] Cohabitation []	0 1 2 3 4

Q7	What is your religious affiliation?	None [] 0 Christian [] 1 Muslim [] 2 Traditionalist [] 3 Others religious affiliation [] 4 Specify
Q8	What is the road network on the area	Tarred 0 Untarred 1

B. ARTEMESININ-BASED COMBINATION THERAPY (ACT) AVAILABILITY

READ TO RESPONDENT: kindly answer the following questions with regards to the availability of ACT.

How long has the shop been in operation?
How many hours do the shop operate?

NO	QUESTION	ANSWER	CODE
Q1	Has your pharmacy ever stocked any ACT?	Yes [] No []	0 1
Q2	Do you currently have stock of any ACT as at the time of this interview?	Yes [] No []	0 1

Q3	Which type of ACT do you stock? (can be more than one)	Artemether+ Lumefantrine [] (eg Lonart) Dihydroartemisinin + Piperaquine [] (eg P-Alaxin) Artesunate + Amodiaquine []	0 1 2
Q4	Which of the types of ACT do patients mostly purchase?	Artemether+ Lumefantrine [] (eg Lonart) Dihydroartemisinin+ Piperaquine [] (eg P-Alaxin) Artesunate + Amodiaquine []	0 1 2
Q5	How many brands of the most purchased ACT (answer to Q4) do you stock?	1 [] 2 [] 3 [] More than 3 []	0 1 2 3
Q6	What is the reason for the most purchased brand?	Cost [] Popularity [] Side effects profile []	0 1 2
Q7	Do you have a separate space/ area for counseling on how the ACT should be taken?	Yes [] No []	0 1

C. ATTITUDES OF PARTICIPANTS TOWARDS ACT

READ TO RESPONDENT: I would like to read out some statements. Kindly indicate your stand; whether you strongly agree, agree, disagree or strongly disagree with these statements regarding ACT and its use.

NO	STATEMENT	RESPONSE	CODE
N1	ACT should be sold on prescription only	Strongly agree [] Agree [] Neutral [] Disagree [] Strongly disagree []	0 1 2 3 4
N2	ACT should be sold to patients after testing positive for malaria infection	Strongly agree [] Agree [] Neutral [] Disagree [] Strongly disagree []	0 1 2 3 4
N3	ACT should be sold to intended users only	Strongly agree [] Agree [] Neutral [] Disagree [] Strongly disagree []	0 1 2 3 4
N4	When supplying ACT, it is not the responsibility of the OTC practitioner to counsel on the dose of how to take the ACT	Strongly agree [] Agree [] Neutral [] Disagree [] Strongly disagree []	0 1 2 3 4

D. ACT DISPENSING PRACTICES

READ TO RESPONDENT: kindly indicate yes or no if you do the following while dispensing ACT. Questions will reflect three main dispensing practices; HISTORY TAKING, MEDICATION COUNSELING and POST DISPENSING ADVICE.

DISPENSING PRACTICE	QUESTION	RESPONSE	CODE
HISTORY TAKING	Q1. Do you ask patients the reason for requesting ACT?	Yes []	0
		No []	1
	Q2. Do you ask for the elapsed time since the patient took ACT?	Yes [] No []	0 1
MEDICATION COUNSELLING	Q3. Do you ask how often a patient takes ACT?	Yes []	0
		No []	1
	Q4. Do you verbally tell patients how to take ACT?	Yes [] No []	0 1
POST DISPENSING COUNSELLING	Q5. Do you label ACT in an indelible ink?	Yes []	0
		No []	1
	Q6. Do you tell patients possible side effects when they take ACT?	Yes [] No []	0 1
	Q7. Do you tell patients the contraindications when taking ACT?	Yes []	0
		No []	1
	Q8. Do you counsel patients on ACT options available?	Yes [] No []	0 1

	Q9. Do you ask patients for any questions or unclear information on ACT use?	Yes	[]	0
		No	[]	1

