PDF - EVALUATION OF THE EFFICACY OF THE CARESTART MALARIA HRP2 AND PLDH/HRP2 COMBO COMPARED TO MICROSCOPY IN THE DIAGNOSIS OF MALARIA - researchcub.info**CHAPTER ONE**

1.0 INTRODUCTION

Malaria is a life-threatening illness, that has continued to pose public health challenges. It affects millions of people all around the globe especially, in Africa, Asia and South America. Malaria is currently endemic in over 100 countries with 3 billion people at risk of infection and around 225 million cases in 2009, leading to approximately 781,000 deaths (WHO, 2010). Malaria has remained a major public health problem in Nigeria, and is responsible for 30% childhood and 11% maternal mortality (FMoH, 2005). It accounts for 300,000 deaths each year and about 60% of outpatient visits (President's Malaria Iniative, 2011). Together Nigeria, and the Democratic Republic of Congo account for over 40% the estimated total malaria burden and deaths globally (WHO, 2012). It is caused by the asexual form of the parasitic protozoan know as *Plasmodium.* The species incriminated are *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, and *Plasmodium ovale* which is found humans and *Plasmodium knowlesi* which found in non-humans. Among these parasites, *Plasmodium falciparum* and *Plasmodium vivax* are the most widespread and common causes of mixed-species malaria, which is defined as co-infection with more than one species or genotype of *Plasmodium* (Mayxay *et al.*, 2004).

Most cases of malaria are uncomplicated, commonly presenting with fever and sometimes with other non-specific symptoms including headache, and aches and pains elsewhere in the body (Gilles, 1991; WHO, 2003). Mtoni and Senosi (2007) noted that early diagnosis and treatment are key to addressing morbidity and mortality due to malaria. Proper management of malaria cases within the first 24 hours of onset is considered to be the best way to reduce its morbidity and mortality (Singh *et al.,* 2013). This would be adequately achieved if most of the patients have access to laboratory facilities (Kamugisha *et al.,* 2008). Most victims of malaria still die, because the disease is not diagnosed in time by health workers (Uzochukwu *et al.,* 2009). Microscopy is the gold standard for laboratory diagnosis of malaria in many developing countries, though expertise may be lacking in both endemic and non-endemic settings (Moody, 2002), especially in Nigeria. However, in situations lacking reliable microscopic diagnosis, rapid diagnostic tests (RDTs) may offer a useful alternative to microscopy (Nour *et al.,* 2009).

In general, RDTs are fast, easy to perform and relatively cheap (Lubell *et al.,* 2007). A lot of research and development has been going on to develop alternative methods for laboratory diagnosis of malaria. Rapid diagnostic tests have been developed, validated and field tested. It was introduced in the nineties, but has now undergone many improvements (Martha *et al.,* 2010). Malaria rapid diagnostic test plays a key role in malaria control and elimination programmes in order to avoid unnecessary anti-malarial therapy, to prevent drug resistance and to enhance case finding (Eibach *et al.,* 2013). The RDTs are based on the principle of immunochromatography, which require finger prick blood and detect malaria specific antigen. There are three different RDTs that are available commercially; one of them is specific for detecting *P. falcipraum* antigens, while the other two detects one or more of the three human malaria species. The RDTs provide quick results, are reliable, and require less skilled persons as compared to microscopic diagnosis. They do not require electricity or any equipment. It promotes patient's confidence as well as health services.

More than 60 RDT brands and over 200 different products have been developed. Of these, the WHO and Foundation for Innovative New Diagnostics (FIND) evaluated 70 from 26 manufacturers (WHO, 2008; 2009).

Of these products, 39 are three-band tests that detect and differentiate *P. falciparum* from non *falciparum* species (Martha *et al.,* 2010). The CareStart™ Malaria HRP-2/ pLDH (Pf/pan) Combo Test and the SD Bioline Ag pf/pan, HRP-2 and pan-pLDH are both a three-band RDT detecting HRP-2 and pan-pLDH. This present study is focused on evaluating the efficacy of two of the many RDTs; SD Bioline and CareStart™ Malaria kits using it microscopy test as the gold standard for the diagnosis of malaria.

SD Bioline (Ag pf/pan, Cassette, RDT, kit) is a one step differential diagnosis by detecting HRP-II antigen from *Plasmodium falciparum* and pLDH antigen from other species (*P. vivax, P. malariae, P. ovale*) in human whole blood. The CareStart (Combo, dev., RDT) is a test designed for the differential diagnosis between *Plasmodium falciparum* and other *Plasmodium* species such as *Plasmodium* vivax, *Plasmodium* ovale and *Plasmodium* malariae. Though, the gold standard for malaria testing remains microscopy, but the limitations associated with this technique could affect the speed of delivery of quality services to the patients (Ameh *et al.,* 2012).

1.1 Statement of the Problem

Microscopy has been in use for over 100 years and is inexpensive, rapid and relatively sensitive when used appropriately (Laveran, 1891). Microscopy is regarded as the 'gold standard' for malaria diagnosis (WHO, 1999). However, the lack of skilled scientists in medical facilities in affected areas often leads to poor interpretation of data. In addition, microscopy is time consuming, labour intensive, and cannot detect sequestered *P. falciparum* parasites (Leke *et al.,* 1999). It is less reliable at low-density parasitaemia that is, 50 parasites (ml blood) (Kilian *et al.,* 2000; Bell *et al.,* 2005). Even though microscopy is cheap, reliable and available on an instant base, it has limitations. For instance, in resource-limited centres, there are problems of equipment, training manpower, and workload, whereas in non-endemic countries, laboratory staff may lack sufficient exposure to malaria positive samples resulting in low expertise (Moody, 2002; Hanscheid, 2003).

In Nigeria, RDTs are still new to the people, and they are unsure of the efficacy, accuracy and authenticity. It has been 7 years since the launching of malaria RDTs in Nigeria but the populace know little or nothing about Malaria RDTs due to poor promoting from the part of manufacturers. In addition, the implementation of RDTs also faces many difficulties such as logistics; transport and continuous supply, limited shelf life and the need of proper storage rooms. RDTs are quickly affected by humidity and extreme temperatures (Wongsrichanalai *et al.,* 2007). They are not able to quantify parasitaemia and may give false positive results owing to the persistence of antigens that can remain in the circulation of a patient after treatment (Wongsrichanalai *et al.,* 2007).

1.2 Significance of the Study

The essence of continuous research and development is to find a way to improve the lives of people around the globe. Thus, finding an alternatively cheap, fast, convenient and effective way to diagnosis malaria is a key to control malaria. This study is therefore significant in many ways:

The finding of this study will be useful and helpful to the Federal and State Government with regard to malaria eradication in making decisions on implementation of RDTs for routine diagnosis in the Nigeria, especially in rural areas.

The findings of this study will provide an alternative, effective and reliable diagnosis of malaria patients in both those that are asymptomatic and symptomatic.

RDTs are fast, easy to perform and relatively cheap and can easily be used by both the trained and

untrained.

1.3 Research Questions

What is the efficacy of SD Bioline and Carestart when compared to microscopy?

Can RDTs such as SD Bioline and Carestart be alternative for the gold standard (microscopy) in the diagnosis of malaria.

1.4 Research Hypothesis

H_A: RDTs are more efficient in the detecting of malaria cases than microscopy

H_O: Microscopy is more efficient in defecting malaria than RDTs

1. Aims and Objectives of the Study

The aims and objectives of this study were to:

Evaluate the efficacy of the Carestart Malaria HRP2 and pLDH/HRP2 Combo compared to microscopy in the diagnosis of malaria.

Determine the sensitivity, specificity, positive and negative predictive values of the malaria RDTs to microscopy.

Determine the relationship between malaria parasite density and results of malaria RDTs.

Correlate results of negative malaria detection rate by microscopy to results of malaria RDTs.

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