FACTORS ASSOCIATED WITH MALARIA RAPID DIAGNOSTIC TEST USE AND ADHERENCE TO TEST RESULTS BY HEALTH CARE WORKERS IN IRINGA RURAL DISTRICT

By

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CERTIFICATION

The undersigned certify that he has read and hereby recommends for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation titled: **Factors associated with malaria rapid diagnostic use and adherence to test results by health care workers in Iringa rural District**, in partial fulfillment of the requirement for the degree of Master of Public Health of the Muhimbili University of Health and Aligned Sciences.

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Professor Zul Premji

DECLARATION

I, Linda C. Chatilla, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for similar or any other degree award.

Candidate's signature..... Chatilla .....

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DEDICATION

This work is dedicated to my beloved mother, my beloved husband Patrick and my children plus all my siblings for supporting me during the time of schooling.

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ABSTRACT

Background: New guidelines on malaria case management include confirmation of malaria episode using mRDT (WHO malaria report 2009). Thus mRDTs are being deployed in most endemic countries in sub-Saharan Africa including Tanzania. Use of mRDTs by HCWs and adherence to test results is thus important in order to reduce the over use of highly effective but expensive ACTs. This may lead to improved targeting of antimalarials, improved health outcome and increased patient satisfaction.

Use of mRDTs and adherence to test negative results by HCWs has shown a mixture of results in recent studies leading to inconsistent use and non adherence thus increasing over prescription of antimalarials among other things. Most studies suggests that the main factor of non use and adherence to test results for HCWs is the ambiguity nature of the guidelines, training messages which have been insisting that any fever means malaria and some senses of mistrust on the accuracy of mRDTs.

Methods: Thirty dispensaries were randomly selected to evaluate the pilot program conducted by NMCP. All HCWs found in these dispensaries were interviewed and assessment of whether they use and adhere to test results was done through review of registers. The first outcome variable was the proportion of HCWs who used mRDTs and the second outcome variable was the proportion of HCWs who adhere to test results. The chi-square statistic was used to determine association between independent variables and outcome variables.

Results: A total of 70 HCWs were interviewed to determine their knowledge on mRDT. Of these 18 were not assessed for use of mRDT as they had never prescribed. 52 prescribers were assed for use and adherence to test results. Only 39 (75%) were using mRDT and 13 (25%) never used mRDT. None of the factors was significantly associated with use of mRDT by HCWs.

Conclusion: The lesson learnt form the pilot which was done in Iringa rural was not sufficient to warrant national roll out of mRDTs. Improved supportive supervision, well defined logistics for ordering mRDTs, feed back to HCWs on what they are doing and training packages that in cooperate theories for behaviour change could increase the proportion of HCWs who use and adhere to test results.

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DEFINITION OF OPERATIONAL CONCEPTS

Health care workers who use mRDTs- In this study mean those who tested patients before they were treated for malaria.

Health care workers who never used mRDT- In this study mean those who treated patients presumptively.

Health care workers who adhere to test results- In this study defined as those HCWs who gave Alu to patients tested positive with mRDT and they did not give Alu to patients who were tested negative with mRDT.

Public facility: Government owned dispensaries and private not for profit (Mission owned)

Over prescription: Is defined as those with a clinical diagnosis of malaria and who are mRDT negative, but are empirically prescribed full dose of antimalarial.

Health care workers: Those who were doing mRDT and those who prescribed

Health care workers who have poor knowledge- Those who scored less than 10 points

Health care workers with adequate knowledge- Those who scored 11-16 points

mRDT trainer- The one who trained HCWs in dispensaries

LIST OF ABBREVIATIONS

AOR- Adjusted Odds Ratio

ACTs- Artemisinin-based Combination Therapies

ACOs- Assistant Clinical Officers

ALu- Artemether Lumefantrine

COs- Clinical Officers

DMO-District Medical Officer

HCWs-Health Care Workers

IMCI- Integrated Management of Childhood Illnesses

ILS- Integrated Logistic System

mRDTs – malaria Rapid Diagnostic Tests

MTUHA- Mfumo wa Taarifa za Uendeshaji wa Huduma za Afya

MSD- Medical Stores Department

NMCP-National Malaria Control Programme

NOs- Nursing Oficers

NMs- Nurse Midwives

PHC-Primary Health Care

PHNs- Public Health Nurses

RAs –Research Assistants

SPSS- Statistical Package for Social Sciences

WHO- World Health Organization

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CHAPTER ONE

1.0: Introduction

1.0: Background

Malaria in sub Saharan Africa is mainly caused by *Plasmodium falciparum*, the most dangerous of the four human malaria parasites (*Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae*).The main vector is the mosquito *Anopheles gambiae* complex and is widely spread across Africa. *Anopheles gambiae* is an extremely efficient vector and is the most difficult to control. In 2008, there were an estimated 243 million cases of malaria worldwide The vast majority of cases (85%) were in the African Region and malaria accounted for an estimated 863 000 deaths of which 89% were in the African region (WHO, 2009) Malaria is implicated in decreased learning capacity in children, students, and trainees in the 5-25 years age range and in loss of economic productivity in the work-force age range 15-55 years. (Kitua, 2003).

In all malaria-endemic countries in Africa, 25–40% (average 30%) of all outpatient clinic visits are due to malaria (most diagnosis is clinically based). In these same countries, between 20% and 50% of all hospital admissions are a consequence of malaria. With high case-fatality rates due to late presentation, inadequate management, and unavailability or stock-outs of effective drugs, malaria is also a major contributor of deaths among hospital inpatients.

In Tanzania Malaria is still the leading cause of morbidity and mortality. In the recent launch of "Zinduka" campaign in February 2010, his excellence the president of the United Republic of Tanzania asserted that more than 290 people, the majority of whom are children under the age of five die every day from malaria. In other words more than 10 people die every hour.

The millennium development goal on malaria is to "halt by 2015 and begin to reverse the incidence of malaria" which has been more specific by the United Nations Millennium Project's working group on malaria as "Reduce malaria mortality and morbidity by 75% by 2015 from the 2005 baseline level. One of the strategies that have been agreed is for countries to achieve coverage of more than 80% for all interventions (WHO, 2009).

The current global initiative is to increase the fight against malaria and eliminate it. As a strategy to achieve this, antimalarial treatment with highly efficacious albeit expensive artemisinin-based combination therapy (ACT) is recommended as a key strategy to reduce the public health impact of failing monotherapies in sub-Saharan Africa. (White, 2006; WHO, 2009)

For the last three quarters of the past century and since the discovery and development of chloroquine in the 1930s and 40s, the global teaching has been to treat all fevers in malaria-endemic countries as malaria thus forgoing the diagnostic process. This practice has been adopted into national and international recommendations and training manuals for health workers, especially for fever in children and the common teaching and expert messages has been 'fever equals malaria unless proven otherwise'. (Perkins and Bell, 2008). Based on this concept, global initiatives like IMCI were developed (WHO and UNICEF, 1996). Further more children in the developing world often have co-morbidity and making a single diagnosis is inappropriate. Malaria treatment in most endemic countries in Africa is based on clinical signs and symptoms due to lack of diagnostic tools in the majority of peripheral health units.

Clinical diagnosis of malaria is sensitive but not specific and most of the time results in significant overdiagnosis and overtreatment. Overdiagnosis and subsequent overtreatment of

patients as a result of clinical diagnosis can lead to increased drug pressure that may facilitate development of drug resistance (White, 2004). Overuse of the more expensive ACTs will not only put an extra heavy financial burden on malaria control programmes in Africa, but also prevent other serious causes of fever from being appropriately treated, as highlighted by Makani et al., (2003). This study was conducted at Muhimbili National Hospital in Tanzania which observed high mortality among patients admitted for cerebral malaria but with no parasitaemia. These were false positive malaria patients. Laboratory confirmation by microscopic examination remains the "Gold standard" and it is good for identifying species and parasite density among other things, but to get accurate results it needs well trained personnel, high quality microscopes and reagents and these are not available in peripheral facilities where electricity is also lacking.

The accuracy of the microscopy in routine practice is often suboptimal as indicated by the study by Ngasala et al., (2008) which assessed the impact of training on anti malarial drug prescription and health outcome at primary health care level in Kibaha and Bagamoyo and found that despite extra training and supervision provided by the study personnel, malaria microscopy accuracy did not significantly improve. In view of these shortcomings mRDTs were developed and accepted by programs as it has several advantages over microscopy and can be used in peripheral facilities. However, in expert hands microscope remains the gold standard for malaria diagnosis. The use of mRDTs is recommended as an opportunity to reduce over diagnosis in the face of increasingly expensive malaria treatment regimens. Compared with presumptive treatment, mRDTs have been reported to be cost-effective in most parts of Africa and they may be beneficial in reducing inappropriate treatment of non-malarial febrile illnesses, in particular bacterial infections (Shillcutt et al: 2008).

The use of malaria rapid diagnostic tests in malaria diagnosis is, therefore, increasing in many countries as the result of their ease of use with minimal training (Mayxay et al; 2004). The test has been widely scaled up in Asia, America and in some African countries to accompany ACTs. Despite all these advantages pertaining to mRDT use other studies have revealed that health care workers frequently ignore results, either because of ingrained treatment habits, pressure to treat from patients and family members, or doubt about the accuracy of the mRDT results (Reyburn et al; 2007). Research has shown that mRDTs achieve sensitivities and specificities of > 90% in the detection of *Plasmodium falciparum* at densities above 100 parasites/µl blood however, below this level sensitivity decreases markedly.

Health care facilities at local level often do not have adequate resources such as working microscopes or properly trained staff to be able to do parasite based diagnosis. Rapid diagnostic tests are a good alternative, providing a simple 'present' or 'absent' result for malaria. In the face of increasingly expensive malaria treatment regimens, the introduction of mRDTs in peripheral health units is being advocated as a means of avoiding over diagnosis of malaria and targeting antimarials. Compared with presumptive treatment, mRDTs have been reported to be cost-effective in most parts of Africa and they may be beneficial in reducing inappropriate treatment of non-malarial febrile illnesses, in particular bacterial infections (Shillcutt et al., 2008).

Using mRDTs to distinguish fevers caused by malaria parasites from those caused by other illnesses is important for at least four reasons;

First, ACT is much more expensive than older antimalarials such as chloroquine (CQ), amodiaquine (AQ), and sulfadoxine-pyrimethamine (SP). Instead of giving these more expensive drugs to all patients with fever, mRDTs can help target ACTs to patients who really suffer from malaria.

Secondly, many life-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 are not getting the correct treatment and leads to delays in diagnosis and death. Kallander et al.,(2008) found that of all children dying of suspected pneumonia, 52% had been given an antimalarial at home.

Thirdly, avoiding unnecessary use of ACTs on patients who do not have malaria may help prevent or delay development of drug resistance.

Finally, it helps to improve the quality of care of fever patients.

As a strategy to implement new policies, countries normally prepare diagnosis and treatment guidelines and trains health workers on how to use. Past studies have shown that health workers in developing countries often do not follow clinical guidelines (Zurovac et al., 2004; Naimoli et al., 2006)

Very little information is available on the factors that are associated with use of mRDT and adherence to test results by health care workers. These factors may lead to over-diagnosis and subsequently over-treatment of malaria. Understanding the factors associated with use and adherence to mRDT results is therefore crucial in order to design appropriate interventions to ensure cost effectiveness of mRDTs and good disease outcomes. Recently in Tanzania, the NMCP has introduced and is still rolling out the use of mRDT as a tool for parasitological

confirmation of malaria in all levels of health care. This new intervention is funded by the glob health fund. This study broadly intends to examine the factors that may impeach th operationalization of this new policy.

1.2: Problem statement

A number of studies have attempted to look into what proportion of children and adults receive antimalarials when they have no malaria. The answer has been consistent: over treatment of children and especially adults with antimalarials is substantial and even when diagnostic facilities are available, half or more of those with negative test results are still treated for malaria (Hamer et al., 2007); (Reyburn et al., 2007); (Zurovac et al., 2008);. Where diagnostic facilities are not available, the proportion of patients is even higher. Most of these studies have been done in East African countries. Studies done in Tanzania were mainly randomized controlled trials prior to national rollout of mRDTs and concentrated in the north-eastern part of the country. The major limitation to these studies is that there were observational studies looking into health workers practices thus the likelihood of health workers temporarily exhibiting the accepted behaviour in the presence of the researchers is high (Hawthorne effect).

Little information is known on the diagnostic and treatment practices following national roll out of mRDTs in all public and non for profit health facilities in Tanzania. Understanding the actual practice and the factors that affect mRDT use and adherence is therefore crucial as mRDT roll out is scaled up to the rest of the country.

Attempts to improve malaria case management with rapid diagnostics, however well implemented will have little impact if the patients are treated with antimalarials even when the test is negative. Findings by Reyburn et al; 2007 on malaria case management in an endemic country like Tanzania are not promising and implicate that mRDT scale-up in Tanzania might

not be cost effective unless clinician change their prescribing practice from clinical diagnosis to parasite based diagnosis. A number of researchers (Ssekabira et al., 2008) have suggested that intensive training to health workers decreases significantly the proportion of blood smear negative patients getting antimalarials.

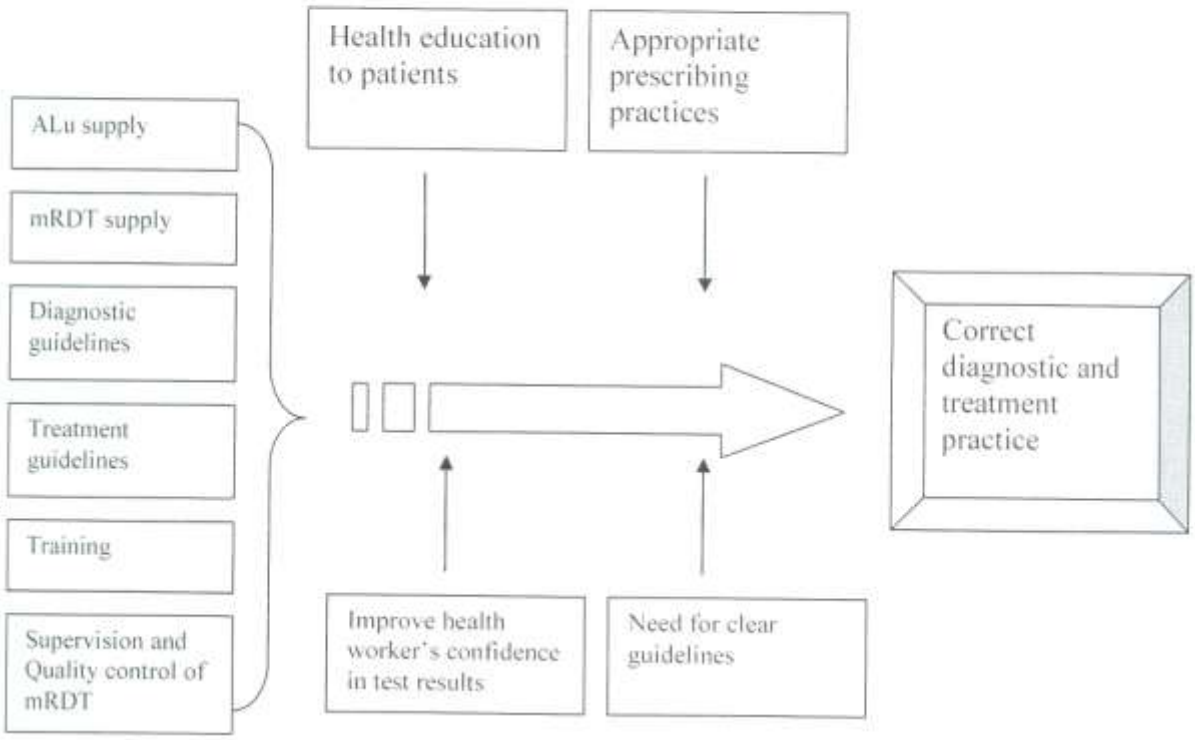
There is good body of evidence from Asia, Africa including Tanzania that in most formal health care settings ACTs are provided to a substantial proportion of patients who do not have parasites and therefore do not have malaria (Joshi et al., 2008). This has negative implications as other causes of fever which are fatal (like meningitis, pneumonia) are left untreated. However, with introduction of mRDTs there is a need at an early stage to gather evidence that prescription practices have changed and over treatment is minimized.

The fact that tests are available and used does not mean that they will change prescribing practices. Several studies have shown that malaria is still treated presumptively under various transmission settings. Despite the availability of diagnostic tools, their use and training of health care workers, malaria is still treated presumptively and (Hamer et al. 2007; Ndyomugyenyi et al. 2007; Reyburn et al. 2007; Zurovac et al. 2008). In Tanzania the NMCP has gained considerable experience to operationalize anti-malaria treatment guidelines. Improving malaria diagnosis and use of diagnostic tests has the potential to improve the management of both malaria and other causes of febrile illnesses. Basically the NMCP supplies antimalarials eg. Alu, mRDT kits, diagnostic and treatment guidelines, it also has to conduct in-service training for HCWs, supervision and quality control of mRDTs. These activities are done in order to enhance correct diagnosis and treatment practices by health care workers in health facilities. In conjunction to

these activities, there are other activities which need to be done: health education to the community and patients in particular, improving health care workers confidence especially on the face of test negative results and need for clear guidelines.

In the last 10 years, new antimalarials were introduced nationally. However, there is inadequate experience how to implement the introduction of a new diagnostic test. Thus NMCP did a pilot project first in the district with the aim to gain experience. It is important to independently verify whether the pilot was appropriately done thus justifying national implementation. The audit of the pilot has not been done and it is an essential component that needs to be done.

A robust operational research component in pilot studies to determine the factors that make health care workers to over diagnose and over treat febrile patients is therefore necessary in order to assure quality of care in real world delivery.



1.2.1: Figure 1; Conceptual framework: improving malaria case management

1.3: Rationale

The World Health Organization as well as Tanzanian malaria treatment policy now both recommends the use of ACTs as the first line drug for treatment of uncomplicated malaria. The recommendation is to use ACTs with parasite based confirmatory tests either by microscopy or mRDTs. Large scale deployment of mRDTs is indeed a great challenge and implementation requires intensive training, regular supervision and operational research to ensure successful implementation. It is crucial that quality control is implemented at all steps and clinicians be trained to manage the patients with a negative malaria test (D'Acremont et al., 2009).

Some studies have suggested that initial poor response to new diagnostic methods improves with time. But a recent study in Ghana by Evelyne et al., (2010) observed an improvement in the prescription practice following mRDT implementation only for the first three months and this was not sustained.

The findings of this study will help to better understand the current diagnostic and treatment practices in the mRDTs era and the information gathered will inform NMCP on the immediate interventions needed as they continue scaling up mRDTs in the remaining regions of the country. This will enable to enhance formulation of best training packages incorporating behavior change strategies to enhance mRDT use and adherence so as to prevent overuse of expensive ACTs and improve patient outcome.

Following adoption of the ACTs in the last 10 years and adoption of mRDT policy in recent years the Ministry of Health and Social Welfare conducted pilot studies in Iringa rural district among others so as to justify national roll out. Based on experience learnt from the pilot areas, a

rationale decision was taken to scale up RDTs throughout the country. Thus, primarily the study intends to explore whether the pilot study for introduction of mRDT was appropriately conducted.

The findings of this study will also help policy makers, donors and all stakeholders committed to combat malaria to the extent of eliminating it, to effectively plan, implement and scale up mRDT interventions in the country towards improving prescription practices guided by confirmed diagnosis. Neighboring countries like Kenya, Uganda are yet to formally introduce mRDTs and perhaps the malaria elimination strategy will have to be regional rather than national. Study findings may guide future regional policy on improving malaria case management.

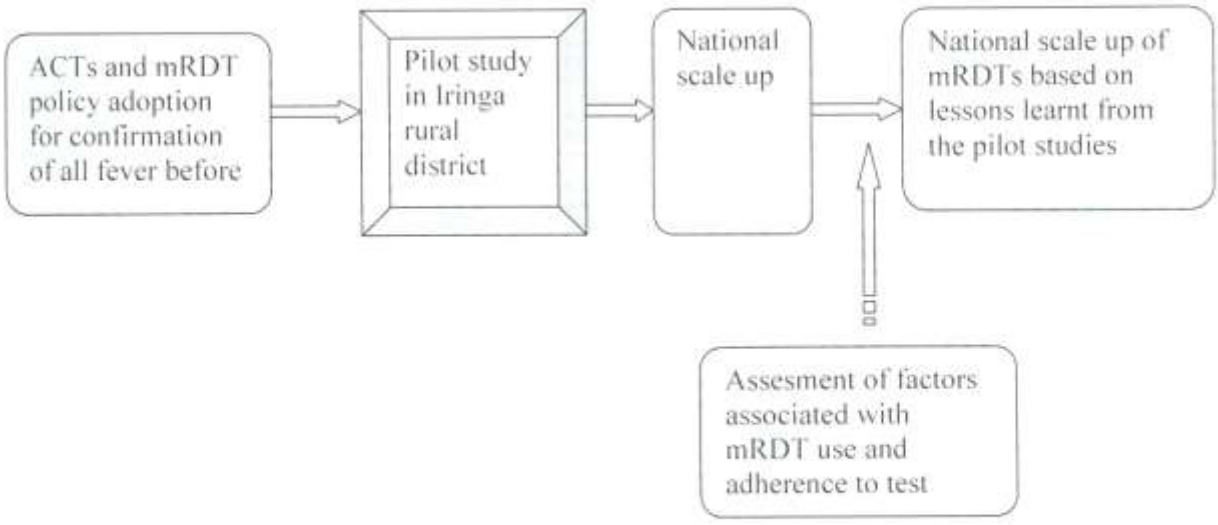


Figure 2: Diagrammatic representation of study justification

1.4: RESEARCH QUESTIONS

1. The primary research question is to find out whether health care workers have changed their prescribing practices based on mRDT results.
2. What are the factors that are associated with or influence mRDT use and adherence to treatment based on mRDT results?
3. Does knowledge on mRDT among health care workers influence use of mRDT?
4. Does training on mRDT for health care workers influence use of mRDT?

1.4.1: RESEARCH OBJECTIVES

Broad objective

To determine factors associated with malaria rapid diagnostic test use and adherence to test results among health care workers in Iringa rural district.

Specific objectives

1. To determine proportion of HCWs who are using mRDT in patients with fever
2. To determine the proportion of HCWs who adhere to test results
3. To determine the association between demographic factors and use of mRDT by HCWs
4. To determine knowledge of HCWs on mRDT in relation to use of mRDT
5. To determine the impact of supportive supervision on use of mRDT by HCWs.
6. To determine the association between availability of mRDT guideline and use of mRDT by HCWs.

CHAPTER TWO

2.0: Literature review

Attempts to change practice by implementing mRDTs in Africa have been disappointing. Studies have been done in Africa and in East Africa in particular. The picture that emerges from the literature across Africa is clear: clinicians invariably respond to positive malaria tests by prescribing antimalarials, but often respond to negative tests by ignoring them and prescribing antimalarials anyway. This practice has been associated with high mortality in patients admitted for severe disease and prescribed antimalarials unnecessarily as demonstrated by the study by Reyburn et al., (2004) on the diagnosis and outcome in people admitted with a diagnosis of severe malaria in areas with differing intensities of malaria transmission. This study involved 10 hospitals from North eastern Tanzania and found that, mortality was high (12%) in slide negative patients than slide positive patients (7%) in all age groups. The study suggested that except for children in areas of high transmission, children diagnosed and treated for severe malaria often have no parasites in their blood smears and most adults at every transmission level who are treated for severe malaria do not have laboratory evidence of disease. Many of those with severe febrile illness with no malaria parasites are also not treated with antibiotics. Findings of this study are summarized in the figure below;

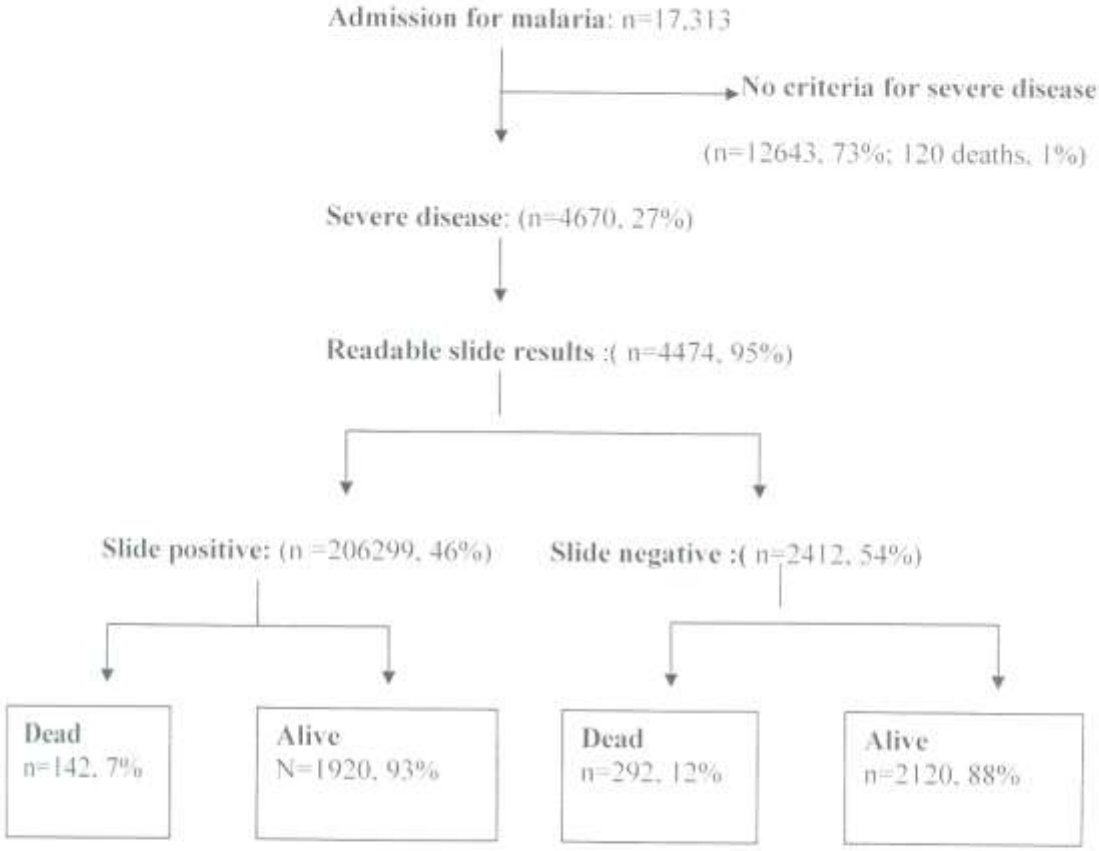


Figure 2: Flow chart showing patients admitted to 10 hospitals with diagnosis of malaria and their outcome over one year period.

The reasons for over diagnosis are multifaceted, some relate to the health facility and its management, training and supervision, individual health worker/prescriber and some to patients.

Quantitative studies exploring malaria treatment patterns suggest that clinical symptoms are not the only determinants of practice. Decision making is also based on other factors such as

consultation length (Rowe et al., 2000), time of day (Osterholt et al., 2006), number of clinicians working, patient load, clinician gender and individual facility. These studies also suggest that social factors, that are not easily measured quantitatively, may have an effect on the treatment decisions. However, most of these studies were observational and the likelihood that clinicians' practices changed due to the presence of an observer is high.

Studies have shown that there are differences in prescription practice between male and female clinicians. Chandler et al., (2008) found that male clinician gave antimalarials without antibiotics to test-negative patients significantly more often than female clinicians irrespective of age and length of training. Similarly a study in Morocco revealed that female workers were more likely to adhere to IMCI guidelines than male workers (Naimoli et al., 2006). Social behavioral studies have shown that one factor that influences provider behaviour is the community and or individual pressure (Gilson, Alilio and Heggenhougen, 1994; Ofori-Adjei and Arhinful, 1996) and the recommendation is that while emphasizing more on supervision of clinical work consideration must be given to socio-cultural context of drug use in future training programmes if rational use of drugs is to be achieved. This observation differ from the findings of a study done in 5 district hospitals in north east Tanzania which observed clinical consultations and later interviewed health care workers on their opinion about whether a patient can influence their antimalarial prescribing practice. Clinicians rarely reported to perceive patient demand as an influencing factor affecting treatment decision. Likewise patients were not observed to demand antimalarials.

A recent qualitative observational study in two district hospitals in northeast Tanzania by Chandler et al., (2008), observed that, the high proportion of antimalarial prescriptions to a febrile and laboratory unconfirmed cases followed neither clinical rationale, guidelines nor epidemiological evidence (particularly at a facility located in low transmission area), similarly the study realized that the factors responsible for malaria overdiagnosis can be grouped into four primary social spheres of influence;

- Firstly, the influence of initial training within a context where the importance of malaria is strongly promoted.
- Secondly, the influence of peers, conforming to perceived expectations from colleagues.
- Thirdly, pressure to conform with perceived patient preferences.
- Lastly, quality of diagnostic support, involving resource management, motivation and supervision.

Rather than following national guidelines for the diagnosis of febrile illness, clinician behaviour appeared to follow 'mindlines'.

A similar study by Chandler et al., (2008), based on quantitative analysis of observed clinical encounters in north east Tanzania observed 2082 consultations with 34 clinicians and found that malaria tests were requested for only 17% of patients and this decision was driven primarily by clinical symptoms. Of patients not tested for malaria 36% were prescribed antimalarials; this decision was associated with both clinical and non clinical factors. In out patients, fever was a strong predictor of presumptive treatment (AOR: 45.9, 95% CI: 30-73).The study conclude that non-clinical factors are important in the overdiagnosis of malaria and strategies to target

antimalarials and antibiotics need to address the context of clinical decision in conjunction to dissemination of clinical algorithms.

The dispensary level pilot implementation of mRDT done at Mkuranga district on evaluation of mRDT acceptance and usage by providers and patient in 2005 revealed that following introduction of mRDTs, over prescription decreased over the study period, patients and care givers expressed high degree of acceptance and satisfaction. However, the authors found that at one dispensary, during one day of the first evaluation period all staff members except one clinical staff were absent, as a result all patients on this day were treated clinically suggesting that shortage of staff may make mRDT usage impossible especially when patient load is also high (Williams et al., 2008).

Literature shows that mRDT are simple to use and needs minimal staff training to master the mechanics of test preparation and interpretation (Premji et al., 1994). However the fact that mRDTs are available and used does not guarantee their role in guiding treatment decision. The findings of the study by Reyburn et al., (2007) on malaria case management in endemic areas are less promising. Their study revealed that 90% of prescriptions for antimalarial drugs in low-moderate transmission settings were for patients for whom a test requested by a clinician was negative for malaria The study further suggested that providing quick and reliable diagnostic tools with basic training in itself, have little impact on overuse of antimalarial drugs. This observation is contrary to the findings by Chandler et al., (2008) where Clinicians who had attended two or more seminars on any topic in the past year were less likely to prescribe

antimalarials presumptively. This study also found no association between supervision and quality of treatment which is also supported by the findings by Rowe et al., (2003).

In Ghana, Ofori-Adjei and Arhinful., (1996) evaluated the impact of in-service training on clinical management of malaria for medical assistants and revealed that gains in knowledge following training deteriorated within a year and a discrepancy was observed between knowledge and practice of malaria treatment shown by over- and under-dosing of chloroquine in children and adults respectively. The overwhelming preference (85% of all cases) for injections and a high tendency towards polypharmacy (average of five different drugs per visit was found to be motivated by socio-cultural reasons and included patient demand and attitudes, prescriber self interests and stereotypes as well as the daily practical challenges of the community.

Supportive supervision is a process that promotes quality at all levels of the health system by strengthening relationships within the system, focusing on the identification and resolution of problems, and helping to optimize the allocation of resources, promoting high standards, teamwork, and better two-way communication (Marquez and Kean 2002). On going supervision is an important, often overlooked step to ensure provision of quality service and is also an excellent opportunity to provide follow up training. Traditional supervisory visits often focus more on fault finding rather than on problem solving to improve performance of HCWs. A randomized controlled trial in one of the district in southern Ghana by Evelyne et al., (2010) compared the impact of mRDTs in settings where microscopy was available and in settings where microscopy was not available. The study found that the use of mRDTs led to better targeting of antimalarials in settings where microscopy was not available but not in the

microscopy setting. The study concluded that mRDT has very little impact in areas where microscopy is available as people find there is no point using them. however it was seen that using rapid diagnostic tests is likely to achieve its greatest impact only if accompanied by training and supervision tailored to the users and informed by social science studies. Similarly a study in Burkina fasso found that more than 80% of patients with mRDT negative test were prescribed antimalarials (Bisoffi et al., 2009).

Clinical practice guidelines have been in use for thousands of years during the entire history of medicine. A guideline is a document with the aim of guiding decisions and criteria regarding diagnosis, management and treatment in specific areas of health care. Many countries use evidence-based clinical practice guidelines to help health workers assess, diagnose and treat children with conditions like malaria, pneumonia and diarrhoea. To implement guidelines, a common strategy is to provide health workers with in-service training; many studies have shown that despite training, health workers often do not follow guidelines. (Nicholas et al., 1991; Igun, 1994; Paredes et al., 1996; CDC, 1998; Zurovac et al., 2004; Naimoli et al., 2006). Thus clinical practice guidelines have known to have had limited effect on changing physician behavior. Similary D'Acremont et al; (2007), suggested that confusing messages from the WHO and ambiguous messages provided by the experts and the national guidelines on how to respond on the result of malaria test could be a reason for increased over prescription of antimalarials. The author further suggested that training messages should not be based on beliefs and fear but should be updated using current evidence. This is of concern especially for children under 5 years and may increase the likelihood of missing other alternative causes of fever given the decreased pattern on malaria prevalence in endemic countries.

One of the theories for behavior change is the trans-theoretical model. In this model, behavior change has been conceptualized as a five-stage process or continuum related to a person's readiness to change: pre-contemplation, contemplation, preparation, action, and maintenance. People are thought to progress through these stages at varying rates, often moving back and forth along the continuum a number of times before attaining the goal of maintenance. Therefore, the stages of change are better described as spiraling or cyclical rather than linear. In this model, people use different processes of change as they move from one stage of change to another. Efficient self-change thus depends on doing the right thing (processes) at the right time (stages). According to this theory, tailoring interventions to match a person's readiness or stage of change is essential. For example, for people who are not yet contemplating becoming more active, encouraging a step-by-step movement along the continuum of change may be more effective than encouraging them to move directly into action.

CHAPTER THREE

3.0: Methodology

3.1: Study area

The study was conducted in Iringa rural district-Iringa region. The district has an area of 20,576 square kilometres of which only 9857.5 square kilometres are habitable whereas the rest are occupied by either national parks, Forests, rocky mountains or and water. The topography varies significantly within the district. The district's rainfall is fairly typical of the tropical region and is largely bi-modal with 'short rains' in certain parts starting from September to October and 'long rains' in November/May, a peak in March. The average annual rainfall varies from year to year and between zones but generally is between 500 – 2700 mm annually.

All over the district, the dry period extends from June to October. The average annual temperature is typically 150 ^{0}C in hilly areas. Extremes are in June and July that is below 15^{0}C but 30^{0}C in lowlands.
The district malaria transmission is between low-moderate and the prevalence of malaria in the district approximated at 34% according to the district Council Comprehensive Health Plan 2010/2011. The public facilities receive Alu and mRDTs through the essential drug program –kit system from MSD, a semi autonomous institution located in part under the Ministry of Health. Apart from mRDTs some dispensaries (mission) have microscopes but are sometimes not used because of lack of experts or being damaged.

Prior to national rollout of mRDTs, the NMCP conducted field evaluation of mRDT implementation as part of the pilot and thus trained HCWs (CHMTs) from health centers within the district from 16th-17th April 2009 and there after mRDTs were introduced in the respective

health centers as part of the pilot. Follow up was done for two months. The CHMTs later conducted a two days training for HCWs from the dispensaries centrally at Ifunda. Two HCWs were trained from each health facility, the clinical officer and a laboratory assistant (or any other staff where the laboratory assistant was not available). The two HCWs trained rest of dispensary staff on site. The training was aimed at familiarizing HCWs with a new guideline on malaria diagnosis and treatment by using mRDT. Based on lessons learnt from the pilot, mRDTs were scaled up nationally starting with Iringa Region.

3.2: Target population

The target population was health HCWs who do mRDT and prescribers who were available at the dispensary at the time of the study.

3.3: Sample selection

3.3.1: Selection of dispensaries

This was done through random selection of 30 dispensaries which constituted 50% of the total dispensaries available in the district

3.3.2: Selection of health care workers

These were not selected instead all health care workers that were found in the selected dispensaries were interviewed. About 70 health care workers were involved in this study.

3.3.3: Inclusion criteria for dispensaries

All public dispensaries receiving ALU from MSD which also performed mRDT were included in the study.

3.3.4: Exclusion criteria for health facilities

The study excluded all private-for-profit dispensaries that were not receiving ALU from MSD and were not doing mRDT.

3.3.5: Sampling procedure for dispensaries

Names of all dispensaries were written on pieces of folded and put in a box. Then researchers shake a box and picked one piece of paper and recorded the selected dispensary. To allow equal chances for each dispensary to be selected, the piece of paper selected at the beginning was put back into the box and another one was picked until when 30 dispensaries were picked.

3.4: Study design

The study was cross sectional analytical, facility based study involving HCWs working in public dispensaries in Iringa rural district. The study was mainly focused on identification of factors associated with mRDT use and adherence to test results by HCWs when they attend patients suspected to have malaria.

3.5: Data collection methods: Tools and techniques

The study used quantitative methods in data collection.

3.5.1: Interviews

This involved an interviewer administered structured questionnaire with both open and closed ended questions. The unit of observation was taken to be the number of health care workers and

not the number of health facilities. Interviews were done after an informed written consent of the health care worker. Each health care worker was interviewed independently and responses were recorded by a researcher. Questions were designed to explore information on mRDT training of health care workers, supportive supervision, socio-demographic characteristics as well as questions for testing provider's knowledge on basic facts about mRDT.

3.5.2: Archival data

This data was obtained from out-patient registers (MTUHA book 5 or ILS) and was used to explore information on patients treated for malaria, mRDT use and adherence to test results by HCWs. Laboratory registers were also used to prove whether patients treated for malaria were tested or not.

3.5.3: Observation checklist

A facility checklist was used to gather information on facility variables like availability of mRDT kits, availability of mRDT report forms and availability of mRDT guideline.

3.6: Study variables

3.6.1: Independent variables

Main independent variables were demographic factors, knowledge of HCWs on mRDT, availability of mRDT guideline at a dispensary and supportive supervision. These variables were then tested for an association with the outcome variable.

3.6.2: Outcome variables

The first outcome variable was the proportion of HCWs who were using mRDTs to test patients suspected to have malaria.

The second outcome variable was the proportion of health care workers who were adhering to mRDT test results.

3.7: Plan for data collection

3.7.1: Permission to proceed

Muhimbili University of Health and Allied Sciences provided a letter of Permission to be able to carry the study in the district. Before carrying out the study permission was obtained from the relevant authority the District Executive Officer (DED) and the District Medical Officer.

3.7.2: Recruitment of research assistants

The principal investigator recruited one research assistant from the district to assist in data collection from the facility under study.

3.7.3: Training of research assistant

Training was done on the following; objectives of the study, overview of data collection process, key information to take from registers, obtaining consent, interviewing skills, and assuring confidentiality.

3.7.4: Pre-testing of research instruments

This was done in one of the municipal dispensary situated a bit far from the municipality in order to test the clarity of questions and study logistics. This helped a researcher and a research assistant to exercise flexibility in the wording of questions. Five interviews were done during pre-testing exercise.

3.7.5: Data collection tasks

Data collection process took two weeks. In the field, interviews were done by the principle investigator and research assistant. Interviews were done first then followed by documentary review of registers and filling of an observation checklist.

3.8: Plan for data processing and analysis

After field work data was entered in SPSS version 13 following the coded responses. Analysis of the data using contingency tables according to the study objectives was done where by the chi square test was used to compare for two proportions. Results were considered significant if the P-value was less than 0.05.

3.8.1: Measurement of use of mRDT by a health care worker

From the outpatient register, each health care worker was assessed for use of mRDT by reviewing 10 prescriptions for patients treated for malaria in the last three months. These patients were then assessed on whether they were tested with mRDT or not by reviewing the laboratory register. Health care workers who tested at least one patient were referred to as using mRDT at some point.

3.8.2: Measurement of adherence to test results

Adherence by a health care worker was measured by considering the proportion of patients who were treated based on test results out of the total number who were tested. The total score was 100. HCWs who scored 0 were termed as not adhering, those who scored 1- 99 were termed as adhering occasionally and those who scored 100 were termed as adhering always.

3.8.3: Measurement of knowledge of health care workers

Questions that measured knowledge were extracted from the mRDT training guideline which was previously used by the trainers and were of five types: knowledge of fever management in children, testing procedures, safety precautions, interpretation of test results and treatment decisions based on results with a total of 16 questions. Each question contributed one point to the overall score. The score was stratified into two levels, 0-10 representing poor knowledge and 11-16 representing adequate knowledge.

3.9: Ethical clearance

Ethical clearance was obtained from Muhimbili University of Health and Allied Sciences Research and Publication Ethical Committee.

Permission from the District Executive Director (DED) and the DMO was sought. Informed consent (verbal/written) from study participants was sought. No invasive procedure was done and it was a voluntary participation. Confidentiality was maintained. Study objectives, methodology and benefits were explained to those who agreed to participate. All HCWs consented and were interviewed. Participants were assured of confidentiality by assigning them with numbers instead of names.

CHAPTER FOUR

4.0: Results

In this survey a total of 30 dispensaries were selected randomly and visited. This constituted 50% of the total dispensaries in the district. Twenty two dispensaries were government owned and 8 were faith based (mission). In these dispensaries, 70 HCWs were found on site at the time of data collection and they were all interviewed. The findings are arranged according to objectives of the study and consist of demographic characteristics of the HCWs and results of the audit. The demographic characteristics of the HCWs are shown in table 1.

Table 1: Characteristics of HCWs in the visited dispensaries.

Characteristic	Categories	Government n =22	%	Faith based n=8	%	Total n=30
Age	21-40	25	67.6	12	32.4	**37**
	41-65	26	78.8	7	21.2	**33**
	Total	**51**	**72.9**	**19**	**27.1**	**70**
Sex	Males	17	81	4	19	**21**
	Females	34	69	15	31	**49**
	Total	**51**	**72.9**	**19**	**27.1**	**70**
Work experience in years	<10	18	72	7	28	**25**
	11-20	16	66.7	8	33.3	**24**
	21+	17	81	4	19	**21**
	Total	**51**	**72.9**	**19**	**27.1**	**70**
Education level	Primary	23	82.1	5	17.9	**28**
	Secondary	28	66.7	14	33.3	**42**
	Total	**51**	**72.9**	**19**	**27.1**	**70**
mRDT trainer	NMCP	2	100	0	0	**2**

	CHMT	33	73.3	12	26.7	**45**
	Workmates	15	71.4	6	28.6	**21**
	Others	1	50	1	50	**2**
	Total	**51**	**72.9**	**19**	**27.1**	**70**
Qualification of a health care worker	COs and ACOs	17	77.3	5	22.7	**22**
	NOs and AMO	2	50	2	50	**4**
	NMs and PHNs	9	90	1	10	**10**
	Dental therapist	1	100	0	0	**1**
	MCHA	5	71.4	2	28.6	**7**
	Medical attendants	14	82.4	3	17.6	**17**
	Laboratory assistants	3	33.3	6	66.7	**9**
	Total	**51**	**72.9**	**19**	**27.1**	**70**

Age of HCWs was balanced within the two age groups and there were more females than males. Majority of HCWs had < 20 years of working experience. More than half of respondents had completed secondary education.

Majority (94%) were trained on mRDT by the CHMT and their fellow staff on the job. Professional qualification constituted mainly clinical officers, nurse midwives and medical attendants.

4.1: HCWs who used mRDT

Of the 70 HCWs who were interviewed, 18 (25.7%) did not prescribe at any point in time. Therefore use of mRDT was assessed on 52 HCWs only .Of the 52 HCWs, 13 (25%) HCWs prescribed antimalarials to patients without testing/requesting mRDT. 39(75%) prescribers had tested/requested mRDT before prescribing at some point, thus the results for adherence was

based only on 39 HCWs. It appears that 75% of HCWs used mRDT irregularly and the rest never used.

4.2: HCWs who prescribed Alu based on mRDT results

Of the 39 (75%) HCWs who used mRDT at some point, 27 (69.2%) adhered occasionally, 8 adhered always and 4 (10.3%) never adhered.

Table 2: Association between demographic characteristics and use of mRDT

Characteristic	Categories	mRDT use					Significance
		never used		Used		Total	
		n	%	N	%	n	
Age	21-40	4	16	21	84	**25**	χ^2=2.080 P=0.149
	42-65	9	33.3	18	66.7	**27**	
	Total	13	25	39	75	**52**	
Sex	Males	4	23.5	13	76.5	**17**	χ^2=0.029 P=0.864
	Females	9	25.7	26	74.3	**35**	
	Total	**13**	**25**	**39**	**75**	**52**	
Qualification of health care provider	COs and ACOs	4	19.0	17	81.0	**21**	
	NOs and AMOs	3	75	1	25	**4**	χ^2=8.815 P=0.117
	NMs and PHN	3	33.3	6	66.7	**9**	
	MCHA	2	40	3	60	**5**	
	Medical	1	9.1	10	90.9	**11**	

	attendants						
	Total	**13**	**25**	**39**	**75**	**52**	
mRDT trainer	NMCP	1	50	1	50	2	χ^2=7.388 P=0.061
	CHMT	5	14.7	29	85.3	34	
	Other workmates	6	40	9	60	15	
	Others	1	100	0	0	1	
	Total	13	25	39	75	52	
Work experience (years)	<10	3	17.6	14	82.4	17	χ^2=0.728 P=0.393
	11+	10	28.6	25	71.4	35	
	Total	**13**	**25**	**39**	**75**	**52**	

Table 2 summarizes that majority of HCWs in each demographic characteristic were using mRDT, however none of the demographic characteristic was significantly associated with use of mRDT (P>0.05).

4.3: Level of knowledge of HCWs in relation to use of mRDT

Table 3: Association between knowledge of HCWs and use of mRDT

Knowledge level			mRDT use					
			Never used		Used		Total	
	n = 70	%	n	%	N	%	n	Significance
Poor	14	20	4	40	6	60	**10**	χ^2=1.486 P = 0.223
Adequate	56	80	9	21.4	33	78.6	**42**	
Total	**70**	**100**	**13**	**25**	**39**	**75**	**52**	

Majority (80%) of respondents had adequate knowledge on mRDT. Knowledge of HCWs was not significantly associated with use of mRDT (χ^2 =1.486, P>0.05). However majority of those with adequate knowledge were using mRDT.

Table 4: Supervision and availability of mRDT guideline as compared to use of mRDT

		mRDT use					
		Never used n	%	Used n	%	Total n	Significance
Supportive supervision	Not supervised	8	22.2	28	77.8	**36**	χ^2=0.481 P=0.488
	Supervised	5	31.3	11	68.8	**11**	
	Total	**13**	**25**	**39**	**75**	**39**	

Availability of mRDT guideline	Not available	4	36.4	7	**63.6**	**11**	χ^2=0.961 P=0.327
	Available	9	22.0	32	**78.0**	**41**	
	Total	**13**	**25**	**39**	**75**	**52**	

Table 4 shows that supervision and availability of mRDT guideline at a dispensary had no significant association with use of mRDT (P>0.05). More than half (68%) of HCWs who were supervised and those who were not supervised (77.8) used mRDT and like wise majority (78%) of HCWs in facilities with mRDT guideline and those not having a guideline (63.6%) used mRDT.

Further findings

4.4: There were two open ended questions which were asked and the responses for each are presented below;

Question 1: What is still not known to you about mRDT?

About 33 (47%) HCWs who responded to this question said that there is nothing they don't understand but the rest 37(53%) mentioned the following points;

1. "We test patients and tell them they don't have malaria but they go to town and come to tell us that they tested and got positive results"

2." I don't understand why we are getting so many negatives, we got only two since January".

3. "We have borellia in our area and we can't see borellia with mRDT so we are afraid of missing borellia cases if we rely on mRDT only"

4. "The mechanisms for ordering are not known, we don't have even a code number for ordering mRDTs, we always face shortages "

5. "They are not available, even when you go to the DMO you just get one or two boxes, patients are asking why they are not tested as they were told previously that they will never be treated for malaria without being tested"

6. "I wonder why previously when we started it was not detecting, but now at least we can see few positive results"

7. "It does not differentiate parasite species; it detects only *plasmodium falciparum* so we can miss patients who have other parasites"

8. "It is of low quality, it does not detect parasites and myself I don't use it"

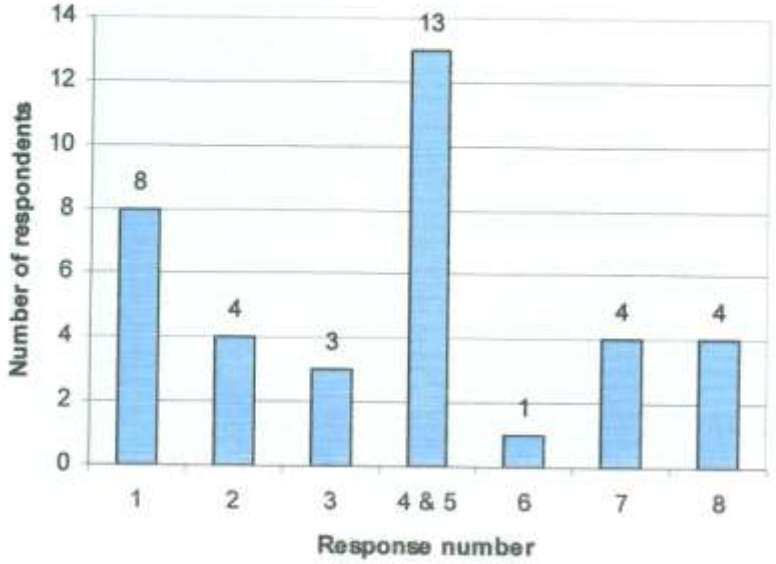


Figure 1: Responses for question 1

Figure 1 shows that majority of respondents argued that the mechanism for ordering mRDT was not well defined to them and that mRDTs were not available. Likewise responses imply that there was a contradiction on validity of results for patients and HCWs as patients who tested negative at a dispensary went for testing again in town and came with positive results.

Question 2: Reasons for prescribing Alu to patients >5 years when mRDT is negative.

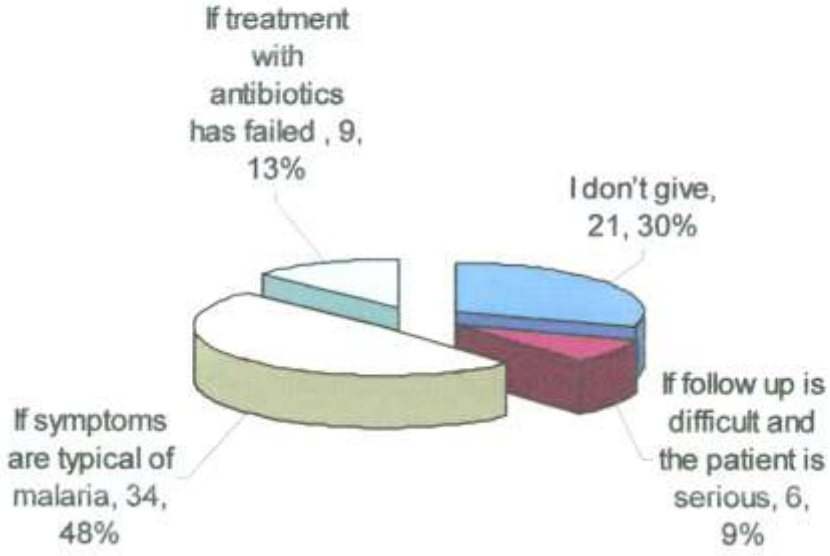


Figure 2: Reasons for prescribing ALu to test negative adults

Figure 2 shows that majority of HCWs mentioned that they could still prescribe Alu for adults even if the test was negative if the patient had symptoms typical for malaria, if treatment with antibiotics had failed and if follow up could be difficult given that the patient was serious.

CHAPTER FIVE

5.0: Discussion

Tanzania is perhaps the first country in sub-Saharan Africa to introduce mRDT on a large scale country wide for confirmatory diagnosis of malaria (NMCP., 2010). A rationale decision was taken to first pilot the implementation in Iringa rural district and then roll out the program through out the country. Therefore this current study was mainly looking into the implementation of the pilot specifically the aim was to assess if the pilot was done properly to warrant national rollout. Thus the main question this study addresses is the justification to rollout based on lessons learnt from the pilot survey. If the pilot was not done appropriately the lessons learnt will not enable large scale deployment to succeed.

The study involved 30 public dispensaries with a good representation for both government and mission. Most HCWs who were involved were also representative of all cadres that are found at primary health facilities. Majority of them were females and this could be because the lower cadres like nurse auxiliaries, nurse midwives and medical attendants are usually possessed ny females. Majorities were trained on mRDT and this might be because health workers who were not trained centrally had an opportunity to learn from their colleague on the job. Most of them had completed secondary education. Likewise most of them had enough work experience as some were retired staff brought back on job.

5.1: Use of mRDT and adherence to test results by HCWs

This study documents that; implementation of mRDTs in Iringa rural did not change prescription practices as accepted and this may be due to behaviour of treating every fever as malaria. As far as use of mRDTs is concerned HCWs can now be categorized into two groups; those who never use and those who use occasionally. For those who use mRDTs non adherence to test negative patients is still a problem. Despite the fact that mRDTs were not regularly available at health facilities, this study suggest that the reason for non use was not because mRDTs were not available as data were taken at times when the facility had mRDTs in place. This observation suggests that the fact that mRDTs are available does not mean that they will be used in decision making.

Inconsistence in mRDTs use and adherence especially for children < 5 years could be because the guideline gives room for HCWs to prescribe antimalarials under certain circumstances (NMCP 2010), but generally it appears that majority of HCWs decisions were still guided by clinical symptoms rather than test results. Similar observations were also made by Chandler et al., 2008 during an observational study for outpatient and in patient consultations in north east Tanzania. Another reason could be perceptions on validity and mistrust of the test by HCWs. Patients also have a similar mistrust since when mRDT is negative they go else where for blood slide which is positive (Allen et al., 2010). This observation was similarly found in a recent qualitative trial in Ghana which was conducted in a similar setting like ours-rural district (Chandler., et al., 2010).

Among prescriptions that were reviewed, it was revealed that HCWs were more responsive to test positive results and definitely prescribed an antimalarial for all patients with a positive mRDT, however a good number prescribed an antimalarial to patients with negative results. A similar trend also was found in a randomized trial in rural Burkina fasso (Chandler et al., 2010). Reybman., et al 2007 also observed that children aged under 5 were more likely to be treated with an antimalarial drug if they tested negative by mRDT than if they tested negative by routine microscope which also explains HCWs questions on accuracy of mRDTs.

5.2: Demographic characteristics and use of mRDT

Education level of HCWs was so low, the findings suggests that a good number had just acquired primary education. This does not imply that they just ended there and get employed but a good number had gone through upgrading courses. However this study found no association between any demographic factor and use of mRDT. This finding is different from the finding in Morocco where female HCWs were more likely to adhere to IMCI guidelines than male HCWs (Naimoli., et al 2006).

5.3: Malaria Rapid Diagnostic Test training

Majority of HCWs that were using mRDT and those that were not using were trained. There was no significant association between use of mRDT and training. Although HCWs were trained for only two days by the CHMTs and the rest were trained by their colleagues on site, fewer numbers of days for the training and the type of the trainer can not explain the observed inconsistence in use of mRDT by HCWs. The study which was done by Msellem et al., 2009 on malaria case management by mRDTs in Zanzibar supports this point as it revealed that after

training of enrolled nurses for only one day, use and compliance to mRDT results for patients of all ages was very high as most RDT-negative patients were not treated for malaria. The observed difference between Msellem and colleagues study and this study could be explained by the fact that in their study research assistants were also prescribers having to record their own prescribing behaviour (self report bias) which also may have influenced their decisions or it could be because HCWs in Zanzibar knew the epidemiology of malaria in their area (<1% prevalence) and there fore were more likely to adhere to negative mRDT results. The guideline for malaria treatment in Zanzibar unlike the one in Tanzania does not give room for HCWs to treat presumptively children less than 5 years of age which could also be a reason for increased compliance after training.

In the coastal districts of Tanzania (Kibaha and Rufiji) a randomized controlled trial at PHC facilities by Ngasala et al., 2008 assessed the impact of training in clinical and microscopy diagnosis of child hood malaria, on antimalarial drug prescription and health outcome at primary health care level and suggested that the relatively short training period contributed to the observed shortcomings.

5.4: Knowledge of HCWs in relation to use of mRDT

Majority of HCWs had adequate knowledge on mRDT but it was not significantly related to mRDT use and therefore it could be suggested that knowledge does not change behaviour but without action knowledge is useless as it is unlikely to achieve the intended goal, likewise action without knowledge is even dangerous. The findings of this study supports one of the theory for behavior change that behaviour change occurs stage wise and different people may be at different stages of change. As it was revealed that some HCWs have not changed anyway (treat

presumptively, some showed a partial change but promising a good number (although not significant) have changed totally.

5.5: Supportive supervision and use of mRDT by HCWs

This study was done a year after national roll out and data collection was done from 8th -23rd June 2010. The study revealed that majority of HCWs were not supervised on issues of mRDTs for the last two quarters (January-June 2010), except for few health facilities where there was an ongoing research work on quality control of mRDTs health care workers reported to be supervised at least once. Frequent stock outs of mRDTs was the main complain of most HCWs as the mechanism for ordering were not well defined. For health care workers who reported to be supervised there was no evidence of the written comments for such supervision was in MTUHA book 2, the 6th table) except a signature in the visitors book. This brings a question on the quality of supervision. Lack of impact of supportive supervision on use of mRDTs by HCWs observed in this study is contrary to the findings by Ssekabira et al., 2008 in Uganda where following intensive training of 6 days for clinical officers, nurses and midwives, there was a potential improvement in some aspects of malaria case management, where the proportion of patients suspected of having malaria referred for laboratory confirmation increased significantly. However the successful findings in Uganda might be because intensive training was followed by regular supportive supervision of HCWs

5.6: Availability of mRDT guideline and use of mRDT by HCWs

Clinical practice guidelines are "systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances (Field and Lohr,.1990). Although most health facilities had a guideline available at the time of the study, there was no significant association between availability of a guideline and use of mRDT by HCWs. The observed lack of association could be because clinicians always follow mind lines rather than guidelines and one of the primary social spheres of influence on malaria over diagnosis is quality of diagnostic support involving resource management, motivation and supervision as evidenced in the study by Cabana., et al., 1999.

The findings of the pilot implementation of mRDTs which was done in Mkuranga in 2005 in (Williams et al., 2008) came up with important observations that need attention prior to national rollout of mRDTs, some of which were:

a) Ensuring effective distribution and management systems b) Appropriate instructions for staff with low levels of literacy assuming that level of supervision will be minimal c) Quality assurance and control systems particularly considering the likelihood that the mRDTs will be stored in less than ideal settings. Based on the findings of this study, supervision and quality assurance of mRDTs is still a problem as evidence by one clinical officer commented that **"Currently we are not testing patients as mRDTs had expired since February and i wrote a letter to the DMO but they have not come to take them",** the researcher observed that there was a box full of mRDTs which were not yet expired. The findings also could be explained that the NMCP did not work properly on the findings from the pilot as most health care workers

complained on frequent stock outs of mRDTs and if this is not solved soon, patient satisfaction that was reported in the previous studies is unlikely to be sustained.

5.7: Study strengths

This study has several strengths; the practice of health care workers was obtained through record review of past records so it is free of 'Hawthorn's effect' commonly affecting observational studies. Also the sample size for health care workers was representative enough given less number of staff that is available at primary health care facilities. The use of archival data also adds strength to this study.

5.8: Study limitations

Poor record keeping at health facilities which made data collection difficult.

Unavailability of staff in place of work at the time of data collection leads to wastage of time.

The study could not asses the impact of introducing mRDT on amount of Alu prescribed and the trend in malaria specific mortality.

The study could not establish the impact of use of mRDT on prescription of antibiotics.

CHAPTER SIX

6.0: Conclusion, recommendations and future research

6.1: Conclusion

The lesson learnt from the pilot in Iringa rural district was not sufficient enough to warrant national roll out of mRDTs. Although mRDTs have been reported to have several advantages like increasing patient satisfaction and improving health outcome, when introduced with a limited supporting package and inefficiency of the system to ensure sustainability in the availability of mRDTs it brings about contradictions and confusions to HCWs and patients. Patient satisfaction that was previously reported as one of the positive impact of introducing mRDTs is likely to perish in the long run. It appears that national roll out of mRDTs took place too early without enough evidence on the logistics for supply, monitoring and quality assurance. Despite the small number of HCWs who had confidence in the face of negative mRDT results, it suggests that presence of a supporting package and feedback for results of quality control of mRDTs could motivate more staff and increase the number of HCWs adhering.

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