AWARENESS AND UTILIZATION OF MALARIA RAPID DIAGNOSTIC TEST AMONG HEALTH WORKERS IN SELECTED LOCAL GOVERNMENTS IN IBADAN, OYO STATE.

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTERS OF PUBLIC HEALTH (MPH) DEGREE IN FIELD EPIDEMIOLOGY

FEBUARY, 2015.

CERTIFICATION

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DEDICATION

This work is dedicated to God almighty, to my lovely fiancé Dr Akindulureni Abimbola for his undying love and support and my parents and siblings.

ACKNOWLEDGEMENT

First and foremost, my thanks to Almighty God for his loving kindness to me at all times.

I sincerely appreciate my supervisors, the Ag. HOD- Dr. Olufunmilayo. I. Fawole and Dr. Fagbamigbe for their unflinching support throughout the period this study was executed.

I deeply appreciate my lecturers, Dr D.M Dairo, Dr Adedokun, Dr Adebowale, Dr Adeoye, Dr Akinyemi, Dr Salawu, Dr Ajayi who contributed to broadening my horizon in Epidemiology and Medical Statistics.

I want to appreciate my parents for their unflinching support through my MPH program.

My appreciation also goes to my fiancé, Dr Abimbola Akindulureni for his support and guidance which made this work possible. I say a big thank you.

Finally, many thanks to Mr. Ademola Ogunlabi; and my friends and colleagues – Banke Oloyede, Abiola Lawal, Bolu Aladeitan, Oluwakemi Arigbede, Toluwani Popoola, and Tayo Awere for their support and assistance.

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ACT:	Artemisinin-based Combination Therapy
CHO:	Community Health Officer
CHEW:	Community Health Extension Worker
HW:	Health workers
HRP-2:	Histidine –Rich Protein 2
IMCI:	Integrated Management of Childhood illness
ITG:	Integrated technical Guidelines for frontline Workers
MRDT:	Malaria rapid diagnostic test
MFI:	Malaria Foundation International
MOH:	Ministry of health
MRRDs:	Malaria rapid diagnostic devices
NMCC:	National Malaria Control Centre
NMCP:	National Malaria Control Programme
NPC:	National Population Census
P.falciparum:	Plasmodium faciparum
P.vivax:	Plasmodium vivax
PHC:	Primary Health Centres
PLDH:	Parasite Lactate Dehydrogenase
POC:	Point-of-care
QAP:	Quality Assurance Project
RBM:	Roll Back Malaria
SPSS	Statistical package for social science
WHA	World Health Assembly
WHO:	World Health Organization

ABSTRACT

Introduction: A key to the effective management of malaria is prompt and accurate diagnosis, and the use of malaria rapid diagnostic tests is becoming relevant in the absence of reliable microscopy. Developments of rapid diagnostic tests (RDTs) have opened new possibilities for improved remote malaria diagnosis that is independent of microscopic diagnosis. It is fundamental to effective management and control of malaria. Although a big step has been taken to equip community health workers with knowledge about malaria RDT programs, there is little evidence that studies have been conducted to assess their level of awareness and use of RDT. Hence, this study aims at determining awareness, utilization and factors influencing the utilization of RDT among health workers in Ibadan, Oyo State.

Methods: The study was a cross sectional survey which involves the use of a three stage sampling technique to select 333 health workers in three LGAs namely:-Ibadan north, Ibadan Northeast and Ibadan Southeast. A self-administered questionnaire was used to obtain information on socio-demographic characteristics, awareness, utilization, factors influencing the use and the pattern of use of RDT. The data was analyzed using SPSS version 20. Percentages, chi square and logistic regression at 5% level of significance were done in the analysis.

Results: The mean age of the respondents was 37.1 ± 8.3 years. Less than half of the health workers (42.9%) were between 30 and 39 years. Majority (80.8%), were females. 82.3% were married and majority were either community health officer (30.3%) or community health extension worker (34.5%). More than half (61.9%) of the respondents had been working in the health facility for less than 4 years.98.2% of the respondents were aware of Rapid Diagnostic Test (RDT) in the diagnosis of malaria. The most common source of information on RDT was from co-health workers (87.4%). Less than half of the respondents (39.8%) had good knowledge on RDT, nevertheless, there was a significant association between the level of knowledge and the use of RDT (p= 0.022). Greater proportion of those than uses RDT were community health workers and this shows a statistically significant association between use and designation p= 0.013). On bivarate analysis, level of knowledge, level of attitude, level of education, age group,

awareness, designation and inadequate staffing level were significantly associated with the use of RDT (P< 0.05). Logistic regression demonstrated that age group (OR= 5.9, 95% CI= 1.4-26.0), awareness (OR= 33.4, 95% CI= 3.9-278.7), Designation (OR= 7.1, 95% CI= 1.2-42.7) and Inadequate staffing level (OR= 5.8, 95% CI= 1.6-21.9) predicted the use of RDT.

Conclusion: For effective utilization of RDT, this study provides evidence that emphasis should be placed on training to broadening the health workers' knowledge on the use and benefits of RDT which also helps to increase the utilization rate of RDT in areas where microscopy is unavailable.

Keywords: RDT, Health workers, Awareness, Utilization

Word Count: 465

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Malaria remains a major cause of morbidity and mortality in tropical and subtropical regions of the world, despite decades of malaria control efforts. Over 90% of the world's malaria deaths occur in Sub-Saharan Africa, where the most severe form of the disease prevails, and making it the second-leading cause of death in the region after HIV/AIDS especially among children under the age of 5 year old (Roll Back Malaria, 2008). The poorest 20% of the world's population bears 58% of the malaria burden and receives the worst standard of care including the process of diagnosis (Breman, 2004).

Malaria still poses a serious public health problem and is particularly prevalent in developing countries. It is also a major cause of complications, including maternal death and low birth weight in pregnancy (Roll Back Malaria, 2008). Under five and pregnant women are at high risk of malaria due to immature and weakened immunity respectively (Habtai, Ghebremeskel, Mihreteab, Mufunda and Ghebremichael, 2008).

Early diagnosis and proper treatment are keys to addressing morbidity and mortality due to malaria. The development of Rapid Diagnostic Tests (RDTs) over the past decade has offered the potential for the extension of accurate diagnosis to remote and poorly resourced areas that are beyond the reach of high quality microscopy services. Rising drug costs and recognition of the inaccuracy of clinical diagnosis are increasing the demand for demonstration of parasitaemia prior to therapy (WHO, 2010). The high cost of artemisinin-based combination therapies (ACTs) compared to

that of previously recommended medicines had led countries in Asia and Latin America, where malaria transmission is low to strengthen parasite-based diagnostic facilities so that cost savings may be made by treating with ACTs only those individuals with a positive parasitological diagnosis. This has led to RDTs being deployed at the periphery of the health services, including at community level, and in the private sector (culled from national guidelines, WHO 2010).

Malaria RDTs are devices which work based on the detection of specific antigens (proteins) released from the parasitized erythrocytes. They are also called "dipsticks" or "malaria rapid diagnostic devices". They assist in the diagnosis of malaria by providing evidence of the presence of malaria parasites in human blood(Unicef,2007). Clinical diagnosis of malaria is sensitive but not specific. Over-diagnosis and subsequent over-treatment of patients as a result of clinical diagnosis can lead to increased drug pressure that may facilitate the development of drug resistance. This may also increase costs, particularly with the shift from inexpensive antimalarials (such as chloroquine [CQ] and sulphadoxine-pyrimethamine [SP]) to newer, more expensive drugs. It also exposes patients to the unnecessary risk of adverse events and, among some patients, leaves the real cause of illness untreated (WHO, 2010).

Guidelines have been developed by WHO on, performing the test, interpreting the results and acting on the results in order to set a minimum standard for utilization of RDTs (WHO, 2004c). The WHO further emphasized that health workers need to be motivated to perform RDTs as they have now been integrated in routine practice (WHO, 2003b). Supervision and training of health workers (HW) to the maximum utilization of malaria is well documented (WHO, 2004b). The National Malaria Control Center in collaboration with cooperating partners since 2007 have been

training health workers of various categories to enable them perform RDTs in order to increase RDT utilization level. (NMCC, 2007b). Also in 2010, RBC and TRAC Plus developed a guide that contains knowledge and practices to be held by community health workers on malaria prevention and management (RBC/TRAC Plus, 2010).

Studies done in Sub- Saharan African have shown that there are a number of factors that are linked to underutilization of RDTs. Reducing or elimination factors that influence underutilization of RDTs in Ibadan would increase utilization of RDTs and consequently manage malaria effectively to reduce mortality and morbidity of malaria and other diseases. It is therefore necessary to explore the factors influencing the utilization of RDTs (Moonasar et al, 2007).

1.2 Problem Statement

Malaria is one of the most important parasitic diseases of mankind, causing almost 5 billion clinical episodes in endemic countries annually, with more than 90% of this burden occurring in sub-Saharan Africa (Berman, 2004). It is estimated that 3.3 billion people worldwide are at risk of malaria (WHO, 2011a). In 2010, the World Health Organization (WHO) reported 216 million malaria cases with an estimated 655,000 deaths, principally among children (WHO, 2011a). The high morbidity and mortality are attributed to the development of resistance of the parasite to antimalarial drugs and of the mosquito vector to currently available insecticides. The 2005 World Health Assembly (WHA) specified that malaria cases and deaths per capital should be

reduced by greater than or equal to 50% between 2000 and 2010, and by greater than or equal to 75% between 2005 and 2015 (WHO, 2008).

Malaria cases form important reservoirs for transmission and managing them effectively is critical. Microscopy remains the most established and widely used technique in confirming blood parasitaemia, however, the lack of microscopic examination in most health facilities means that health workers have to rely on clinical suspicion to treat malaria (Font et al, 2001).

It must be noted that the problem of underutilization of MRDT's for malaria diagnosis is nationwide (Egwang, 2007). At the moment, Nigeria has not profiled the challenges of malaria RDT; it is not known if availability or use of guidelines is a factor in performing a test or whether it has to do with the health worker's attitude. This leaves researchers to speculate whether inadequate supervision, inadequate staffing and very limited training on the use of RDT at the Primary Health Care level, may be the factors affecting utilization.

The diagnosis and treatment of malaria within 24 hours of the onset of symptoms is a principal objective in the management of malaria and specified that malaria control largely relies on the diagnosis and prompt treatment of confirmed cases through the health care facilities (Font et al, 2001). Thus this study is aimed at investigating the awareness and use of malaria RDT among health workers.

1.3 Justification

Though a big step has been taken to equip community health workers with knowledge about malaria prevention and control programs, there is a paucity of studies in addressing their awareness and utilization for RDT use. It would also be of interest to find out how comprehensive their roles are with respect to malaria diagnosing and management.

A study done in Zambia in 104 health facilities randomly selected in four (4) districts revealed that of the patients with fever (suspected malaria) treated in health facilities for malaria, only 27.8% were subjected to malaria diagnosis and 44.6% had positive test results. RDTs have a place as an alternative to diagnosis based on clinical grounds or microscopy in some situations, particularly where good quality microscopy services cannot be readily provided (Hamer et al, 2007).

A study done in Zambia (Baboo et al. 2008) demonstrated MRDTs having sensitivity of 96.1%. A similar study in Uganda (Guthmann et al. 2002) and another study done in India (Singh et al 2005) showed specificity and sensitivity of MRDTs of above 90%. This indicates that there is a great opportunity to achieve the above mentioned target in Nigeria if MRDTs are used as a major malaria diagnostic tool in all the states of Nigeria where microscopy is not readily available.

Health workers are considered to have played an important role in the decline of malaria prevalence in many areas (Mukanga et al., 2010). The potential for using health workers for administering timely and effective treatment for presumptive malaria attacks was evaluated in the Katana health zone in Zaire, whereby the trained

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HWs were found to perform well in the use of a simple fever management algorithm (Delacollette, Van derstuyft and Molima, 1996).

Having access to a test that quickly confirms the presence of malaria parasites could enable the health care provider to determine whether prescription of antimalarials is appropriate. Microscopy, though still considered the gold standard for malaria diagnosis, is not available at most health facilities. Quality control measures and supervision are often inadequate or absent, staff are poorly trained, and equipment is missing or is in need of repair. Furthermore, clinicians have been known to distrust microscopy results (Barat L et al, 1999).

Due to the burden of malaria and its consequences, persistent delays and inaccuracy in malaria diagnosis and treatment, this study becomes necessary. The study is expected to inform planning at primary healthcare on the challenges that go with malaria RDT utilization and also serves as a guideline in planning for more effective and reliable solution to health problems in relation to malaria. With the level of the knowledge of the health workers towards MRDT, the study will influence future RDT training programs. The results can direct policy makers on health promotion intervention that are more likely to improve in declining and eliminating the malaria disease in future. The study will also make recommendations to encourage proper utilization of RDT in order to assist in prompt case management of malaria in Ibadan. Finally, the study is expected to influence increased utilization levels of MRDTs in the health centres and this increase the number of confirmed malaria cases.

1.4 Research questions

a) What is the level of awareness of malaria RDT among the health workers?

b) What is the prevalence and pattern of utilization of RDT among health workers?

c) What are the factors influencing the use of RDT among the health workers?

1.5 Objectives of the study

1.5.1. General objective

To determine the knowledge and use of malaria RDT among health workers in the selected local Government areas of Ibadan, Oyo State.

1.5.2. Specific objectives are to:

a) Assess the knowledge of health workers on RDT use in malaria treatment.

b) Determine the attitude of health workers towards the use of RDT.

c) Determine the prevalence of use of RDT among health workers.

d) Identify the factors associated with the use of RDT by the health workers.

CHAPTER TWO

LITERATURE REVIEW

2.1 Epidemiology of Malaria

Malaria is protozoan infection of erythrocytes caused in human beings by five species of the genus plasmodium (*P falciparum, P vivax, P ovale, P malariae and P Knowlesi*). In most cases, malaria is transmitted via the bite of an infected female anopheline mosquito. *Plasmodium falciparum* is responsible for most malaria-related deaths worldwide and is the predominant Plasmodium species in sub-Saharan Africa (Crawley et al, 2010). Of the 2.4 billion people at risk of *falciparum* malaria, 70% live in areas of unstable or low endemic risk. Almost all populations at medium and high levels of risk live in sub-Saharan Africa, where the burden of disease, death and disability from *falciparum* malaria is high (Crawley et al, 2010). In areas of high stable transmission, morbidity and mortality are highest in young children in whom acquired protective immunity is sufficient to protect against severe disease. Areas of low or unstable transmission are subject to malaria epidemics, and people of all ages are at risk of severe disease (Crawley et al, 2010).

2.2 The Burden of Malaria

Malaria is highly prevalent worldwide, it is estimated to affect 247 million people with up to 3.3 billion people at risk of malaria in 2008 (WHO, 2008). Of this total, 2.1 billion were at low risk, 97% of whom are living in regions other than Africa. The 1.2 billion at high risk were living in the WHO African (49%) and south – East Asia region (37%). About 90% of all malaria deaths in the world today occur in Africa

south of the Sahara. This is because the majority of infections in Africa are caused by *Plasmodium falciparum*, the most dangerous of the four human malaria parasites. It is also because the most effective malaria vector – the mosquito Anopheles *gambiae*– is the most widespread in Africa and the most difficult to control. An estimated one million people in Africa die from malaria each year and most of these are children under 5 years old (WHO, 2002).

In 2006, the World Malaria Report shows that an estimated 881,000 malaria deaths occurred of which 91% were in Africa and 85% were of children under 5 years of age (WHO, 2006). Malaria has also been estimated to constitute 10% of the overall disease burden in sub-Saharan Africa, being the leading cause of mortality in children aged less than five years accounting for about 40% of public health expenditure (Adams et al, 2004). It is also known to be the leading cause of visitation to health facilities for all age groups and accounts for up to 40 percent of all infant mortality and 20 percent of all maternal mortality in Zambia (MOH, 2008).

Worldwide, malaria kills more than one million people each year; between 20 and 40% of outpatient visits and 10 to 15% of hospital admissions in Africa are attributed to malaria (WHO/UNICEF, 2003). Malaria has significant cost implications including direct and indirect economic and other developments. Malaria still presents obstacles to attaining of socioeconomic targets in Africa, with malaria intervention programs costing the continent about $12 billion of its annual gross domestic product (BuaNews/AllAfrica.com reports 2008). It is reported that over a quarter of a poor family income can be absorbed in the cost of malaria). Furthermore, malaria and fear of malaria may prevent investment and tourism into affected regions, further hampering economic development (MFI, 1998).

MRDT was based on the understanding that in many rural areas, children are unable to access effective malaria treatment for some reasons among which is for health services being too far away. A home or community-based programme for managing malaria is considered as one of the key strategies to overcome these problems (WHO, 2011). In the home/community based programmes, people living in rural settings, such as mothers, volunteers, or health workers, are trained to recognize fever and provide antimalarial medicines at a low cost or for free. Malaria is not the only cause of fever and thus RDTs have recently been made available for use by the HW that diagnose and treat malaria (Okwundu, Nagpal, Musekiwa and Sinclair, 2013).

2.3 Malaria Rapid Diagnostic Test

2.3.1 Overview of Malaria Rapid Diagnostic Tests

Malaria Rapid Diagnostic Tests (MRDTs) detect specific antigens (proteins) produced by malaria parasites, which are present in the blood of infected or recently infected individuals (other "RDTs" that detect antibodies are used for screening blood for evidence of recent infection). Some RDTs can detect only one species (*Plasmodium falciparum*) some detect more than one species (WHO, 2004). Blood for the test is commonly obtained from a finger prick. When used correctly, MRDTs can provide a useful guide to the presence of clinically significant malaria infection caused by the species of parasite they are designed to detect. RDTs can help in case management, particularly when good quality microscopy-based diagnosis is unavailable (National guideline on the use of RDT).

MRDTs have now been integrated into routine practice in several national malaria control programmes including among others, Thailand, Cambodia, and South Africa (WHO, 2003a). Studies done in India and Uganda revealed that overall specificity, sensitivity, and accuracy of RDTs were >90% in areas of different endemicity. This shows that the diagnosis and prompt treatment of confirmed cases through the health care facilities (Singh et al, 2005; Guthmann et al, 2002).

RDTs for malaria provide an opportunity for improved point-of-care diagnosis and better disease management in malaria-endemic areas (D'acremont V. et al, 2010). The three main groups of antigens are histidine-rich protein 2 (HRP-2) specific to P. *falciparum*, parasite specific Plasmodium lactate dehydrogenase (pLDH) and aldolase (pan-specific) (Abba et al, 2011). RDTs for malaria, similar to RDTs use to detect the human immunodeficiency virus (HIV), can be utilized at the point-of-care (McCutchan et al., 2008; Hurdayalet al., 2010, Piper et al., 2011). RDTs are easy to use and provide reliable results within 15–20 minutes (Bharti PK, et al, 2008).

Compared to other diagnostic methods (e.g. Giemsastained thick and thin blood films examined under a microscope), RDTs are highly cost-effective is widely used to control malaria (Shillcutt S, et al, 2008). It requires minimal training and equipment and provides rapid results. RDTs use immunochromatographic methods to detect antigens derived from malaria parasites in lysed blood (Chanda et al, 2009).

In Nigeria, RDTs are currently rolled out by the National Malaria Control Programme (NMCP) in all settings as a tool for parasite-based diagnosis in the scope of artemisinin-based combination therapy (ACT). The introduction of rapid diagnostic tests in most health centers has increased diagnostic services to 73% of all health centers in the country (Hamer et al, 2007) and it was seen as an accurate alternative in

regions where microscopy is not available or not a practical method of diagnosis (Albin and Nesbit, 2008). It is therefore mandatory that provision of RDT is accompanied by a major change in clinical treatment of patients presenting with a fever (Hamer, 2007).

RDTs that are marketed in Nigeria include materials for 20-25 tests with lancets for finger pricking, test strips (cassette, dipstick), transfer devices (pipettes, inverted cup loop, capillaries or loop) and buffer. All materials are equivalent to the number of tests per device (WHO, 2004c). Every RDT requires a buffer, supplied either in a single bottle or dropper vial, to help lyse the blood, and to allow capillary flow (lateral diffusion or immunochromatographic separation) along the nitrocellulose strip (Richter et al. 2004).

With proper implementation, utilization of RDT could make close-to-home diagnosis available in community settings, thus improving the possibility for timely treatment and management of the disease (Egwang, 2007). WHO currently makes recommendations that parasite based diagnosis should be used in all cases of suspected malaria with the possible exception of critical conditions in order to provide prompt and effective case management(Samuel et al, 2008).

2.3.2 Mechanism of Action of Malaria Rapid Diagnostic Tests

RDTs are lateral flow "Immuno-chromatographic" antigen – detection tests, which rely on the capture of dye-labeled antibodies to produce a visible band on a strip of nitro-cellulose. With malaria RDTs, the dye labeled antibody first binds to a parasite antigen, and the resultant complex is captured on the strip by a band of bound

antibody, forming a visible line (test line) (WHO guideline, 2010). RDTs display a control line and two or three test lines: one targeting P. falciparum-specific antigen, another line targeting antigens common to the four species such as pan specific Plasmodium and in case of so-called four band RDTs, a third line which targets P. vivax-specific pLDH (PvpLDH). A control line gives information on the integrity of the antibody-dye conjugate, but does not confirm the ability to detect parasite antigen (National guidelines on the use of RDT).

The first step of the test procedure involves mixing the patient's blood with a lying agent in a test strip or well. This ruptures the red cells, releasing more parasite protein. labeled antibody, either in the well or on the strip, may then bind the target protein (antigen).The resulting mixture of blood products and antigen-labelled antibody complex then passes along the nitro-cellulose strip. This is facilitated partly by capillary action through the fiber-mesh of the strip, and partly by flushing with a fluid buffer placed behind the blood. It passes over the test and control bands. The free, labeled antibody will capture the parasite antigen if present which will in turn be captured by the test-band antibody (WHO guideline. 2010).

The accumulation of microscopic dye particles on the thin band produces a visible line if sufficient antigen – labeled antibody complex is present. The control band will come visible as sufficient labeled antibody accumulates on the line. Antibody (or antigen) bound to the strip captures labeled antibodies which failed to bond to antigen from the patient's blood. A visible control line indicates that labeled antibody has traversed the full length of the strip, past the test line, and that at least some free antibody remains conjugated to the dye and that some of the capturing properties of the antibodies remain intact. The intensity of the test band will vary with the amount

of antigen present, at least at low parasite densities (antigen concentration), as this will determine the amount of dye particles which will accumulate on the line (Maltha et al., 2013). The control band intensity may decrease at higher parasite densities, as much of the labeled antibody will have been captured by the test band before reaching the control.

2.3.3 Types of Malaria Rapid Diagnostic Tests

The three main groups of antigens detected by RDTs (Huong et al. 2002) include:

a) Histidine - rich protein 2 (HRP2) which is specific to *P. falciparum.*

b) Plasmodium lactate dehydrogenase (pLDH) currently used in products that include *P. falciparum* – specific, pan-specific, and P.vivax specific pLDH antibodies.

c) Aldolase (pan specific)

RDT detecting both *falciparum* – specific and non-falciparum (or pan-specific) target antigens are commonly called combination or "combo" tests.

In areas where only *falciparum* malaria occurs, or non-falciparum malaria rarely occurs without co-infection of *P.falciparum*, RDTs that detect only *P. falciparum* are generally preferable on grounds of lower cost. Most (or all) commercially – available RDTs in this category detect HRP2 (WHO, 2010).

Commercially available MRTs have specific target antigens (Appendix A). Current malaria RDT tests have specific characteristics (Appendix B).

2.3.4 Factors affecting Utilization of Malaria RDTs.

Utilization of malaria can be faced with many challenges which may result in low utilization of these diagnostic tools. While RDTs are relatively simple to administer, they can deliver incorrect diagnoses if not administered in the appropriate manner (Harvey et al. 2008).

Studies done in Sub- Saharan African have shown that there are a number of factors that are linked to underutilization of RDTs. For instance, a study done in South Africa revealed stock-out of RDT, inadequate storage facilities and monitoring, nurses rely on clinical judgement to treat, limited training on the use of RDT, negative test results are some of the challenges in utilization of RDT (Moonasar et al 2007).

Moreover, some researchers argue that insufficient research exists to terminate the use of presumptive treatment. Issues of staffing levels may also contribute largely in utilization of malaria RDT's. For example, health workers are less likely to utilize malaria RDTs to diagnose malaria if they have an overload of work. They are more likely to diagnose malaria clinically as it takes less of their time compared to performing a rapid test which takes 10 to 15 minutes for the results to show. With more clients demanding a health worker services, it is more likely that a health worker will limit the time spent on each client in order to attend to all the clients within the working hours and this may rule out the possibility of performing malaria RDT (Moonasar et al, 2007).

2.3.4.1 False Negatives

A false negative test from a RDT could prove fatal for children. In fact, in a study in Sudan, health workers prescribed drugs despite negative test results; the same problems with presumptive diagnosis could exist with this new technology as well. Moreover, some researchers argue that insufficient research exists to terminate the use of presumptive treatment (Kumar et al. 2013).

Studies done in central India detected persistent positivity 24.2% of treated patients without sexual parasitc on day 10 of treatment due to persistent parasite antigen even after the clinical symptoms disappeared and the parasites had apparently been cleared. Therefore the value of predictability of a test band may be restricted to new, untreated cases. However, the high Negative Predictive Value (NPV) allows to confidently diagnosing negative test patients as non-malaria patients (Unicef. 2007).

2.3.4.2 Cold chain

The devclopment of a "cool chain" for shipment and storage of RDTs is essential. Environmental conditions during transportation can be extreme. and every precaution should bc taken to avoid RDTs being kept in conditions of excessive heat or humidity (Jorgensen ct al. 2006). Transport from the manufacturer and road transport within a country. are particularly vulnerable times. these demand a 'cool chain' transport and storage. and arc important for: careful coordination of transport to avoid unnecessary delays. avoidance of exposurc to direct sunlight. temperature monitoring of storage facilities and rejection of RDTs where packaging is significantly damaged and it is likely that moisture- proofing of envelops or canisters is lost (Jorgensen et al. 2006).

2.3.4.3 Stability and Storage:

Proteins are denatured by heat, and RDTs are thus susceptible to being inactivated through exposure to excessive heat. Exposing RDTs to temperatures of 0°C and below may also cause damage. Most manufacturers recommend RDT storage between 2°C and 30°C. Expiry dates are generally set according to these conditions. If kits are stored at temperatures exceeding the recommended limits, it is likely that the shelf life of the RDTs will be reduced and sensitivity lost prior to the expiry date (National guidelines on the use of RDT).

All RDTs should remain sealed until immediately before use. If stored in a cool environment, they should be allowed to reach room temperature before being opened to avoid condensation forming on the strip.

2.3.4.4 Training and Skill Acquisition

Most of the current RDTs are designed for ease of use. It seems clear that it is possible to train unskilled – but willing – individuals to become reliable competent in the use of RDTs.The RDT training is also crucial in the practice of malaria RDTs. The RDT training is able to provide the skill needed to perform RDTs (Harvey eta al. 2008). The health workers who have not undergone any formal RDT training are more likely to shun performing MRDTs for fear of making errors which may eventually affect malaria treatment decisions. The RDT training will give the health worker confidence in performing the test especially that it involves a technique of pricking and withdrawal of blood. The acquired skill after RDT training becomes

useful especially for the community health workers who are the majority of those performing the MRDTs in the health centres (QAP/WHO, 2006).

With adequate training, (usually 1 day), Health Care Auxilliary staff, Family Welfare Educators, nurses, and doctors, can use RDTs effectively, achieving acceptable high sensitivity and specificity, comparable with the results obtained by an experienced microscopist (Moonasar et al, 2007).

2.3.4.5 Policy Guidelines

The type of guidelines or instructions may either influence a health worker to utilize or not utilize malaria RDTs. If the guidelines are lengthy involving many steps to follow, it is more likely that the health workers will omit some steps and this may affect the result of the test depending on the step omitted. The inconsistence in the accuracy of the results will discourage the health workers from utilizing malaria RDT's. They are more likely to decide to avoid the whole procedure of performing malaria RDT and treat malaria based on clinical diagnosis. On the other hand, if the guidelines on utilization of malaria RDT are unavailable, the health workers are more likely to ignore the importance of correctly diagnosing malaria as they are used with the traditional practice of clinically diagnosing malaria (Moonasar et al, 2007).

2.3.4.6 Cultural Values and Misconception

In addition, cultural misconceptions concerning the purpose of the tests can inhibit their uptake. For example, a facility in Tanzania found that some caregivers believed

that the tests were for HIV. Furthermore, there is stigma surrounding the drawing of blood, especially blood drawn from children. Community members in study expressed the concern that children could be infected with HIV when blood was drawn (Mukanga et al, 2010).

2.3.4.7 RDT training and knowledge

The training and supervision of health workers that will perform MRDTs are vitally important to the utilization of MRDTs. Ideally training may consist of instructions received on the job as well as information gained informal courses (WHO, 2004). One of the prerequisites for the acceptability of MRDTs for use is ease of use, and most current MRDTs are designed to ensure this (WHO, 2004). Concern has been expressed about the ability of some groups of RDT users (principally health volunteers) to read accurately, to discriminate and interpret the intensity of test lines, or to differentiate between all species on the pan-malaria tests. With adequate training, however, health workers and health volunteers can use MRDTs effectively, achieving similar acceptably high sensitivity and specificity. In facts, the widespread use of MRDTs is dependent on the possibility of unskilled health persons routinely carrying out the tests.

Insufficient knowledge on malaria RDT programme and its procedure may affect health workers utilization of malaria RDT. Health workers may be aware of the need to utilize malaria diagnostic service in order to confirm diagnosis but may have some resistance to perform the tests because of having inadequate knowledge on the importance of confirming malaria cases (Moonasar et al, 2007).

The health workers who know and understand the benefits of utilizing malaria RDTs are more likely to utilize malaria RDTs than those who don't. Enough knowledge needs to be provided to health workers on the importance and the benefits of utilizing malaria RDTs. Supervision of malaria RDT utilization provides an opportunity to reinforce the need to perform MRDTs and to check whether it is performed according to the laid down guidelines (Unicef, 2007). The feedback from health workers during supervision allows the authorities to make necessary recommendations in order to encourage utilization of malaria RDTs. Health workers who are often supervised in the practice of malaria RDT are more likely to consistently perform MRDTs.

Findings from this study showed that a well-designed job aid and brief training can ensure high health worker performance. However, a study in Zambia concluded that RDT training program in Zambia needs to be restructured such that trainees are provided with clear instructions about how to respond to a negative test results (Egwang, 2007). Building on these findings the National Malaria Control center has developed RDT field test simplified instructions in local languages and a training curriculum aimed at low—literacy community health workers about the correct use of malaria rapid diagnostic tests (Egwang, 2007).

2.3.4.8 Staffing Levels

Appropriate and adequate human resource is critical to maximally manage the health services in order to facilitate effective and efficient diagnosis of malaria. The current health sector human resource capacity would affect the level of utilization of Malaria RDTs. Rapid Diagnostic tests, in simple kit form, can provide results based on

fingerpick or venous blood within minutes. (Mayxay et al, 2004) revealed that community health workers can utilize MRDTs after as little as an hour of training. This demonstrates that community health workers would be ideal to perform and interpret the RDTs in situations where staffing levels are inadequate.

2.3.4.9 Other Issues

Operational problems that might be encountered include the following:

a) Supply delays, resulting in stock outs

b) Delayed disownments and limitation of funds for procurement.

c) Delays between peripheral and control levels in re-ordering of supplies.

d) Difficulty in ordering specific product and consumer pressure for treatment despite a negative RDT result.

Despite limitations, post survey study of all the personnel directly involved in the performance of the RDT were of the opinion that the test was easy to use, decreased stress and potential delay in the diagnosis of *falciparum* malaria in the field. In another study in India, it was shown that RDT could facilitate the early diagnosis and appropriate therapy inpatients with cerebral malaria thereby reducing mortality especially in situations where health services are deficient or absent (Singh and Saxena, 2005, Singh and Nagpal, 2004).

The above mentioned factors have been summarized in a conceptual framework shown in the diagram below:

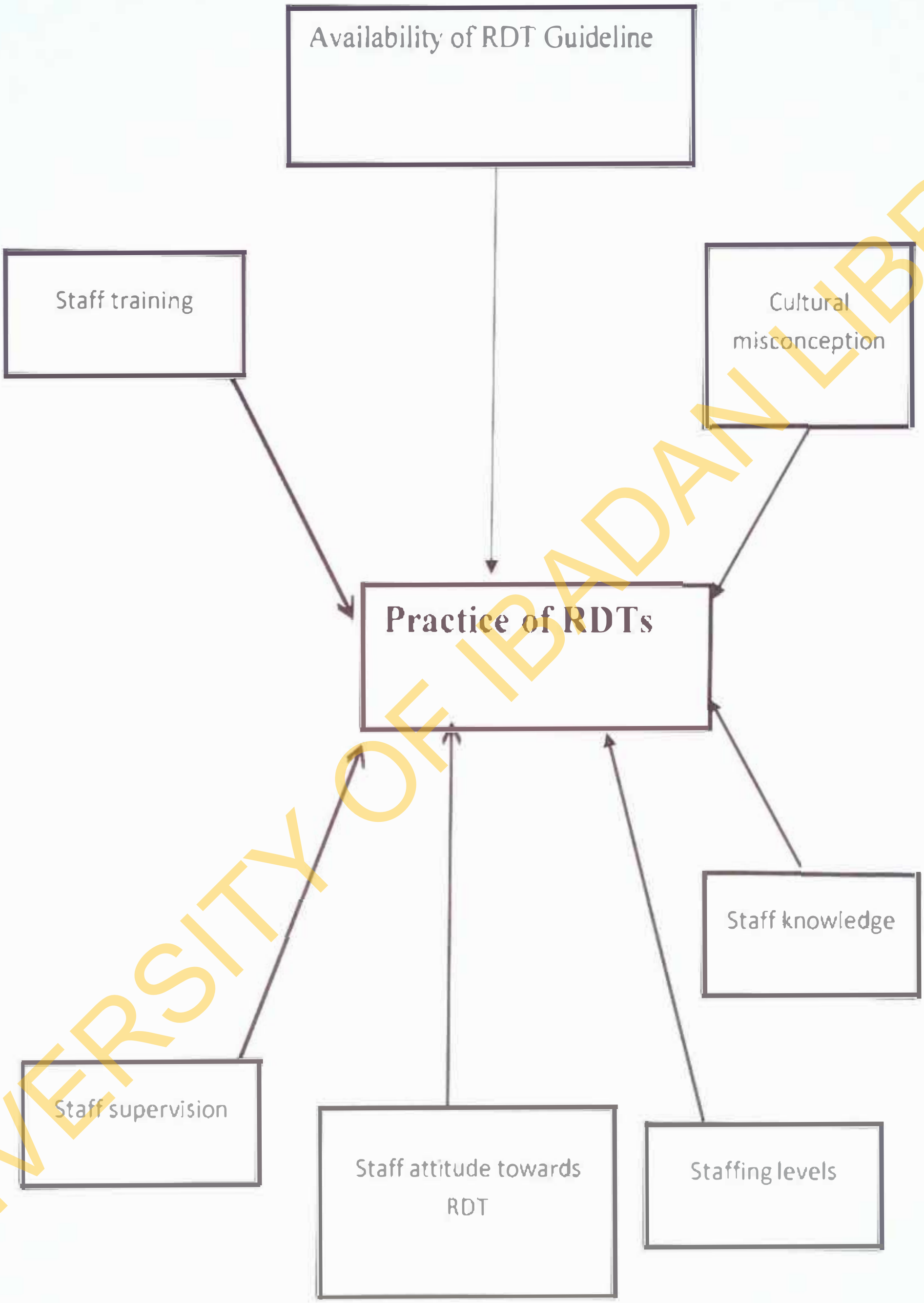

Figure 2.1: Conceptual framework indicating factors relating to Malaria prevention and control

2.4 Knowledge and Awareness of RDT among Health workers

For effective malaria control, assessing the knowledge of the health workers on RDT is crucial. Studies have shown varied levels of knowledge of RDT among health workers. These are as follows:

In a study carried out in Uganda, less than half of the health workers (46%) had received any training on management of malaria in the last 5 years, such as ACT or Integrated Management of Childhood Illness (IMCI) guidelines; none had training in microscopy and only 5% had been trained on RDTs. When their knowledge on the current malaria treatment policy and RDTs was assessed, 42 (65%) drug shop staff claimed that they knew the recommended first-line anti-malarial treatment, but only 43% (28/65) specified an ACT, such as Coartem; whilst 11 could not specify any drug. Of the 42 claiming knowledge of the treatment policy, 15 (36%) reported they had learned about the first-line treatment from the national guidelines; 11 (26%) from another health worker; five (12%) from training workshops; while the remainder stated that they had learned about the first-line treatment from the DDI, the radio or general conversation. Regarding RDTs, only 19 of the 65 health workers interviewed (29%) knew what an RDT was for; of whom 10 had learned about RDTs from another health worker; 6 from the national guidelines; while 3 had heard about RDTs from the research team as part of community sensitization/consent process (Mukanga et al. 2010).

Three trials – one in the United Republic of Tanzania (WHO, 2003b) another in Uganda (WHO, 2003b), and the third in the Lao People's Democratic Republic (WHO,2003b) reported on the results of training village health workers, district health

workers and village health volunteers respectively. It was clear that it is possible to train unskilled but willing, individuals to become reliably competent in the use of MRDTs. The outcome of any training session will depend on the motivation of the trainees, the subsequent supervision and interest in their performance. In the three experiences quoted, the training took different form and was of different duration, indicating that it is the quality of training that is more important than the competent an d duration of the course (WHO, 2004a).

2.5 Health Worker's Attitude on Rapid Diagnostic Test

It is expected that there will be risk involved with the introduction of MRDTs into any area for the first time. It may be difficult to persuade health workers that MRDTs are more reliable than clinical diagnosis and that treatment should be given according to test results.

In a study done to assess the health workers perception about RDT, majority (92%) of the health care workers believed that positive RDT results were always truly positive (sensitivity), but only half (51%) believed that negative RDT results were always truly negative (specificity), reasoning that the RDTs can miss a true case of malaria (Daniel et al, 2010). Almost all (98%) health care workers said they communicate RDTs results to patients. Up to 44% of the health workers mentioned that they do not always have to treat RDT positive patients and the possible reason for not treating may be due to the current guidelines that recommend referral of severe malaria cases. Twenty-three (40%) mentioned that they would consider treating based on clinical suspicion despite a negative RDT test result. Over 98% of the health workers said

they were willing and committed to performing RDTs on a daily basis in the management of out-patients who present with fever (Daniel et al, 2010).

Over-diagnosis of malaria on this scale also threatens the sustainability of deployment of ACT. Health workers may use the MRDTs as screening tools (testing every patient "just to be sure") rather than to support clinical diagnosis in symptomatic patients. Such practices may lead to RDT mistrust and eventually cause health workers to continue diagnosing malaria clinically(WHO, 2004b).

2.6 Utilization of Rapid Diagnostic Test

Health workers are considered to have played an important role in the decline of malaria prevalence in many areas (Mukanga et al., 2010). The potential for using health workers (HW) for administering timely and effective treatment for presumptive malaria attacks was evaluated in the Katana health zone in Zaire, whereby the trained HWs were found to perform well in the use of a simple fever management algorithm (Delacollette, Van derstuyft and Molima, 1996).

A study done in Lusaka Zambia, concluded that use of malaria rapid diagnostic tests by health workers is potentially an effective alternative for malaria case management in areas with limited functional microscopy and limited health care personnel or facilites (Harvey et al 2008).In a similar study, it was concluded that the RDTs in the hands of HWs may safely improve early and well-targeted ACT treatment of malaria patients in Africa (Mubi et al, 2011).

While the literature demonstrates a positive impact of HWs on malaria prevention and management it further reveals a number of factors that hinder effectiveness in their

daily work. These are low prevention focus, resource distribution problems, and inadequate support and supervision (Alto,1996). Others include non-comprehensiveness of the HWs' care and their ambiguous position in the health care system that tend to create problems and compromise the sustainability of the intervention (Hopkins, Talisuna, Whitty and Staedke, 2007).

2.7 The Need to focus on reliable diagnosis

It has become widely recognized that early diagnosis and effective case management are key to addressing the immediate burden of malaria (WHO 1993; Nabarro and Tayler 1998; WHO 2003b; Keiser and Utzinger, 2004).The clinical symptoms of malaria include fever, chills, perspiration, stiff neck, runny nose, apprexia, headaches, vomiting, malaise and general danger signs (WHO, 2000a). In much of sub-Saharan Africa (SSA) the decision to treat a patient with an antimalarial is often made solely on the basis of fever, especially for outpatient care (Chandramohan et al,2002).

The introduction of MRDTs in the early 1990s ushered in a new era of diagnosis that was expected to challenge the limitations of other diagnostic tests. MRDTs are intended to allow simple, swift, precise diagnosis of malaria in areas where standard laboratory diagnosis is not available. Ideally, these tests should offer high sensitivity, specificity, rapidity, ease of performance and interpretation, species differentiation, allow for quantitative analysis, and all at an affordable price (Shiff et al, 1994).

Rapid and accurate diagnosis is fundamental to effective management and control of malaria. Modern methods of malaria diagnosis include fluorescent microscopy, flow cytometry, automated blood cells analyzers, serology antibody detection, molecular

methods and laser desorption mass spectrometry (Hanscheid,1999). However, conclusive diagnosis still relies predominantly upon clinical presentation and the century old technique of reviewing stained blood smears by light microscopy. Diagnosis by clinical syndrome alone is unreliable (Luxemburger et al, 1998; Bojang et al, 2000, WHO, 2000b; Chandramohan et al, 2002).

2.8 Role of Effective RDT Program

RDT of malaria is gaining increasing importance in health programmes in endemic countries in response to increasing drug costs and recognition of the importance of early, correct treatment to the reduction in malaria morbidity and mortality (WHO 2003a).

Prompt Diagnosis and early treatment are vital elements of the management of malaria. Using MRDTs to distinguish fevers caused by malaria parasites from those caused by other illnesses is important for at least three reasons. First, ACT is currently much more expensive than older antimalarial such as sulfadoxine-pyrimethamine (SP) and chloroquine. Rather than giving these more expensive drugs to all patients with fever, MRDTs can help target ACTs to patients who really have malaria. Secondly, many threatening illnesses, such as meningitis and acute lower respiratory infection, cause symptoms similar to malaria (fever, chills, malaise, aches, etc.). Treating all febrile cases for malaria means that patients with these other conditions may not get the treatment that really need. Finally, avoiding unnecessary use of ACTs on patients who do not have malaria may help prevent or delay drug resistance making ACTs effective for a longer period (OAP/WHO, 2006).

In most of Africa countries, diagnosing malaria based on symptoms is normal practice. It is generally estimated that 50% of Africans present with fever and treated for malaria may not be infected with malaria parasite (Medecins Sans Frontieres, 2003). Malaria control and prevention efforts need to be designed for a specific environment in which they will be used and need to take into account the local epidemiology of malaria and the level of available resources. MRDTs can provide parasite-based diagnosis in places where microscopy is not possible or practical. The utilization of RDT would improve laboratory diagnosis and early treatment for malaria as it requires no special equipment, minimal training is needed, the test and reagents are stable at ambient temperatures and no electricity is needed (Singh et al, 2005).

In addition, there are public health reasons for confirming suspected malaria. Over-diagnosis inflates perceives levels of malaria morbidity. It also increases the perceive level of resistance (fever is unresponsive to antimalarial). In areas of high transmission, treatment of patients without parasitaemia leads to unnecessary drug pressure on the parasite by exposing new infections to sub-therapeutic drug levels during their slow elimination phase (Greenwood 1999).

CHAPTER THREE

METHODOLOGY

3.1 Study Area

This study was conducted in Ibadan metropolitan city. Ibadan is one of the largest cities in sub-Saharan Africa. It is the capital of Oyo state, one of the 36 states of the Federal Republic of Nigeria. It is found in the South-western part of the country and located 128km north-east of Lagos and 345km south-west of Abuja (OYI, 2012).

For administrative purposes, Ibadan is divided into 11 Local Government Areas, five of which are urban. Ibadan has an estimated population of 5.6 million people from 2006 census. It is made up essentially, core inner city areas and the new town. The core areas have many slums dwellings and they are characterised by high population density per household and these core areas constitute about half of the city (Olaniran 1998). The geographical location of the state makes the climate suitable for malaria transmission. Ibadan also enjoys modern health facilities. All the three tiers of health facilities are well represented in the city, with the University College Hospital (UCH), Ring Roads and Yemetu State Hospitals and myriad of clinics, dispensaries maternal and child health centres. There are 1,648 health facilities disaggregated into 631 PHCs, 46 Secondary Health facilities, 5 Tertiary Health centres and 9668 registered private health facilities (HMIS, oyo state).

Ibadan North Local Government Area has it headquarter at Agodi. It has an area of 42km^2 and a population of 306,795 according to the NPC of 2006. There are 11 political wards and 12 PHCs in Ibadan North.

Ibadan Northeast Local Government Area has it headquarter at Iwo road. It has an area of 18km^2 and a population of 330,399 according to the NPC of 2006. There are 12 political wards and 24 PHCs in Ibadan Northeast.

Ibadan Southeast Local Government Area has it headquarter at Mapo hall. It has an area of 17kn^2 and a population of 266,046 according to the NPC of 2006. There are 12 political wards and 16 PHCs in Ibadan Southeast.

3.2 Study Design

A cross-sectional study design was used to obtain information from respondents.

3.3 Study Population

The study population were health workers (doctors, nurses, lab scientist/ technician, Community Health Extension Workers (CHEW) and Community Health Officers (CHO) at the health facilities in selected Local Government Areas.

3.4 Inclusion and Exclusion criteria

3.4.1 Inclusion criteria

Only the skilled /Medical health workers (doctors, nurses, lab scientist/ technician, CHEW and CHOs) were included in the study.

3.4.2 Exclusion Criteria

Health workers in secondary and tertiary health facilities were excluded from the study. Health workers who were not in the health centers at the time of the study were not included in the study.

3.5 Sample Size Determination

The minimum sample size for the study was calculated using the formula;

$$N = Z^2 p (1-p) / d^2$$

Where N= minimum estimated sample size

p= 0.73 (proportion of health workers that have the knowledge of malaria RDT and practiced it). This was set at 73% considering past studies (Hamer et. al. 2007)

1–p = q = 0.27 (proportion of health workers that does have good knowledge of malaria RDT).

d = 0.05 (precision level of 5%)

Z = 1.96 (standard normal deviation at 95% confidence interval)

$$N = \frac{1.96^2 \times 0.73 \times 0.27}{0.05^2}$$

N= 302.872

Assuming non-response rate(r) to be 10%,

$$\text{Adjusted sample size} = \frac{100 \times N}{100 - r} = \frac{100 \times 303}{100 - 10}$$

= 336

N is approx. 337

3.6 Sample Technique

A three-stage random sampling method was employed to select the participants. The stages were:

Stage 1: From the list of the five local governments in Ibadan metropolis, three local government areas were selected by random sampling technique.

Stage 2: From each of the local government area, 12 health centres were randomly selected by balloting.

Stage 3: From the sample frame of the health workers in the health centres, all the skilled health workers were recruited until the required number was achieved.

3.7 Pretest and Validation

The questionnaire was pretested among health workers in Ibadan Southwest local government area of Ibadan, another local government which was not selected for the study. The pre-test was done to determine the validity and reliability of the questions to be asked. Thirty health workers were interviewed at the pre-test. The responses were then coded, entered and analyzed with SPSS software after which corrections were made to improve the efficacy of the questionnaire. The flow of the questions was modified and ambiguous questions were corrected following the pre-test.

3.8 Data Collection

Information was obtained from health workers using a semi-structured self-administered questionnaire. The semi-structured questionnaire consisted of five sections which comprises of 61 questions. Section A included socio-demographic

characteristics of the respondents. The characteristics examined were age, sex, highest educational qualification, religion, marital status, designation and years of experience. Section B consisted of questions on Awareness of RDT. Questions like heard about RDT, meaning of RDT were asked. Respondents' knowledge of RDT were assessed with information in Section C. Section D included questions on attitude of health workers towards the use of RDT. Section E included questions on the use and pattern of use of RDT. The purpose of the study was explained to each respondent and the questionnaires were administered to only those who agree to participate.

3.8.1 Knowledge of the health workers

Knowledge on RDT, it uses, benefits, limitations were asked. It was categorized into good, fair and poor knowledge. A correct response to each question was coded as 1 while the wrong responses was coded as 0. The variables were computed using the total. Those who scored 25th percentile was graded as poor, those who scored 50th percentile was graded fair while those who scored 75th percentile was graded good knowledge.

3.8.2 Attitude of health workers

Health workers attitude were assessed using ten questions with response options of "agree", "neutral", "disagree" and were coded 1, 2 and 3. The right answers had the highest score and were also computed using the total. Those who scored <15/30 were graded as poor while >15/30 were graded as good.

3.8.3 Use of RDT

Use were assessed with a question with a "Yes" or "No" response. Pattern of use were assessed as the proportion of health workers who were able to follow steps on a job aid guide when performing MRDT. It will be categorized into poor (60% and below) and Good (70% and above). Correctness of steps was assessed with reference to the national guidelines on the use of RDT. Correct if chosen the right answer and any other answer is incorrect. Availability of RDT guidelines was the proportion of health centers that have an MRDT job aid guideline, IMCI guidelines and ITG guidelines. Yes if at least one guideline is used and No if none. The chi-square was used to determine the association between categorical variable.

In determining the factors influencing the use of RDT, socio demographic factors, awareness of RDT, knowledge of RDT, Staff attitude towards RDT, Availability of RDT guidelines, use of guidelines were considered.

3.9 Study Variables

3.9.1 Dependent variable

The dependent variable was use of RDT

3.9.2 Independent variable:

The independent variables were: Social demographic variables such as: (Age, Sex, Religion, Level of Education, Ethnicity, Designation); Staff knowledge, Staff attitude towards RDT, Availability of RDT guidelines, Use of guideless, Staff level of awareness, Staff level.

3.10 Data management and analysis

Questionnaires were inspected daily to identify and correct errors and to ensure they are properly filled. Results from the field were compiled and recorded daily. Data were entered, cleaned and analysed using the statistical package for social sciences (SPSS) version 20. Descriptive statistics were summarized using mean, standard deviation, range, proportion and frequency tables.

The chi-square test was used to determine the association between categorical variables. Logistic regression analysis was used to determine the predictors of use of RDT. The level of statistical significance was set as 0.05.

3.11 Ethical Consideration

Ethical approval for the study was obtained from the Oyo State Ethical Review Committee. Participation was voluntary and each respondent received detailed information on the purpose of the study following which written informed consent was obtained from participants before questionnaires were administered. Data collected was used only for research and was anonymous to ensure confidentiality. No financial reward was given to any of the study participants; however incentives were given to the respondents.

CHAPTER FOUR

RESULTS

Out of 350 questionnaires administered, 333 persons responded and the duly completed questions were analysed.

4.1 Socio-demographic characteristic of respondents

Table 4.1 below shows the socio-demographic characteristics of respondents. The mean age of the respondents was 37.1 ± 8.3 years. Less than half of the health workers (42.9%) were aged 30 and 39 years, majority (80.8%) were female, (82.3%) were married and 34.5% of the respondents were community health extension workers. A greater proportion of the respondents (48.9%) had diploma as their highest level of qualification and more than half (61.9%) of the respondents had been working in the health facility for less than 4 years.

Table 4.1: Respondents' socio-demographic characteristics.

Variables	Frequency (N= 333)	Percentage (%)
Local Government Area		
Ibadan North	114	34.2
Ibadan Northeast	111	33.3
Ibadan Southeast	108	32.4
Age of Respondents		
20-29	55	16.6
30-39	142	42.9
40 and above	134	40.5
Sex		
Male	64	19.2
Female	269	80.8
Marital Status		
Single	53	15.9
Married	274	82.3
Divorced	2	0.6
Widowed	4	1.2
Religion		
Christianity	241	72.4
Islam	88	26.4
Traditional	4	1.2
Highest Level of Education		
B.Sc/HND	69	20.7
Diploma	163	48.9
CHEW/CHO	98	29.4
O'level	3	0.9
Designation		
Medical Laboratory Scientist	28	8.4
Nurse/Midwife	89	26.7
Community Health Officer	101	30.3
Community Health Extension Worker	115	34.5
How long have you worked in this health facility		
0-3yrs	206	61.9
4-6yrs	45	13.5
7-9yrs	21	6.3
10yrs and above	61	18.3

4.2 Awareness of Rapid Diagnostic Test

Majority (98.2%) of the respondent were aware of Rapid Diagnostic Test. All the health workers got information on RDT from different sources and the most common source of information was from co-health workers (87.4%) while 4.8% of the respondents got their information from all the sources listed and 4.5% of them got their information from other sources not listed above.

Table 4.2 Respondents' Awareness of RDT

Variables	Frequency (N= 333)	Percentage (%)
Awareness of RDT		
Yes	327	98.2
No	6	1.8
Source of Information		
Radio	6	1.8
Television	5	1.5
Health workers	291	87.4
All of the above	16	4.8
Others	15	4.5

4.3 Knowledge on Rapid Diagnostic Test

Of all the respondents, 78.1% have received training 21.9% were not trained. Out of the 78.1% that have been trained, 53.5% received training while 24.6% received sensitization alone.

Out of all the health workers that were interviewed, only 27.7% had poor knowledge about malaria RDT, 32.5% had fair knowledge while a larger proportion, (39.8%) of them had good knowledge.

Table 4.3: **Respondents' knowledge on RDT**

Variables	Frequency N=333	Percentage (%)
RDT training		
Yes	260	78.1
No	73	21.9
Types of training		
Formal training	178	53.5
Sensitization only	82	24.6
None	73	21.9
Negative results mean absence of malaria		
Yes	158	47.3
No	175	52.7
Uses of RDT		
Malaria diagnosis	299	90.3
Proinpt treatment	20	6.0
Malaria Diagnosis and prompt treatment	8	2.4
Don't know	6	1.2
Overall knowledge score		
Poor	93	27.7
Fair	108	32.5
Good	132	39.8
Total	**333**	**100.0**

4.4 Health workers attitude towards the use of RDT

Greater proportion of the respondents, (57.5%) had poor attitude towards the use of RDT while (42.5%) had good attitude towards the use of RDT.

Table 4.4: Respondents Attitude towards the use of RDT

Variables	Frequency (N=332)	Percentage (%)
Level of attitude		
Good Attitude	141	42.5
Poor Attitude	192	57.5

4.5 Use and Pattern of use of Rapid Diagnostic Test

Overall, (93.1%) of the respondents used RDT while (6.9%) of them does not use RDT.

Steps to be taken in conducting RDT was assess, adherence to the use of guidelines while conducting RDT was assess and also if they do follow all the steps to be taken.

Overall, (4.8%) of the respondents took the correct steps in conducting RDT while majority of them took the incorrect steps. From the individual chosen, (80.2%) of the respondents followed all the steps while (19.8%) does not follow all the steps. When asked if they adhere to the use of guidelines while conducting RDT, (64.6%) of them always adhere to it, (28.8%) of them sometime adhere to it, (3.0%) of them rarely adhere to it while (3.6%) of them never adhere to the use of guidelines.

Table 4.5 **Use and Pattern of use of Rapid Diagnostic Test**

Variable	Frequency	Percentage (%)
RDT use		
Yes	310	93.1
No	23	6.9
Steps to be taken in conducting RDT		
Correct	15	4.8
Incorrect	298	95.2
Do you follow all the steps		
Yes	267	80.2
No	66	19.8
Adherence to guidelines		
Always	215	64.6
Sometimes	96	28.8
Rarely	10	3.0
Never	12	3.6

4.6 Association between socio-demographic factors and the use of Rapid Diagnostic Test

Table 4.6 below shows the association between socio-demographic factors and the use of RDT.

From the table, it was observed that the highest proportion of those that used RDT was in the age category 40 and above years and this was statistically significant (p= 0.004). Respondents who were female used more of RDT compared to respondents who were male but this was not statistically significant (p= 0.349). More of the respondents who were currently married used RDT compared to those who were single, divorced or widowed and this was statistically significant (p= 0.002). It was observed from the table that 301 (92.3%) of the respondents were from Yoruba ethnic group.

4.6 Association between Demographic factors and the use of RDT

Variable	Use of RDT		Total	X^2	p-Value
	Yes	No			
	N = 333				
Age					
20-29 years	44(83.0%)	9(17.0%)	53(100.0%)	11.129	0.004*
30-39 years	134(94.4%)	8(5.6%)	142(100.0%)		
40 and above	129(96.3%)	5(5.3%)	134(100.0%)		
Sex					
Male	56(90.3%)	6(9.7%)	62(100.0%)	0.879	0.349
Female	252(93.7%)	17(6.3%)	269(100.0%)		
Marital Status					
Single	41(80.4%)	10(19.6%)	51(100.0%)	15.147	0.002*
Married	261(95.3%)	13(4.7%)	274(100.0%)		
Divorced	2(100.0%)	0(0.0%)	2(100.0%)		
Widowed	4(100.0%)	0(0.0%)	4(100.0%)		
Religion					
Christian	224(93.7%)	15(6.3%)	239(100.0%)	1.090	0.580
Islam	80(90.9%)	8(9.1%)	88(100.0%)		
Traditional	4(100.0%)	0(100.0%)	4(100.0%)		
Ethnicity					
Yoruba	301(92.3%)	25(7.7%)	326(100.0%)	0.580	0.748
Igbo	1(100.0%)	0(0.0%)	1(100.0%)		
Hausa	6(100.0%)	0(0.0%)	5(100.0%)		

*Significant at 5% level of significance.

4.7 Association between knowledge and the use of RDT

Table 4.7 below shows that out of the 333 respondents, (93.5%) had poor knowledge and uses RDT, (97.2%) had fair knowledge and use RDT while (87.9%) had good knowledge and use it. This shows a statistical association between knowledge and use of RDT (p=0.022).

Table 4.7 **Association between knowledge and use of RDT**

Variable	Use of RDT		Total	X^2	p value
	Yes	No			
Health workers' level of Knowledge					
Poor	86(93.5%)	6(6.5%)	92(100.0%)	7.633	0.022
Fair	105(97.2%)	3 (2.8%)	108(100.0%)		
Good	116(87.9%)	16(12.1%)	132(100.0%)		
Total	**307(92.5%)**	**25(7.5%)**	**332(100.0%)**		

4.8 Association between Awareness and use of RDT

Table 4.8 showed the cross tabulation of awareness of RDT and the use of RDT. Majority of the respondents have actually heard about RDT, (93.0%) of those who were aware use RDT compared to (66.7%) who were not aware of RDT but uses it. There was a statistical association between awareness and use (p= 0.015).

Table 4.8 Association between awareness and use of RDT

Variable	Use of RDT		Total	X^2	p value
	Yes	No			
Level of Awareness					
Yes	304(93.0%)	23(7.0%)	327(100.0%)	5.869	0.015
No	4(66.7%)	2(33.3%)	6(100.0%)		
Total	**308(92.5%)**	**25(7.5%)**	**333(100.0%)**		

4.9 Association between Attitude and Use of RDT

As shown in Table 4.9, a higher proportion of respondents who had good attitude about RDT used RDT compared to those who had negative attitude and there was an observed association between Attitude and use of RDT (p= 0.011).

4.9 Association between Attitude and Use of RDT

As shown in Table 4.9, a higher proportion of respondents who had good attitude about RDT used RDT compared to those who had negative attitude and there was an observed association between Attitude and use of RDT (p= 0.011).

Table 4.9: Association between Attitude and Use of RDT

Variable	Use of RDT		Total	X^2	p value
	Yes	No			
Health workers' Attitude					
Good	137(97.2%)	4(2.8%)	141(100.0%)	6.485	0.011
Poor	170(89.9%)	19(10.1%)	189(100.0%)		
Total	**307(93.0%)**	**23(7.0%)**	**330(100.0%)**		

4.10 Association between Designation and Use of RDT

From the table 4.10, the respondents who are Community Health Extension Workers used more of RDT than other professions and this was statistically significant which shows there is an association between designation and use of RDT ($p = 0.013$).

Table 4.10 Association between designation and use of RDT

Variable	Use of RDT		Total	X^2	p value
	Yes	No			
Designation					
Med Lab Scientist	23(82.1%)	5(17.9%)	28(100.0%)	10.820	0.013
Nurse/Midwife	78(87.6%)	11(12.4%)	89(100.0%)		
CHO	97(96.0%)	4(4.0%)	101(100.0%)		
CHEW	110(95.7%)	5(4.3%)	115(100.0%)		
Total	**308(92.5%)**	**25(7.5%)**	**333(100.0%)**		

4.11 Association between level of education and the use of RDT

From this table, it was observed that (92.5%) of the respondents uses RDT. Greater proportion of the respondents who had Diploma used RDT compared to with other levels of education and this was statistically significant, showing an association between Respondents' level of Education and use of RDT ($p = 0.029$).

Table 4.11 Association between level of education and the use of RDT

Variable	Use of RDT		Total	X^2	P value
	Yes	No			
Education					
B.Sc/HND	61(88.4%)	8(11.6%)	69(100.0%)	9.033	0.029
Diploma	149(91.4%)	14(8.6%)	163(100.0%)		
CHEW/CHO	96(98.0%)	2(2.0%)	98(100.0%)		
O`level	2(66.7%)	1(33.3%)	3(100.0%)		
Total	**308(92.5%)**	**25(7.5%)**	**333(100.0%)**		

4.12 Significant predictors of use of RDT

Table 4.10 shows that respondents who are Medical Lab Scientists were 7.1 times more likely to use RDT compared to those who were CHEWs, however, this observed result is statistically significant (OR= 7.148, 95% CI= 1.195-42.743, P< 0.031). Respondents who used guidelines were about 9.3 times less likely compared to respondents who did not use guideline to have used RDT. The observed association is not statistically significant (OR = 0.107; 95% CI= 0.002 – 5.365, P > 0.263).

It was observed that respondents who had poor knowledge on RDT were 1.2 times more likely to use RDT compared to those with Good knowledge. The observed association is not statistically significant (OR= 1.159, 95% CI= 0.334 - 4.024, p>0.816). Respondents who were aware of RDT were 33.3 times more likely to use RDT compared to those who were not aware and this observed association is statistically significant (OR= 33.378, 95% CI= 3.998 – 278.673, P < 0.001).

The table also shows that respondents who are in the age category 20-29years are 5.9 times more likely to use RDT than those who are 40 years and above. The observed association is statistically significant (OR= 5.937, 95% CI= 1.354–26.021, P < 0.018). It was also observed that staffs who said the staffs were inadequate were 5.8 times more likely to use RDT than those that said the staffing level is adequate. This observes association is statistically significant (OR= 5.852, 95% CI= 1.567 – 21.861, P<0.009).

Among the level of attitude, respondents who had good knowledge were 2.4 times less likely to use RDT than those with poor attitude. This observed association is not statistically significant (OR= 0.415, 95% CI= 0.107 – 1.604, P > 0.202).

Table 4.12 Logistic regression on predictors of use of RDT

VARIABLE		OR	95% CI Lower	95% CI Upper	P value
Level of knowledge	Poor	1.159	0.334	4.024	0.816
	Fair	0.607	0.137	2.686	0.510
	Good	1.000			
Level of attitude	Good	0.415	0.107	1.604	0.202
	Poor (REF)	1.000			
Availability of guidelines	Yes	0.871	0.017	44.761	0.945
	No (REF)	1.000			
Use of guidelines	Yes	0.107	0.002	5.365	0.263
	No (REF)	1.000			
Age	20-29	5.937	1.354	26.021	0.018*
	30-39	1.474	0.401	5.423	0.559
	>40 (REF)	1.000			
Awareness	Yes	33.378	3.998	278.673	0.001*
	No (REF)	1.000			
Designation	Med lab scientist	7.148	1.195	42.743	0.031*
	Nurse/Midwife	5.252	1.209	22.816	0.027*
	CHO	3.251	0.634	16.671	0.158
	CHEW (REF)	1.000			
Inadequate staffing Level	Yes	5.852	1.567	21.861	0.009*
	No (REF)	1.000			

*Significant at 5% level of significance.

CHAPTER FIVE

5.1 DISCUSSION

This study was a cross-sectional survey executed in Ibadan North, Ibadan NorthEast and Ibadan SouthEast Local Government Areas of Ibadan. It focussed basically on the health workers to determine their awareness of Rapid Diagnostic Test, the use of RDT and the factors influencing their use of RDT. The study also explores the pattern of use, the relationship between their level of awareness and use, Knowledge and use and their attitude and use.

5.1.1 Awareness of Rapid Diagnostic Test

Awareness of RDT was found to be high among the health workers. Majority of the health workers knows the meaning of RDT which was contrary to a study done in Tanzania where majority of the health workers were not aware of RDT (Holly et al, 2005). Diverse sources of information on RDT were mentioned by health workers, the commonest source of information was from their co-health workers.

5.1.2 Knowledge of Rapid Diagnostic Test

Health workers are key personnel in malaria control; they linked RDT use to care and treatment of malaria. This study showed that only 53.0% of the respondents had received formal training on the proper usage and application of RDT. This result was contrary with a study done in SouthEast Nigeria (Oghoi et al, 2014) which showed that only 30% received formal training. This result is also consistent with a study

done in Zambia where greater proportion of the health workers were formally trained (Mutinta et al. 2009). This study also showed that majority of the respondents learned how to run RDT on job. This was consistent with the study done in southEast Nigeria (Ogboi et al. 2014) where majority of the health workers learnt how to run RDT on job. Some of the health workers also said "The program officers in their various health centres don't allow them to go for any training that is organized by the state or some organizations"

Thus the overall level of knowledge of the respondents from this study shows that less than half of the respondents had good knowledge about RDT. This was in line with the result of the study done in Zambia (Mutinta et al. 2009).

5.1.3 Health workers' Attitude towards the use of RDT

HWs could play an important role in delivering health care to abandoned and displaced populations with little access to formal health services. Staff attitude towards performing RDT were assessed and it was noted that attitudes were poor for the majority of the respondents. This result was consistent with the result from a study done in Zambia (Mutinta et al. 2009). A greater number of the health workers had negative attitude toward RDT. For instance, 64.3% had poor attitude towards waiting for the strip to react thereby estimates result.

5.1.4 Use of Rapid Diagnostic Test among Health workers

An assessment of use of RDT showed that a greater proportion of the HW used RDT. This result was contrary to the finding of a study done in Zambia where greater proportion of the health workers had utilized RDT (Mutinta et al. 2009). It was observed that among the various professional who used RDT, greater proportion of them reported to have ran out of RDT. This findings was similar to the results of the study on misdiagnosis of malaria using wrong buffer substitutes for rapid diagnostic tests (Ogboi et al, 2014). This observation could be due to insufficient stock or too high demands.

5.1.5 Factors influencing the Utilization of RDT

A previous study done in Zambia has shown that various factors influences the use of RDT. This includes: staff level, staff knowledge, staff attitude, staff adequacy, use of guidelines, availability of guidelines etc. This finding is similar to this study. However in this study, age group, awareness, profession/designation, and staff levels are the predictors of the use of RDT. HWs were asked if at all they used either of the three guidelines in making decisions to perform malaria RDT and to aid them in performing MRDTs. Interestingly, the guidelines were used by majority of the healthworkers. Most of the HWs had at least one of the guidelines in the health facility and when staffs were asked about adequacy vis-a-vis performing MRDTs, less than half of the staffs said they were adequate whereas greater proportion said they were inadequate implying that they needed more persons to conduct RDT. These results were consistent to the result of the study done in Zambia (Mutinta et al, 2009).

5.2 LIMITATIONS

This is a cross sectional study, so it can only determine association, not causality. Another limitation of this study is that a structured questionnaire is used to collect data from the survey population. This can limit the responses that the people could choose from the questionnaire and do not have the capacity for in-depth answers. Also, data was gotten from 333 health workers; it is possible for individuals to argue that we could not generalize the findings to the result of the health workers in the state. The small population can be seen to limit the validity of the study. As malaria is a vast and very important topic, there some aspects were not been included in the questionnaire leaving many areas of knowledge not explored.

5.3 CONCLUSION

The use of Malaria Rapid diagnostic Test is potentially an effective alternative malaria case management in areas with limited functional microscopy and limited health care personnel or facilities. In spite the factors limiting the use of RDT, greater proportion of the health workers uses RDT. Findings from this study revealed that awareness of RDT was high and this translated in high use of RDT. The study also reveals that knowledge of RDT was low which also affected the health workers attitude to the use of RDT. In assessing the pattern of use of RDT, most of the respondents don't follow all the steps correctly according to the national guidelines on the use of RDT. Significant factors predicting the use of RDT in this study includes: age group, awareness, designation and staff level.

5.4 RECOMMENDATION

Government should increase training avenue even for health workers with prior health experience, it would go a long way to provide orientation on correct use of MRDTs and interpretation of results as this may increase utilization levels of RDT. Governments should increase sensitization among community members about RDT. There should be availability of guidelines in all health centres to allow easy decision to utilize RDT. Government should also endeavour to recruit more staffs into the health centres, this helps to reduce the malaria caseloads in health centres and help to improve access to timely and appropriate diagnosis and treatment services for malaria. Furthermore, appropriate measures should be in place to ensure that RDT are available in all health centres.

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Appendix A

Table 2.1 **Target antigens of commercially available malaria rapid diagnostic tests (Huong, et al, 2002).**

	HRP2	pLDH	Aldolase
p. falciparum specific	+	+	
Pan specific (all species)		+	+
P. vivax – specific		+	

Appendix B

Table 2.2 Characteristics of current malaria RDT tests

Characteristic	HRP2	PLDH	Aldolase
Species detected	*P. falciparum only*	*P. falciparum, P. vivax, P. ovale, P. malariae*	*P. falciparum, P. vivax*
Persistence after parasite clearance (days)	>28	<10	<10
Genetic variation	Yes	None to date	None to date*
Repeat epitopes	Yes	None	None
Sensitivity for P. falciparum (%)	95	93.2	48-80
Sensitivity for P. vivax 2000 parasites μl^{-1} (%)	Not present	78.9-98.8	15-83
Specificity (%)	95.2§	98.5§	‖
Monitor parasite clearance	No	Yes	Potential
Monitor drug efficacy	No	Yes	Potential
Prozone effect	Yes	No	No
Predict progression to severe malaria#	Potential	Not Tested	Not Tested
Diagnose severe malaria#	Potential	Not Tested	Not Tested

*Kim et al. (2012) found a point mutation in Korean isolates of P. vivax..

Abba et al. (2011).

Summary of data in the current review.

§Specificity pLDH .HRP2 (Abba et al.. 2011).

‖Insufficient data.

#ELISA-based data at present.

TELEGRAMS.....

TELEPHONE.....

MINISTRY OF HEALTH

DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION

PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. .....

All communications should be addressed to

the Honorable Commissioner quoting

Our Ref. No. AD 13/ 479/____

December, 2014

The Principal Investigator,
Department of Epidemiology and Medical Statistics,
Faculty of Public Health,
University of Ibadan,
Ibadan.

Attention: Akinyuwa Abimbola

Ethical Approval for the Implementation of your Research Proposal in Oyo State

This acknowledges the receipt of the corrected version of your Research Proposal titled: "Awareness and Utilization of Malaria Rapid Diagnostic Test among Health workers in Selected Local Governments in Ibadan, Oyo State."

2. The committee has noted your compliance with all the ethical concerns raised in the initial review of the proposal. In the light of this, I am pleased to convey to you the approval of committee for the implementation of the Research Proposal in Oyo State, Nigeria.

3. Please note that the committee will monitor closely and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of the findings as this will help in policy making in the health sector.

4. Wishing you all the best.

OYO STATE RESEARCH ETHICAL REVIE COMMITTEE
Signature & Date
MINISTRY OF HEALTH IBADAN

Sola A... (Dr.)
Director, Planning, Research & Statistics
Secretary, Oyo State, Research Ethical Review Committee

"AWARENESS AND UTILIZATION" OF MALARIA RAPID DIAGNOSTIC TESTS (MRDT) AMONG HEALTH WORKERS IN SELECTEED LOCAL GOVERNMENT IBADAN, OYO STATE.

Dear Respondent,

Good day. I am a Postgraduate Student from the University of Ibadan and I am carrying out a research on Awareness and Utilization of Rapid Diagnostic Test among health workers. Your sincere response will help me to assess the awareness and the use of RDT in Ibadan. All information disclosed will be held in high confidentiality.

I would be grateful if you participate. I agree to participate in this study ☐

Serial Number----------

SECTION A: SOCIAL DEMOGRAPHIC CHARACTERISTICS

1. Local Government Area.....
2. Age (in years): .....
3. Gender: A. Male [ ] B. Female [ ]
4. Highest Educational Qualification:
   A. B.Sc / HND[ ] B. Diploma [ ] C. CHO/CHEW [ ] D. O'level [ ]
   E. Others. please specify.....
5. Marital status:
   A. Single [ ] B. Married [ ] C. Divorced [ ]
   D. Widowed [ ] E. Others. Please specify.....
6. Ethnicity:
   A. Yoruba [ ] B. Hausa [ ] C. Igbo [ ]
   D. Others. Please Specify.....
7. Religion:
   A. Christianity [ ] B. Islam [ ] C. Traditional [ ]
   D. Others. Please Specify.....
8. Designation
   A. Medical Doctor [ ] B. Medical Laboratory Scientist/Technician [ ]
   C. Nurse/Midwife [ ] D. Community Health Officer [ ]
   E. Community Health Extension Worker [ ]
9. How long have you worked in this health facility?
   A. 0-3yrs [ ] B. 4-6yrs [ ] C. 7-9yrs [ ] D. 10yrs&above[ ]

SECTION B: AWARENESS OF HEALTH WORKERS ON RDT

10. Have you heard about RDT? Yes [ ] No [ ]

11. Do you know what RDT means? Yes [ ] No [ ]

12. Can u tell me the full meaning of RDT? Rapid diagnostic test [ ]
Rapid diagnostic tool [ ]

13. What are your sources of information on RDT? Radio [ ] Television [ ]
Magazine [ ] Health workers [ ] Friends [ ]

SECTION C: KNOWLEDGE OF HEALTH WORKERS ON RDT

14.	Have you received any RDTs training?	Yes [ ] No [ ]
15.	If yes	Formal training [ ] Sensitization only [ ]
16.	Where did you learn how to run RDTs?	On the job [ ] School [ ] Training [ ]
17.	Number of months of experience of RDT program	1-2 months [ ] 3-4 months [ ] 5-6 months [ ] 7 & above [ ]
18	Is RDT time consuming?	Yes [ ] No [ ]
19	Do Negative result mean absence of malaria?	Yes [ ] No [ ]
20	Fever (by history or feels hot or temperature 37.5^{0}c	Yes [ ] No [ ]
21	RDT should be use immediately after detecting individual with suspected malaria case	Yes [ ] No [ ]

22.	When RDT test positive, you are confirm that you are testing malaria.	Yes [ ] No [ ]
23.	Positive RDT result allow treatment with coartem	Yes [ ] No [ ]
24.	Supplying coartem to the health centre is dependent on the number of RDT positive result.	Yes [ ] No [ ]

26. What do you think are the uses of RDT?

.....

.....

.....

27. Why are RDTs important for malaria control?

.....

.....

28. What are the limitations for RDT?

.....

.....

SECTION D:HEALTH WORKERS' ATTITUDE TO RDT

Circle '1' if you "**Agree**", Circle '2' if you are "**Neutral**", Circle '3' if you "**Disagree**"

29.	RDT should be use at all time.	1	2	3
30.	RDT are better replacement for clinical diagnosis in the management of malaria.	1	2	3
31.	RDT are difficult to prepare	1	2	3
32.	The procedure is too long to follow step by step	1	2	3
33.	It is not possible to follow all the steps on the guideline	1	2	3
34.	Many RDTs shows a negative result	1	2	3
35.	Managing malaria is easier when you diagnose with RDTs	1	2	3
36.	RDT consumes time for both health workers and patients	1	2	3
37.	If malaria test positive or if unable to do test, treat with oral antimalarials	1	2	3
38.	If malaria test is negative, look for other causes of fever	1	2	3

39.	If malaria is negative and no other cause of fever is found, treat with antimalarial	1	2	3

40. When the strips react slowly, what do you do?

A. You read results earlier than the time[ ] B. Estimate time [ ] C. Wait until it reacts [ ]

SECTION E: USE OF RDT

41. Do you use RDTs? A. Yes [ ] B. No [ ]

42. How long have you been using RDTs?

A. <1yr [ ] B. 1-2yrs [ ] C. 3-4yrs [ ] D. >4yrs []

43. Do you prefer this type of diagnosis than other methods?

A. Yes [ ] B. No [ ]

44. Do you sometimes run short of RDT Tools? A. Yes [ ] B. No [ ]

45. What is/are your reason(s) for running low on RDT Tools?

A. Insufficient Stock [ ] B. Too high demand [ ] C. Not sure [ ]

46. Are staffing levels adequate to meet the daily MRDT loads and tasks?

A. Yes [ ] B. No [ ]

SECTION F: PATTERN OF USE

47. How many steps should be taken in conducting RDT?

A. 10 [ ] B. 12 [ ] C. 14 [ ] D. 16 [ ] E. 18 [ ]

48. Do you follow all the steps? A. Yes [ ] B. No [ ]

49. To what extent do you conduct MRDTs in referring to meeting all the steps?

A. Agree [ ] B. Strongly Agree [ ] C. Disagree [ ]

50. How often do you do RDT? A. Daily [ ] B. Weekly [ ] C. Monthly [ ]

51. What is the average number of MRDTs that you are able to do per day in this health centre?

.....

52. On the average, how many health workers perform RDTs on a daily basis?

A. 1 [ ] B. 2 [ ] C. 3 [ ] D. 4 [ ] E.>4 [ ]

53. How often are you supervised on RDT programs? A. Regular B. Irregular [ ]

54. If you do use RDT, what guidelines do you use to utilize malaria RDTs?

	Yes	No
A. RDT job aid guidelines		
B. RDT Intergrated Technical Guidelines (ITG)		
C. RDT Integrated Management of Child Illness (IMCI) Guidelines		

55. Which of the guidelines are available in your health facility?

Availability	Yes	No
A. RDT job aid guidelines		
B. RDT Intergrated Technical Guidelines (ITG)		
C. RDT Integrated Management of Child Illness (IMCI) Guidelines		

56. How would you rate the National guideline for the management of Malaria and Febrile patients? A.Very Useful [ ] B. Useful [ ] C. Only slightly useful [ ] D. Not at all useful [ ]

57. To what extent to you stick to the MRDT guidelines?

A. Always [ ] B. Sometimes [ ] C. Rarely [ ] D.Never [ ]

58. Depending on your experience, if the test result is positive, do you treat the person for malaria according to the national guideline?

A. Yes [ ] B. No [ ]

59. Depending on your experience, if the test result is negative, do you follow the national guidelines for management of febrile patients who have a negative test results? A. Yes [ ]

B. No [ ]

60. To what extent does your facility accept MRDT as a reliable tool?

Very much	Much	Less	Not sure

61. What do you think contribute to your level of RDT utilization?

	Yes	No
A. Inadequate guidelines		
B. Inadequate staffing levels		
C. Negative attitudes		
D. Inadequate RDT training		
E. Inadequate RDT knowledge		
F. Inadequate supervision		

Thanks for your cooperation

EPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS

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O. Akinyemi, Lecturer II

A. F. Fagbamigbe, Lecturer II

ADJUNCT LECTURER

4th November, 2014.

TO WHOM IT MAY CONCERN

RE: LETTER OF INTRODUCTION – Akinyuwa Abimbola C.

I write to introduce to you the above-named MPH (Field Epidemiology) student with matric. no. 172732 in this Department.

Akinyuwa is to carry out a study on the topic: "*Awareness and Utilization of Malaria Rapid Diagnostic Test Among Health Workers in Selected Local Government Area in Ibadan, Oyo State*" in partial fulfillment of Masters Degree in the Department of Epidemiology and Medical Statistics.

Kindly give her all necessary assistance.

Yours sincerely,

Dr. Olufunmilayo I. Fawole.

DEPT OF EPID & MEDICAL STAT.
COLLEGE OF MEDICINE
DATE 4/11/14
TIME
UNIVERSITY OF IBADAN.

Head of Health facilities

Kindly allow this U.I into your
student of U.I [illegible] facility to collect data from staff
that have skill with the use of RDT
pls, assist her

[illegible]

DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS

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Ag Head: Dr. Olufunmilayo I. Fawole

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Dr. Olufunmilayo I. Fawole

COLLEGE OF MEDICINE
DATE 4/11/14
TIME
UNIVERSITY OF IBADAN

Chief Matron
F.Y.N.O

TO/ ALL H.O.U
IB: UNIV. F.H.-GOVT.
Kindly give her all
necessary assistance.
Thanks
Folasanmi

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DEPT OF EPID & MEDICAL STAT
COLLEGE OF MEDICINE
DATE 4/11/14
TIME
UNIVERSITY OF IBADAN

M.C.H

Pls allow the MPH student Abimbola Akinyuwa to administer her questionnaire in the centre

mott 4/11/14

Appendix F

List of selected health centres in Ibadan North LGA

1) Sabo PHC
2) Obasa PHC
3) Sango PHC
4) Barika PHC
5) Bodija PHC
6) Agbowo PHC
7) Basorun PHC
8) Samonda PHC
9) Okeltunmu PHC
10) Idi Ogungun PHC
11) Oke Are Health Centre
12) Widow and Aged Clinic

Appendix G

List of selected health centres in Ibadan North East LGA

1) PHC Oje
2) PHC Akeeke
3) PHC Iwo road
4) Ayekale Health Post
5) Omowunmi PHC. Aperin
6) Ode- Aje PHC
7) Agugu Health post
8) Aremo Health centre
9) Oke Ibadan Health centre
10) Ajobo Health post, Ojagbo
11) Lagelulupejul lealt centre
12) Oranyan Health post

Appendix H

List of selected health centres in Ibadan South East LGA

1) Mapo PHC
2) Odinjo PHC
3) Oranyan PHC
4) OniyereAperin PHC
5) Owode Health centre
6) Elekuro Health centre
7) Boluwaji health centre
8) Iyana court Health centre
9) Agbongbo PHC, Agbongbon
10) Orita Challenge Health centre