OUTCOME OF TRAINING ON HEALTH WORKERS' KNOWLEDGE AND PERCEPTIONS OF CURRENT ANTI-MALARIAL TREATMENT POLICY AND PRESCRIPTION PATTERN IN IBADAN METROPOLIS

BY

ASOGWA, NWABUEZE THANKGOD

B.Sc BIOCHEMISTRY/MICROBIOLOGY (UNN)

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DEDICATION

This work is dedicate to the Ancient of days, God Almighty from whom all wisdom flows for his unequaled love, care, provisions and protection throughout this project period. Lord, I am grateful!

ABSTRACT

Malaria is a major public health issue in Nigeria. Despite the existence of a national malaria response and the National Antimalarial Treatment Policy (NATP), the prevalence is still high. Health workers have pivotal roles to play in the implementation of this policy but their knowledge of the policy has not been adequately assessed. Hence, information on health workers' knowledge and perception of the policy and pattern of antimalarial prescriptions would enhance health workers adherence to treatment policy. This study was designed to investigate the outcome of training on health workers' awareness, knowledge of current treatment policy, perception and prescription pattern of anti-malarial medicines in Ibadan Metropolis.

A quasi-experimental design was used for this study. Sixty participants (Nurse/Midwives, Community Health Extension Workers/Officers & Pharm.Tech/Assistants) were purposively selected from primary health care facilities in two Local Government Areas (LGA) in Ibadan Metropolis. Ibadan North West was the experimental group while Ibadan South East was the control. The training content was on awareness and knowledge of current treatment policy; perception and prescription pattern of anti-malarial medications. Data were collected using a pretested, interviewer-administered questionnaire; with questions on socio demographic characteristics, awareness, knowledge of the current NATP; perception and antimalarial prescribing patterns. Respondents' knowledge was measured using a 66-point scale consisting of identification, rationale and management of malaria using the NATP. Knowledge scores <33 and ≥33 were rated as poor and good, respectively. Data were analysed using descriptive and inferential statistics at $p = 0.05$.

Most respondents (93.8%) were female and over 40.0% were above 40 years of age. About 46.0% were Community Health Extension Workers, while 6.0% were Nurses. Awareness of the current antimalarial treatment policy was 87.5% and 76.7% at pre-intervention compared to 100.0% and 98.3% at post intervention among the experimental and control. Almost all the respondents in the experimental and control had heard about Arthemisinin Combination Therapy (ACT) pre and post intervention. At post-intervention, 75.0% and 3.6% of respondents in the

experimental and control groups indicated that Arthemeter Lumefantrine was the current medicine for malaria treatment compared to 5.0% and 0.0% at pre-intervention. Respondents' knowledge increased from 52.5% (47.2±7.5) at baseline to 100.0% (63.1±95.6) in the experimental group while there was a decrease in knowledge in the control group from 70.0% (50.8±12.6) to 60.7% (47.2±7.9). Arthemeter Lumefantrine was most preferred (78.1%) as the first line antimalarial medicine at post-intervention than at pre-intervention (17.5%) in the experimental group. Prescription pattern of antimalarial medicines among health workers across all ages was not in line with the policy recommendations.

There was increase in knowledge of anti-malaria policy among health workers in Ibadan metropolis. However the prescription panern of Artemisinin-based Combination Therapy was not in line with the policy recommendation. Therefore more training to enhance correct anti-malarial prescription pattern among health workers is recommended.

Keywords: National anti-malarial treatment policy, Artemisinin-based Combination Therapy. Prescription pattern, Health Workers

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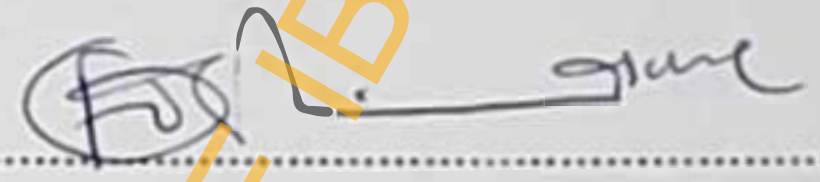
CERTIFICATION

I certify that this study was carried out by Nwabueze ThankGod ASOGWA in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.



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SUPERVISOR

FREDERICK O. OSIHNAME

MPH (Ibadan), MA (CWRU Cleveland), Ph.D. (Ibadan)

Senior Lecturer

Department of Health Promotion and Education,

Faculty of Public Health, College of Medicine,

University of Ibadan, Nigeria.

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ABBREVIATION

AL	-	Artemeter-Lumefantrine
SP	-	Sulphadoxine-Pyrimethamine
AA	-	Artesunate-Amodiaquine
WHO	-	World Health Organisation
UNICEF	-	United Nations Children Fund
NDHS	-	National Demographic Health Survey
FMOH	-	Federal Ministry of Health
OSMOH	-	Oyo State Ministry of Health
FDC	-	Fixed-dose combination
STGs	-	Standard Treatment Guidelines
CQ	-	Chloroquine
ITN	-	Insecticide Treated Net
*P*fHRP2	-	*P. falciparum* Histidine-Rich Protein-2
CHO	-	Community Health Officer
CHEW	-	Community Health Extension Worker
VHW	-	Village Health Workers
J-CHEW	-	Junior Community Health Extension Worker
S-CHEW	-	Senior Community Health Extension Worker
PMV	-	Patent Medicine Vendors
LLIN	-	Long Lasting Insecticide Net
CSPs	-	Country Specific Strategy Plans
PHC	-	Primary Health Care
NMCP	-	National Malaria Control Programme
ACT	-	Artemisinin Combination Therapy
NATP	-	New Antimalarial Treatment Policy
GFATM	-	Global Fund for AIDS, Tuberculosis and Malaria
LGA	-	Local Government Area
AMFM	-	Affordable Medicine Facility
RBM	-	Roll Back Malaria
OTC	-	Over-the-Counter
DOT	-	Directly Observed Therapy

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Malaria has been with man for centuries. Malaria was derived from "*mal aria*." The term was coined in the 16th century by the Italians, who believed that bad air (*mal aria*) from marshy areas was the cause of the disease which was among the most common reasons for hospitalization during the world wars 1 and 2. Much later a British physician, Ronald Ross, proved conclusively that malaria could be traced to mosquitoes and not bad air or water. For this, Ross was awarded the Nobel Prize for medicine (Hempelmann, Krafts, 2013).

Malaria is an infection caused by *Plasmodium* parasites. There are four species of Plasmodium that infect man: *P. falciparum, P. malariae, P. ovale and P. vivax*. *Plasmodium falciparum* is the most dangerous type of infection in Sub sahara Africa including Nigeria. It can cause severe malaria which can lead to death (W.H.O, 2011). According to WHO (2011), P. falciparum is the commonest species in virtually all parts of Africa, accounting for 90.0%-98.0% of cases of malaria. The other species, which include P. malariae and P. ovale, constitute 2.0%-10.0% of malaria cases. P. vivax is rare in Africa (World Health Organization [WHO, 2001]).

Malaria is an entirely preventable and treatable mosquito-borne illness. In 2014, 97 countries and territories had ongoing malaria transmission. An estimated 3.3 billion people are at risk of malaria globally, of which 1.2 billion are at high risk. In high-risk areas, more than one malaria case occurs per 1000 population. There were an estimated 198 million cases of malaria worldwide in 2013 with an estimated death of 584 000. It has been documented that 90% of all malaria deaths occur in Africa. Also, an estimated 437 000 African children died before their fifth birthday due to malaria. Globally, the disease caused an estimated 453 000 under-five deaths in 2013 (WHO, 2014).

Malaria is a major public health issue in Nigeria. It is responsible for 60.0% of total outpatient attendance in health facilities, 30.0% of death among under five children and

11.0% cases of maternal mortality. The disease causes the nation 132 billion Naira economic loss annually (Federal Ministry of Health. 2000 ([FMOH]). The economic loss includes costs of treatment and transport to source of treatment, loss of man-hours and absenteeism from school.

The main factors contributing to increasing malaria mortality and morbidity is the widespread of *plasmodium falciparum* resistance to conventional anti-malaria drugs, such as chloroquine, sulphadoxine-pyrimethamine (SP) and amodiaquine (Roll Back Malaria (RBM). 2006). Drug-resistant malaria, thought to have originated from South-east Asia, has spread across Africa, Asia and South America over the past four decades. Its impact is greatest in Africa and in parts of Asia especially where the deterioration of health infrastructure has exacerbated the effects of inadequate treatment (WHO. 2001).

In Nigeria, malaria is responsible for 25.0% of infant mortality and causes 30.0% of all childhood deaths (WHO, 2011). Malaria is highly endemic in Nigeria and it impedes human development (FMOH, 2010). The most vulnerable groups are children below 5 years and pregnant women, particularly the primigravidae. About 70.5% of pregnant women interviewed in Nigeria report symptoms and signs suggesting malaria (FMOH, 2010). It is estimated that 50% of the population in Nigeria experiences at least one episode of malaria each year while children under the age of five years have on the average of 2 – 4 attacks in a year. Malaria has severe negative effects on maternal health and birth weight, (NDHS, 2013)

Like Human Immunodeficiency Virus and tuberculosis, malaria does not elicit what is called a complete immune response in human beings. One can be infected with the microbes repeatedly, or carry them for any length of time, without developing a full resistance to them. One does not develop a protective immune response to these diseases as one does for infections such as polio, measles, and smallpox (GMOH, 2009).

In an attempt to combat malaria, Nigeria developed its first National Malaria Control Policy in 1996 with chloroquine as first line medicine for its management. However, the results of the 2002 and 2004 Efficacy Studies indicated that chloroquine and SP were no longer adequate for national first-line use (FMOH, 2002; FMOH, 2004). Several previous

studies have shown that the emergence of malaria resistant parasites to chloroquine had rendered use of medicine virtually useless in fighting malaria disease (WHO, 2001; WHO, 2007; FMOH, 2005; Okogun and Amadi, 2005). The emergence of resistant parasites to chloroquine therefore accounted for the Federal Ministry of Health's decision to change from the use of chloroquine to ACTs in the new antimalarial treatment policy (FMOH, 2005). Similarly the World Health Organization advised malaria endemic countries to change their antimalarial treatment policy to ACT (WHO, 2006).

The Policy promotes the use of artemether-lumefantrine or amodiaquine plus Artesunate thus replacing monotherapy involving use of chloroquine and sulphadoxine-pyrimethamine (SP). The policy change became necessary because the therapeutic efficacy of chloroquine and SP had deteriorated following the drug efficacy study conducted by the Federal Ministry of Health. This finding therefore led to the formulation of a new Antimalarial Treatment Policy (NATP) with the aim of adopting Artemisinin-based Combination Therapy (ACT). The policy stipulated that the first-line medicine for the treatment of uncomplicated malaria will be Artemether Lumefantrine (AL).

The need to address the problem posed by resistance to chloroquine and SP led to the adoption of Artemisinin based Combination Therapy (ACT) for the treatment of uncomplicated malaria by the Federal Ministry of Health in 2004 (FMOH, 2005).

The Federal Ministry of Health through the National Malaria Control Programme (NMCP) claimed that 6 million doses of ACTs were distributed to under-five children free of charge between 2006-2007 through support from Global Fund for AIDS, Tuberculosis and Malaria (GFATM). The Nigeria's GFATM Round 4 grant was implemented through the use of public health facilities with the distribution of Coartem (Artemeter Lumefantrine) through the primary Health Care clinics in eighteen states of Nigeria including Oyo state (FMOH, 2008). Presently, Nigeria is in her GFATM Round 8 grant which involves training and distribution of Coartem to private health care providers including Patent Medicine Vendors (PMVs). A major concern, however, is the low level of prescription of artemisinin based medications.

A study which explored the prescribing practices of health care providers following the change of treatment policy from chloroquine to ACT has been recently conducted in Ibadan metropolis. The study revealed the failure of frontline public health care workers to prescribe the recommended medicines (Oyedeji, 2010). According to FMOH (2005), only 26 percent of children needing treatment with ACT according to national guidelines received a prescription for this drug; 39 percent received amodiaquine; 4.0% received SP; 8.0% received other anti-malarial drugs while 23% left the facility without any anti-malarials prescribed, although their symptoms indicated the need for anti-malarials. In cases where AL was prescribed by health care providers, dosages were less likely to be correct compared to the more common drugs such as amodiaquine and SP. In many developing countries, including Nigeria, inappropriate, ineffective and inefficient uses of drugs have been reported in public health care facilities (Oshikoya, 2007).

The National Malaria Control Programme has conducted a series of programmes aimed at promoting the use of ACT among primary health care providers on malaria case management. Despite these efforts, it appears that the primary health workers' training needs were not adequately assessed from the definition and conduct of such training programmes. They constitute a significant population of health workers with inappropriate prescription practices that can lead to parasite drug resistance (Ologe Olugbenga and Olanrewaju, 2002).

Majority of frontline public health workers studied in Ibadan metropolis were found to have negative attitude to ACT as only 40.0% of them said they would adopt it only when chloroquine fails. High level of awareness about the NATP and ACT notwithstanding, the adoption of AL as the first-line artemisinin-based drug is low. This necessitated the suggestion by Oyedeji (2004) that there is the need for health education intervention strategies such as training to encourage and promote the adoption of ACT and rational prescribing among health workers.

Research findings have shown that workers who attended recent malaria seminars were more likely to agree with the policy change than those who did not attend seminars indicating that educational interventions could have a pronounced impact on perception of health workers relating to policy (Orcagba et al 2006).

In a study by Oyedeji 2011 to document primary health workers' awareness, knowledge and perception of the new antimalarial treatment policy in Ibadan Metropolis, nearly half of the respondents could correctly state fever as the main manifestation of uncomplicated malaria. The mention of Amalar (a sulphadoxine pyrimethamine) by 60.0% of the respondents as the first line drug of choice for the management of uncomplicated malaria. This implies that Amalar is their first drug of choice for the management of uncomplicated malaria (Oyedeji, 2011). This has a lot of implications for the correct management of uncomplicated malaria and progression to severe malaria.

Over half (56.0%) of the respondents were unaware that quinine is safe in pregnancy in all trimesters. This means that they will not prescribe quinine but subject pregnant women to prescription of other antimalarial drugs that are harmful to the developing fetus. There is insufficient information on the safety and efficacy of most antimalarial drugs in pregnancy, particularly for exposure in the first trimester, and so treatment recommendations are different from those for non-pregnant adults. In high transmission areas like Nigeria, (FMOH, 2006) malaria could be asymptomatic in pregnancy and quinine remains the most effective and can be used in all trimesters of pregnancy including the first trimester.

In reality women do not often make their pregnancies known in the first trimester and so, early pregnancies will often be exposed, inadvertently to any available first line treatment (WHO, 2006). The health workers did not have deep knowledge on the signs of severe malaria as majority of them mentioned fever which is the main sign of uncomplicated malaria. Severe malaria presents with life threatening clinical features requiring urgent treatment (FMOH, 2005). The signs of severe malaria include anemia, hypoglycemia, breathing difficulty, renal failure and coma (FMOH, 2005). The frontline health workers should be very familiar with them

The knowledge gap was revealed among the large number of Community Health Officers (CHO) and Community Extension Workers (CHEW) who mentioned chloroquine as a recommended drug for the management of severe malaria contrary to the policy which stipulates the use of quinine, (FMOH, 2005). The recommended drugs for the management of severe malaria are quinine, Artemeter and Artesunate injections and Artesunate suppository for pre-referral treatment only (FMOH, 2005). A large number of CHO and CHEW who have enormous PHC responsibilities in health facilities erroneously

stated that chloroquine is the recommended drug for the management of malaria. There is therefore the need to bridge the knowledge gap of the health workers so as to ensure full implementation of the new policy.

Oyedeji (2011) documented the awareness, knowledge and perceptions of health workers about the use of the new antimalarial treatment policy. He noted that 49.0% correctly mentioned fever as the main manifestation of uncomplicated malaria while 51.0% were incorrect. The incorrect responses consisted of Anemia (41.0%), hypoglycemia (2.0%), breathing difficulty (2.0%) and no response (6.0%). A question was asked to assess respondents' level of knowledge about the malaria control interventions in Nigeria. Oyedeji 2011 showed that majority of the respondents correctly stated the four malaria control interventions in Nigeria based on the national antimalarial treatment policy. Prompt diagnosis and treatment (89.0%) topped the list of the correct interventions followed by use of ITNs/ITMs (84.0%). The respondents were then requested to state the new first line drug for the management of uncomplicated malaria. A majority (59.8%) incorrectly mentioned Amalar which is a sulphadoxine pyrimethamine product. Only 21.0% correctly mentioned Coartem (Oyedeji, 2011).

During the study by Oyedeji 2011, questions were asked to probe into detailed knowledge of national antimalarial treatment policy and in order to do this, statements were made either true or false. Many respondents (41.0%) wrongly stated that chloroquine is still the first-line drug for the management of uncomplicated malaria. Majority (74.0%) correctly stated that SP is recommended for all pregnant women as Intermittent Preventive Treatment (IPT) for malaria and a large number of respondents (68.0%) correctly stated that pregnant women should receive at least two doses of IPT with SP during the 2nd and 3rd trimesters. Over half (56.0%) did not know that quinine is considered safe in pregnancy and can be used in all trimesters. Most (91.0%) of respondents correctly responded that mothers should be taught to recognize the signs of severe malaria. Few (14.8%) of the respondents did not know that Artemisinin-based combination drugs are to be taken every day for three days (Oyedeji, 20011).

Also responses of various categories of health workers on the new ACT related drugs promoted for the management of uncomplicated malaria were documented by Oyedeji (2011). Options were provided and respondents were requested to choose whether it was

correct or not. There were also provisions for those not sure and those who would not want to respond. The listed correct new ACTs being promoted for the management of uncomplicated malaria were Amodiaquine-Artesunate and Artesunate-Mefloquine. The other listed drugs are not being promoted for the management of uncomplicated malaria The results showed that four of the five doctors (80.0%) mentioned Amodiaquine-Artesunate. The drug was mentioned by 68.0% nurse. 49.0% CHOs and 59.0% CHEWs. With respect to Artesunate-Mefloquine, three out of the five doctors (60.0%) correctly listed it while mention of Artesunate-Mefloquine was made by 52.0% nurses, 18.0% CHOs and 40.0% CHEWs. Also a question was asked to probe into respondents' knowledge of signs of severe malaria. Only doctors (80.0% and CHEWs 81.0%) had high level of knowledge of anemia as one of the signs of severe malaria. Slightly above half (54.0%) of CHEWs were aware of this. Fever is a sign of uncomplicated malaria and not severe malaria. Majority of doctors (60.05), the nurses (78.0%), CHOs (67.0%) and CHEWs erroneously mentioned it

In many developing countries information on drugs is scarce. Health workers receive limited basic training or continuing education on drugs. Knowledge, however, is only part of the problem. In many developing countries, ownership of health facilities by medical societies or practitioners creates conflict of interests, which may explain the overuse of drugs in therapy. Prescribing and dispensing patterns are influenced by socio-cultural factors such as patient demand, the prescriber's attitude to risk, previous prescribing experiences and drug promotion. Misleading advertisements for pharmaceuticals and pressure from pharmaceutical sales men for certain drugs are common practice. Many drug advertisements in journals for medical and paramedical personnel in French-speaking African countries were found to contain incorrect or inadequate information (Amanda Hans and Flora, 1999).

A key component in the framework for the implementation of the ACT Policy is dissemination, training and supervision of health workers consistent with the new guidelines (WHO, 2000). In a cross-sectional study on knowledge, perception and use of the new malaria treatment policy among primary health care workers by Oyedeji (2011) in Ibadan metropolis, a large majority of the respondents (64.0%) had never attended training on use of ACT and this included Nurses (66.0%) and CHEW (69.0%) who are responsible

for the primary health care management of health problems. In a study by Oreagba et al (2006) in Lagos State General hospitals, it was found that prescribers or health workers had no formal training on the use of ACT. The research findings revealed that health workers who attended recent malaria seminars were more likely to agree with the policy change than those who did not attend seminars indicating that educational interventions could have a pronounced impact on the perception and knowledge of health workers towards the policy change. These findings therefore credence to the use of training as effective intervention to modifying the perception, attitude and knowledge of health workers towards the policy stipulations.

1.2 Problem Statement

Malaria continues to remain a health problem of great public health importance in sub-Saharan Africa and there are several misconceptions relating to the cause of the disease (Obol, et al, 2011). The disease impedes human development and it is both a cause and consequence of under development (FMOH, 2001). Malaria is a social burden to society in terms of treatment and prevention. Malaria for instance accounts for over 60% of outpatient visits in Nigeria and it is responsible for 30% mortality in under-five years old and 11% mortality in pregnant women (UNDP, 2000). Nigeria accounts for a quarter of all malaria cases in the WHO Africa Region (WHO, 2006).

The Artemisinin Based Combination Therapy has been adopted in Nigeria for the treatment of uncomplicated malaria by the Federal Ministry of Health. The policy stipulates that the first-line drug for the treatment of uncomplicated malaria will be Artemether Lumefantrine (AL).

Frontline health workers have pivotal roles to play in the implementation of the new treatment policy with special reference to the main thrusts of the policy such as prescription, management of adverse effects and referral system. This is especially so in Ibadan metropolis which is made up of five Local Government Areas (LGAs) with numerous frontline health workers in the primary health care (PHC) facilities. The knowledge of the new policy among this category of health workers has not been adequately assessed. Majority of the frontline public health workers studied in Ibadan metropolis were found to have negative attitude to ACT. The adoption of ACT related medications has been found to be low among them (Oyedeji, 2011).

About 64.0% of frontline health workers (respondents) in Ibadan metropolis had never attended training on use of ACT. The population included Nurses (66.0%) and CHEW (69.0%) who are responsible for the primary health care management of health problems (Oyedeji, 2011).

In a study on use of ACT conducted by Oreagba, Ene, Mabadeje (2006) in Lagos State General Hospitals, it was found that prescribers had no formal training on the use of ACT. This study revealed that 44.0% of the health workers prescribed Artemisinin derivatives as Monotherapy while only 5.9% prescribed ACTs in spite of the high proportion (59.2%) of health workers who were favourably disposed to the National Antimalarial Policy change from chloroquine to ACTs as first line treatment.

It has been noted that a majority of the frontline health workers in Ibadan were aware of the national anti-malaria treatment policy with workshop and seminar being the main sources of information about the policy (Oyedeji, 2011). But only half of them had ever seen a copy of the policy while 30.5% of those who had seen the policy had ever read it. The implication of this is that only a negligible number of health workers will be knowledgeable about the content of the policy. This situation poses a serious challenge to compliance with the policy.

According to Oyedeji (2011), 60.0% of the health workers in Ibadan metropolis erroneously mentioned Amalar (a sulfadoxine pyrimethamine) as the first line drug of choice for management of uncomplicated malaria. This has implications for the correct management of uncomplicated malaria and eventual progression to severe malaria (Oyedeji, 2011). In addition, only 20.8% of respondents could correctly state how to use new front-line antimalarial drugs for treatment of uncomplicated malaria

Thirty percent (30.0%) of the 105 health workers studied in Ibadan metropolis who had ever prescribed ACT to adults prescribed Artemeter Lumefantrine (AL) at incorrect dosage while among 81 respondents who had prescribed ACT to children, 40.0% of them did so at incorrect dosage (Oyedeji, 2011).

It is in these aforementioned training needs including gaps in knowledge relating to ACT and NATP and the poor adoption of ACT related medications that informed the conduct of this intervention. The intervention focuses on the outcome of training on knowledge, perception and patterns of prescription of anti-malaria drugs as articulated in the new National Antimalaria Treatment Policy among primary health care workers in Ibadan Metropolis.

Knowledge and perception of an innovation have potential roles to play in the adoption of the innovation. Training can be used to upgrade health workers knowledge and influence their perception with special reference to the use of ACT. There is however dearth of intervention on the use of the strategy in enhancing health workers capacity to be using ACT.

However, most trainings designed for health workers especially that relating to the use of ACT did not include use of a framework for identifying intervention strategies to address a specific factor relating to health problem by diagnosing health workers training needs in an ecological perspectives which includes predisposing factors which in this context refer to factors that can either facilitate or hinder health workers likelihood of exposure to awareness, knowledge and motivation to adopt the use of the new antimalarial treatment policy have not been adequately assessed. These factors include knowledge regarding malaria treatment policy, attitude about treatment pattern, perception about treatment pattern and demography of health workers. The enabling factors which generally focus on resources such as skills, money, time. They come before the behaviour that allows a motivation or aspiration to be realized and include health workers skills in the use of the new antimalarial treatment policy and its availability. Examples of these factors include continuing education for health workers, training and policy reinforcement and reforms.

And finally, the reinforcing factors are factors which occur after the behavior which provide the continuing incentive, reward or punishment for that behavior and either contribute to its persistence of extinction. These factors include attitudes/behaviors of significant others (e.g. heads of facility, professional peers), support received system as in level of supervision or concerns expressed and encouragement, in-house training by supervisors.

1.3 Justification for the intervention

Having identified the factors driving the problem in this study through training needs and scoping of other previous studies, these factors therefore were used in upgrading and modifying the perception, attitude and knowledge of frontline health workers relating to the adoption of the treatment strategies recommended by the policy for treatment of uncomplicated malaria which would help in averting possibility of progression to severe stage of malaria.

The study adopted the use of a framework (PRECEDE Model) which identified intervention strategies that addressed specific factors relating to health problem by diagnosing health workers training needs in an ecological perspectives, these factors included predisposing factors, enabling factors and reinforcing factors. Also, the research questions were designed such that they addressed the factors highlighted in the framework adopted.

This research work was important for several reasons; these included the following:
It helped in increasing the proportion of front-line health workers who have adequate and accurate knowledge about the contents and provisions of the new antimalaria treatment policy in Ibadan metropolis. The study also helped to bridge the knowledge gap relating to the management of uncomplicated malaria using ACT medications among frontline health workers which invariably improve appropriate prescribing practices that will result in reduced morbidity and mortality from malaria. Finally, the outcome of the intervention could serve as a guide to formulation of policies relating to the training of frontline health workers on the knowledge and use of appropriate malaria medicines as contained in the NATP.

1.4 Research Questions

The research questions that guided the conduct of this study are as follow

1. What are primary health workers' perceptions about the new anti-malaria treatment policy?
2. What is the level of knowledge of the new National Anti-malarial Treatment Policy among primary health care workers in Ibadan Metropolis?
3. What are the patterns of prescription of antimalarial drugs by primary health workers in Ibadan metropolis with respect to the policy stipulation?
4. What factors influence health workers' level of knowledge, perception and patterns of prescription of the recommended antimalarial drugs?
5. What is the outcome of training on the primary health care workers' level of knowledge, perception and patterns of prescription of the recommended antimalarial drugs articulated in the new antimalarial treatment policy?

1.5.1 Study objectives

Broad Objective

The broad objective of this study is to document the outcome of training on health workers' knowledge and perceptions of current anti-malarial treatment policy and prescription pattern in Ibadan metropolis.

1.5.2 Specific Objectives

The objectives of the study were to:

1. Assess the level of knowledge about the current National Anti-malarial Treatment Policy among primary health workers in Ibadan Metropolis.
2. Determine primary health workers' perceptions of the current anti-malaria treatment policy.
3. Determine the pattern of prescription of anti-malaria drugs by health workers in line with the current national anti-malaria treatment policy.
4. Use the outcomes of the objectives 1 - 3 to design and implement a training intervention for selected frontline health workers in Ibadan metropolis.
5. Asses the changes in knowledge, perception and patterns of prescription of anti-malaria drugs by health workers in line with the national anti-malaria treatment policy which could be attributed to the training intervention.

1.6 Research Hypothesis

HO: Training would not produce any significant change between pre-intervention and post-intervention in knowledge, perception, and prescription patterns of antimalarials in line with current National Treatment Policy among primary health care workers participating in the study.

HA: Training would produce a significant change between pre-intervention and post-intervention in knowledge, perception, and prescription patterns of antimalarials in line with current National Treatment Policy among primary health care workers participating in the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Malaria situation, Knowledge and Perception of the new National Anti-Malarial Treatment Policy and Pattern of Prescription of antimalarials among Health Workers

Malaria is a life-threatening parasitic disease whose causative agent (plasmodium) is transmitted by mosquitoes. Approximately 300 million people worldwide are affected by the disease and between 1 and 1.5 million people die from it every year (Kakillaya, 2008). Malaria is now mainly confined to Africa, Asia and Latin America (WHO, 2005). Previously, it was thought that it is "miasma" (bad air or gas from swamps) that caused malaria (Kakillaya, 2006).

Although people were not aware of the origin of malaria and the mode of transmission, protective measures against the mosquito, the vector of the parasite that causes the disease had been used for many hundreds of years (CDC, 2004). The inhabitants of swampy regions in Egypt were sleeping in tower-like structures out of the reach of mosquitoes, whereas others slept under nets as early as 450 B.C. In 1880, scientists discovered the real cause of malaria to be a one-cell parasite called plasmodium (World malaria report, 2005). Later scientist discovered that the parasite is transmitted from person to person through the bite of a female Anopheles mosquito, which requires blood to nurture her eggs (CDC, 2004; WHO, 2002).

Malaria is caused by infection of red blood cells with protozoans of the genus *Plasmodium*. The parasites are inoculated into the human host by a feeding female anopheline mosquito. The four species of *Plasmodium* that infect humans are *P. falciparum, P. vivax, P. ovale and P. malariae. Plasmodium vivax* and *P. falciparum* are the most common but *P. falciparum* is the most deadly type of malaria infection. *P. falciparum* is most common in Africa, south of the Sahara, accounting in large part for the extremely high malaria related mortality in this region (RBM, WHO and UNICEF, 2005). There are also worrying indications of the spread of *P. falciparum* malaria into new

regions of the world and its re-emergence in areas where it had been eliminated (CDC, 2004; WHO, 2006). Plasmodium develops in the gut of the mosquito and is passed on in the saliva of an infected mosquito each time it takes a new blood meal. The parasites are the carried by the blood to the victim's liver where they invade the hepatic cells and multiply (WHO, 2008).

The plasmodium, after 9- 16 days return to the blood and penetrate the red cells, where they multiply again, progressively breaking down the red cells. This induces bouts of fever and anaemia in the infected individual. In cerebral malaria, the infected red cells obstruct the blood vessels in the brain. Other vital organs can also be damaged leading to the death of the patients (WHO, 2008; Cross, 2004). Malaria symptoms appear about 9 to 14 days after the infectious mosquito bite, although this varies with different species. The first symptoms of malaria are nonspecific and similar to the symptoms of a minor systemic viral illness (FMOH, 2005). They comprise the following: headache, fatigue, abdominal discomfort as well as muscle and joint aches, followed by fever, chills, perspiration, anorexia, vomiting and worsening malaise. This is the typical picture of uncomplicated malaria. Malaria may cause anaemia and jaundice (yellow colouring of the eyes and skin) because of the loss of red blood cells (FMOH, 2005). Infection with *Plasmodium falciparum* may cause kidney failure, seizures, mental confusion, coma, and death if not promptly treated (FMOH, 2005). Malaria control in Nigeria is based primarily on early recognition and prompt and appropriate treatment. However, the armamentarium of drugs available for malaria case management and the prospect for the discovery of new molecules is limited.

2.1.1 Severe malaria manifestations of *P. falciparum* in children and adults

Malaria can be differentiated into two broad types: these are uncomplicated malaria and severe malaria (FMOH, 2005). It is important for proper patient management, to always classify a patient with malaria into either of the two types. This makes the management of malaria to be well focused, and also helps the health workers to look for features that are associated with progression to life threatening situation. A heavy workload should not e used as excuse for not classifying a patient (WHO, 2000, FMOH, 2005). One notice that classifying a patient cases ones work in the end and ensure that patient is well managed (WHO, 2000).

The uncomplicated malaria is the type which has no life threatening manifestations (FMOH. 2005) and the common manifestations include: fever and "flu-like" symptoms such as headache, pain and malaise. Rigors and chills also often occur (FMOH, 2005). On the other hand, there has been controversy over the definition of severe malaria. The appropriateness of any definition will vary with the use to which it is to be put, the facilities available and the clinical spectrum of disease in any environment (WHO, 2000). In clinical settings the definitions are usually broad and inclusive (FMOH, 2005). In patients with P. falciparum, asexual parasitaemia and the absence of any other confirmed cause for their symptoms, the presence of one or more of the clinical or laboratory features in Table 1 below classifies the patient as suffering from severe malaria (WHO, 2000). Frontline health workers such as PHC workers should be familiar with peculiar manifestations of uncomplicated and severe malaria so as to provide appropriate treatment and/or make prompt referral when the need arises.

Table 2.1: Severe malaria manifestations of *P. falciparum* in children and adults

Clinical manifestation or laboratory findings	Frequency	
	Children	Adults
Prostration (i.e. generalized weakness or inability to sit, stand or walk without support)	+++	+++
Impaired consciousness (confusion or drowsiness or coma)	+++	++
Respiratory distress (difficulty in breathing, fast deep breath)	+++	+
Multiple convulsions	+++	+
Circulatory collapse (shock)	+	+
Pulmonary oedema (respiratory distress/radiology)	+/-	+
Abnormal bleeding (disseminated intravascular coagulopathy)	+/-	+
Jaundice (yellow discoloration of the eyes)	+	+++
Haemoglobinuria (coca-cola coloured urine)	+/-	+
Severe anaemia (Hb < 5gm/dl)	+++	+
Hyperparasitaemia (high level of parasite in blood)	++	+
Hyperpyrexia (very high body temperature)	++	+
Hypoglycaemia (Low blood sugar)	++	++
Renal failure	+/-	++
Persistent vomiting	++	+

On a scale from + (slight occurrence) to ++ (moderate occurrence) and to +++ (frequent occurrence); +/- indicates infrequent occurrence, depend on endemicity (FMOH, 2005).

2.1.2 Antimalarial Drug Resistance and Efficacy of ACT

One of the challenges facing Africa in the fight against malaria is drug resistance (WHO, 20008). Drug resistance could be defined as the 'ability of a parasite to multiply or to survive in the presence of concentrations of a drug that would normally destroy the parasites of the same species or prevent their multiplication' (Kakillaya, 2006). Resistance to chloroquine, the cheapest and most widely used antimalarial, is common throughout Africa. Resistance to Sulphadoxine-Pyrimethamine (SP), often seen as the least expensive alternative to chloroquine, is also increasing in eastern and southern Africa (WHO, 2008). The emergence and rapid spread of *P. falciparum* resistance to commonly used antimalarial drugs constitute a serious challenge to the effectiveness of early diagnosis and prompt treatment as a priority strategy within current malaria control efforts (Bloland, 1993; Bloland and Ettling, 1999, Marsh, 1998).

2.1.3 Therapeutic Efficacy of Anti-malarial Drugs in Nigeria

The results of the drug efficacy trials carried out in the six geo-political regions of the Country in 2002 and 2004 are shown in the Table 2. WHO guidelines recommend consideration for policy review when adequate clinical and parasitological response hits the 75% mark.

The result of the 2002 Efficacy Studies indicated that Chloroquine and SP were no longer adequate for national first line use and this necessitated the urgent need to move from monotherapy to more effective combination therapy. As a result, further efficacy trials were conducted in 2004 by Federal Ministry of Health on two suitable Artemisinin based combination therapy. Both combination therapies were found to be highly efficacious and thus suitable for use in the treatment of uncomplicated malaria.

Table 2.2: Therapeutic Efficacy of Anti-malarial Drugs in Nigeria

S/N	Zones	Chloroquine	Sulphadoxine/ Pyrimethamine	Artemether/ Lumefantrine	Artesunate/ Amodiaquine
1	SE	3.7%	14.9%	100%	100%
2	SS	9.1%	8.5%	87%	82.5%
3	NC	53.2%	82.7%	100%	96%
4	NW	77.3%	94.2%	100%	100%
5	SW	40.9%	75.6%	NA	NA
6	NE	50.8%	64.8%	100%	100 %

*2002 Drug Efficacy Study *2004 Drug Efficacy Study ***NA means not available (FMOH, 2005).

In general, sensitivity of the parasite in-vivo to amodiaquine, halofantrine, mefloquine and other artemisinin derivatives has been known to be very good (>90% cure rate on day 14). Primary reduced sensitivity in-vitro of P. falciparum to mefloquine and to artemisinin has been reported in up to 10 - 15% of isolates obtained from southwest Nigeria but as previously indicated above; response in-vivo to these drugs is excellent (FMOH, 2005).

Resistance to Pyrimethamine has long existed in Nigeria since the late 1950s (FMOH, 2005). There is no convincing evidence that the drug has potent prophylactic efficacy in pregnancy (FMOH, 2005). However, Pyrimethamine in combination with Sulphadoxine has been demonstrated to have markedly improved efficacy (FMOH, 2005). It is generally assumed that daily proguanil is effective prophylactically, but there is no hard data to support this. Certainly, carefully designed clinical studies are required to address the issue of antimalarial chemoprophylaxis in vulnerable groups such as sickle cell anemia patients (FMOH, 2005).

A new group of antimalarial drugs – the Artemisinin compounds such as Artesunate, Arteneter and Dihydroartemisinin – have been deployed on an increasingly large scale for the management of malaria over the past decade (WHO, 2006). These compounds produce a very rapid therapeutic response (reduction of the parasite biomass and resolution of symptoms), and are active against multi-drug resistance P. falciparum. The drugs are well tolerated by patients and reduce gametocyte carriage (and thus have the potential to reduce transmission of malaria (WHO, 2006)).

Artemisinin will cure *falciparum* malaria in 7 days if used alone, but studies have shown that in combination with certain synthetic drugs they produce high cure rates in 3 days with higher adherence to treatment (WHO, 2006). For instance, Artemisinin used in combination with Lumefantrine could be effective. There is some evidence that use of such combinations in areas with low to moderate transmission can retard the development of resistance to the partner drug (WHO, 2006). As a response to increasing levels of resistance to antimalarial medicines. WHO recommends that all countries experiencing resistance to conventional monotherapies. such as chloroquine, amodiaquine of SP, should use combination therapies, preferably those containing Artemisinin derivatives for falciparum malaria (WHO, 2001; WHO, 2002).

Another step taken by WHO towards combating drug resistance in Africa, has led to the lowering of the resistance-threshold recommended for treatment policy change from 25% to 10% as assessed by standard WHO protocols in children under 5 years of age (WHO, 2003). This means that a more effective treatment should be adopted when the proportion of treatment failures to the old treatment reaches 10% (WHO, 2003).

2.1.4 The Pre-ACT Policy Guidelines in Nigeria

It is pertinent to review the historical antecedents which have led to policy guidelines in vogue in Nigeria. In 1996, Nigeria developed its first National Malaria Control Policy (FMOH, 2005). A yearly Plan of Action was developed for 1997 and 1998 (FMOH, 2005) and a three year Plan of Action was also developed for 1999-2001 (FMOH, 2005). Malaria Control units in the states were revitalized or re-established and an awareness relating the funding of malaria activities was created.

The highest advocacy between 1996 and 1998 was the celebration of the National Social Mobilization Day when the Malaria Control logo was launched by the then minister of health, Rear Admiral Jubril Ayinla (FMOH, 2005).

A National Technical Committee was resuscitated in 1998 (FMOH, 2005). THE National Malaria Control Committee is a body consisting of National, States and some LGA malaria programme managers and officials, as well as representatives from the private sector and some international agencies. The committee which meets t the end of each year is responsible for receiving the activities of the previous year and planning those for the

following year. In 1997-1998 Training of Trainers activities were carried out relating to the management of severe and uncomplicated malaria.

The training programmes were held nationally and in zones. It was hoped to that these training activities would produce a core of trainers skilled in monitoring and evaluation (FMOH, 2005).

In 1998, the Roll Back Malaria (RBM) in Nigeria was initiated as joint partnership of the FMOH and WHO, UNICEF, UNDP and the World Bank. It is an initiative to improve malaria control within the context of the health sector reform. The RBM programme consists of two phases – the inception phase and the implementation phase. The vision of the RBM was to have a world free from the burden of malaria (FMOH, 2005). The goals of the programmes included the following:

- By 2015, the malaria-related Millennium Development Goals (MDGs) will be achieved. Malaria would no longer be a major cause of mortality and no longer be a barrier to social and economic growth and development anywhere in the world.
- Beyond 2015, all countries and partners would sustain their political and financial commitment to malaria control efforts to ensure that the burden of malaria never rises above the 2015 level and ensuring that malaria does not re-emerge as a global threat.
- In the long term, global malaria eradication would be achieved and there would be no malaria infection in any country.

After the consensus building meeting for countries in West Africa in March 1999, Nigeria started the RBM inception phase. Sensitization and advocacy on RBM at the highest level started with letters to all Commissioners of Health in the States and Federal Capital Territory (FCT), Abuja. A ministerial press briefing was held to enlighten the public about the importance of RBM and the need for all stakeholders and partners to ensure the new approach to malaria control (FMOH, 2005).

Workshops were held for executives of malaria houses to inform them adequately on RBM and its technicalities (FMOH, 2005).

Nigeria drew attention of the world to problems of malaria control in Africa by hosting and co-financing the African Heads of State Summit on RBM in April 2000. Forty-four of the fifty malaria-affected countries in Africa attended the summit. Nineteen country delegations were led by their Heads of State while the remaining delegations were led by senior government officials (FMOH, 2005). The Summit was also attended by the senior official from each of the following four founding agencies: WHO, UNICEF, World Bank and UNDP and some other development partners (FMOH, 2005).the Summit ended with the signing of the Abuja Declaration and Plan of Action. By signing the Declaration, African leaders rededicated themselves to the principles and targets of the Harare Declaration of 1997 and gave commitment to intensify efforts to halve the malaria mortality in Africa by the year 2010 through implementing strategies and actions of Roll Back Malaria which are:

- Consensus building meetings nationally and in all the six geopolitical zones. A three year National Plan of Action which contained the States Plan of Action was also developed.
- Development of partnership with agencies with stakeholders (private and public sectors) and NGOs and international development agencies (WHO, UNICEF, DFID, USAID, etc).
- Deskwork analysis (review of literature and records) of the malaria situation in Nigeria.
- Conduct of a malaria situation survey to assess the actual situation of malaria in the country with a view to filling the gap created from the deskwork.
- The holding of the round table partners/stakeholders meeting to brief the partners on the findings of the survey and National Plan of Action developed from it and to deliberate modalities for funding the National, State and LGA Plan of Action.

The implementation of RBM started with Federal Ministry of Health, States and LGAs carrying out some activities as in the plan of Action. Growing political commitment by African leaders for action on malaria was given a boost by the founding of the Roll Back Malaria global partnership in 1998. Less than two years later African Heads of State and their representatives met in Abuja, Nigeria to translate RBM's goal of halving the malaria burden by 2010 into tangible political action (FMOH, 2005).

The Abuja Declaration, signed in April 2000 endorsed a concerted strategy to tackle the problem across Africa. The Abuja Declaration endorsed RBM's goal and established a series of interim targets relating to the number of people having access to treatment and protective measures. Considerable progress has been made since the signing of the Abuja Declarations. Almost 20 African countries have reduced or eliminated taxes and tariffs on insecticide treated nets (ITNs) to make them more affordable (UNICEF, 2007. Global Fund. 2006).

More than half of the malaria-endemic African countries, representing almost half the population at risk have established Country Specific Strategy Plans (CSPs) to achieve the RBM goal and the targets set in Abuja. The CSPs are all based on the four technical elements of RBM and the evidence-based interventions associated with them prompted access to effective treatment, promotion of ITNs and improved vector control, prevention and management of malaria in pregnancy and improving the prevention of, and response to malaria epidemic and malaria in complex emergencies (UNICEF, 2007, Global Fund. 2006).

Following the recognition of the role of combination therapy, RBM considered it timely to convene a technical consultation to:

- Review current evidence on combination therapy for managing malaria
- Recommend the minimal criteria for selection and use of antimalarial combination therapies in different epidemiological settings
- Select appropriate combinations for use, particularly in Africa countries
- Identify priority research, product development and production needs to facilitate the implementation of antimalarial combination therapies

This singular initiative paved the way for the evolution of the Nigerian new antimalarial treatment policy.

2.1.5 Evolution and Characteristics of the new Antimalarial Treatment Policy in Africa

In Ghana following the widespread development of Chloroquine resistance in Africa, ACTs (Artemisinin-based Combination Therapies) have become the drugs of choice for uncomplicated malaria. Ghana began implementing an ACT-based Anti-Malaria Drug

Policy (AMDP) in 2004 (GMOH, 2009). At the time, Artesunate/Amodiaquine was the only ACT officially promoted for the treatment of uncomplicated malaria. The policy however faced challenges because it made no provision for those who could not tolerate the recommended drug (GMOH, 2009). The policy has therefore since been revised to include alternate ACTs for uncomplicated malaria. The options for treatment of severe malaria and of malaria in pregnancy were also expanded.

In 1998, the National Malaria Control Programme in collaboration with the Noguchi Memorial Institute for Medical Research initiated a study in six sentinel sites on the responses of Plasmodium falciparum to chloroquine in the treatment of uncomplicated malaria. The report of the study showed that there was resistance of Plasmodium falciparum to chloroquine (GMOH, 2009). The conservative figures for malaria treatment failure using chloroquine were between 6% and 25% among the different demographic cohorts. Some sources quoted as high as 30% treatment failures; which could not be attributed to poor quality of chloroquine (GMOH, 2009). These levels of treatment failures according to WHO Global Response to Anti Malaria Drug Resistance put Ghana's state at best in the 'Alert Period' and at worst, in the 'Change Period'. These necessitated the review of the policy to replace chloroquine as first line drug for malaria treatment.

But after two years of implementation, it became obvious that there was a section of the population that could not tolerate the Artesunate-Amodiaquine. Therefore upon the recommendations of a task team set up by the Minister of Health to review the policy, the following alternatives were chosen

- Artemether-Lumefantrine
- Dihydroartemisinin-Piperaquine

These drugs have been shown to be efficacious Artemisinin-combination products that may be used for patients who may not tolerate Artesunate-Amodiaquine

All three drugs are safe for use in children. It was determined that either Artesunate-Amodiaquine or Artemether-Lumefantrine combination may be used in pregnancy with caution if the benefits to both the mother and foetus outweigh the risk (GMOH, 2009). These drugs can be used in the 2nd and 3rd trimesters of pregnancy but not the 1st trimester. Since Artesunate-Amodiaquine continues to be a very cost-effective drug, the

national policy continues to recommend it as the first line drug for treating uncomplicated malaria in Ghana (GMOH, 2009)

In Ghana, Artesunate-Amodiaquine Combination was adopted as the combination drug of choice for the treatment of uncomplicated malaria and the second line combination medicines for the treatment of uncomplicated malaria was adopted as the recommended strengths and dosage forms of Artemether -Lumefantrine and Dihydroartemisinin Pipemquine (GMOH, 2005).

In the home management of uncomplicated malaria, Artesunate-Amodiaquine was adopted as the combination drug of choice for treating uncomplicated malaria in the community or near-home setting for children below five (5) years of age. The Ministry of Health and other stakeholders involved in home management of malaria in the context of the High Impact Rapid Delivery Approach and Community Integrated Management of Childhood Illness shall ensure that community based agents involved in home management of malaria are adequately supported, supervised and provided with essential skills in behaviour change communication (GMOH, 2005).

In Ghana, the case of treatment failure of uncomplicated malaria quinine was adopted as the drug of choice for the management of malaria in the event of treatment failure. ACTs are not recommended for use in the first trimester, however their use shall not be with held in cases where they are considered to be life-saving and other antimalarials are deemed to be unsuitable. During the second and third trimesters, quinine or Artesunate-Amodiaquine or Artemether-Lumefantrine combination therapies shall be given depending on which medicine was used first (GMOH, 2005).

A treatment option other than what was first used shall be given where treatment failure is established. Complicated/ severe malaria is caused by Plasmodium falciparum and confirmed by the presence of the asexual parasite forms in the blood. Management of severe/complicated malaria requires parenteral treatment to provide adequate blood-serum concentrations as quickly as possible initially; subsequently revert to oral treatment as soon as the patient's condition permits (GMOH, 2005).

In Ghana, for pre-referral treatment of malaria in homes and communities, all children who do not respond to treatment with Artesunate-Amodiaquine within 24 hours shall be referred immediately to the nearest health facility after tepid sponging. Such children shall be given an initial dose of an artemisinin-based suppository prior to referral to the nearest health facility. In the management of complicated (severe) malaria quinine or I.M. Artemether shall be the drugs of choice for treating complicated malaria. The necessary support therapy shall be provided as and when appropriate. The treatment of pregnant women with severe malaria shall be with parenteral Quinine (GMOH, 2005).

Intravenous or Intramuscular (I.V. or I.M. in all trimesters) in all trimesters until the patient can take oral preparations and intramuscular (IM) Artemether should be used for the second and third trimesters. Pregnant women with co-morbidities of HIV and sickle cell anaemia shall be treated as above. Currently, apart from ITNs the most preferred intervention to prevent malaria in pregnancy is the use Intermittent Preventive Treatment (IPT) and is based on the use of anti-malaria drugs given in treatment doses at predefined intervals after quickening (16 gestational weeks) to reduce malaria parasitaemia and poor pregnancy outcomes(GMOH, 2005). IPT is preferably provided as part of a comprehensive antenatal package with other products like hematinics and anthelmintics. The drug will also be administered under the supervision of a qualified health worker - "Directly Observed Therapy (DOT)". Every pregnant woman should also have access to insecticide treated nets (ITNs), which should be used throughout the pregnancy as an additional method of malaria prevention (GMOH, 2005).

Sulphadoxine-Pyrimethamine (Sulphadoxine 500mg + Pyrimethamine 25mg) shall be reserved for Intermittent Preventive Treatment (IPT) given under DOT. Conditions for use of Sulphadoxine-Pyrimethamine in pregnancy stipulate that all pregnant women shall undergo screening before the commencement of IPT in order to exclude those who are either Glucose – 6- Phosphate Dehydrogenase (G-6PD) deficient or allergic to Sulphanamides. Pregnant women who cannot take the Sulphadoxine-Pyrimethamine in IPT shall be encouraged to sleep under Insecticide Treated Nets and to report early when they have symptoms suggestive of malaria. Pregnant women, especially those who are non-immune, may be put on Proguanil beginning in the first trimester of pregnancy (GMOH, 2005).

The World Health Organization in the mid-1990s therefore recommended change in first line drug policy if resistance reached 25%. During this period some countries in the sub-region including Kenya, Botswana, Malawi and South Africa, faced with similar evidence, changed their first line drug from CQ to Sulfadoxine-pyremethamine (SP). In Tanzania however surveys on antimalarial drug resistance continued, finally bringing on board the National Malaria Control Programme (NMCP) working in collaboration with the newly (1997) founded EANMAT (East African Network on Monitoring Antimalarial Treatment); the latter drew expertise from all Tanzanian malaria research institutions and gathered data on antimalaria drug sensitivity from across Tanzania. Results obtained indicated that in much of the country CQ resistance was already unacceptably high.

In Tanzania, an interdisciplinary National Task Force on Antimalaria Drug Policy was formed in May 1999, as a sub-committee of the National Malaria Advisory Committee. Two months later, the Taskforce developed a summary from previous clinical trials showing trends in antimalaria drug resistance, trends in malaria related morbidity and mortality, and recommended that SP be adopted as the first-line interim antimalarial drug. As a follow up of these recommendations the media started to inform the public that CQ was no longer recommended for malaria treatment, which led to much debate, revealing that this was a highly sensitive issue (African Malaria Network Trust, 2007).

Meanwhile a consultancy contract was awarded to undertake a systematic cost-effectiveness analysis of alternative antimalarials (SP, CQ and amodiaquine). The consultants observed among other things, that the cost of changing from CQ to SP would be half that of maintaining CQ. Furthermore the NMCP organized consensus building malaria workshops and meetings with an array of stakeholders ranging from health researchers, health providers, teaching institutions, pharmaceutical industry, pertinent NGOs, etc. Later on the Minister for Health in mid-2001 informed Parliament that from routine health facility-based morbidity and mortality statistics, and surveys carried out on resistance, there was need for a more cost-effective alternative antimalarial to replace CQ. On 1st August 2001, the Tanzanian Ministry of Health officially changed its malaria treatment policy guidelines whereby CQ was finally replaced by SP as the first-line antimalarial drug (African Malaria Network Trust, 2007).

The National Antimalarial Treatment Policy (ATP) adopted in Nigeria is a set of recommendations and regulations concerning antimalarial drugs and their utilization in Nigeria. The goal of NATP is to use the available resources efficiently to maximize the reduction in mortality and morbidity due to malaria (WHO, 2006). The goals of the antimalarial Treatment Policy were to:

- Provide rapid and long lasting cure for malaria
- Reduce morbidity, including malaria related anemia
- Prevent the progression of uncomplicated malaria to severe and potentially fatal disease
- Reduce the unfavourable effects of malaria in pregnancy through Intermittent Preventive Treatment (IPT).
- Minimize the likelihood and rate of development of drug resistance

The contents of the ATP of Nigeria include the following:

- Decision on whether a sick patient requires antimalarial treatment or not
- Recommended treatment for uncomplicated and severe malaria
- Chemoprophylaxis for various groups at risk
- Criteria for the review of antimalarial treatment policy
- Regulation and deployment of antimalarial medicines

The decision to change antimalarial treatment policy in malaria endemic environments was based on a number of factors including malaria prevalence, geographical distribution of documented treatment failures, impact on morbidity and mortality, political-economic situation and availability of alternatives (WHO, 2005). In the absence of well defined criteria for determining the level of clinical parasitological failures with antimalarial therapy at which a first-line drug should be replaced, a cut-off level of 10% treatment failures has been widely used in many countries (WHO, 2003). This figure may not be acceptable to richer endemic countries. It is necessary for ATP to be integrated into existing health programmes such as Integrated Management of Childhood Illnesses (IMCI) and other relevant areas. There is also need to evolve a management for using the drugs outlined in the ATP for home management with increased compliance (WHO, 2005).

According to the Nigerian Strategic Plan 2009 – 2013 tagged "A Road Map for Malaria Control in Nigeria." the principle approach to diagnosis and treatment of malaria in Nigeria is to provide prompt and highly effective anti-malarial combination therapy for confirmed uncomplicated malaria episodes, especially in persons over five years of age (FMOH, 2005). This will complement efforts of malaria prevention by:

- Reducing the number of cases progressing to severe malaria
- Prevention or at least delaying development of parasite strains resistance against used anti-malaria combinations.
- Contribute to reductions of malaria transmission by reducing the reservoir of parasite stages transmissible by the mosquito vector (gametocytes)

2.1.6 Health Workers' Knowledge of the New National Antimalarial Treatment Policy

Unlike awareness which simply refers to having heard about the policy, knowledge in the context of this research implies detailed information about the national antimalarial treatment policy by demonstrating great understanding of its contents and provisions. In a study aimed at documenting primary health workers' awareness, knowledge and perception to the new antimalarial treatment policy in Ibadan Metropolis by Oyedeji (2011), nearly half of the respondents could correctly state fever as the main manifestation of uncomplicated malaria. The mention of Amalar (a sulphadoxine pyrimethamine) by 60.0% of the respondents as the first line drug of choice for the management of uncomplicated malaria is very instructive. This implies that Amalar is their first drug of choice for the management of uncomplicated malaria (Oyedeji, 2011). This has a lot of implications for the correct management of uncomplicated malaria and progression to severe malaria.

Over half (56.0%) of the respondents were unaware that quinine is safe in pregnancy in all trimesters. This means that they will not prescribe quinine but subject pregnant women to prescription of other antimalarial drugs that are harmful to the developing fetus. There is insufficient information on the safety and efficacy of most antimalarial drugs in pregnancy, particularly for exposure in the first trimester, and so treatment recommendations are different from those for non-pregnant adults. In high transmission areas like Nigeria, (FMOH, 2006) malaria could be asymptomatic in pregnancy and

quinine remains the most effective and can be used in all trimesters of pregnancy including the first trimester.

In reality women do not often make their pregnancies known in the first trimester and so, early pregnancies will often be exposed, inadvertently to any available first line treatment (WHO, 2006). The health workers did not have deep knowledge on the signs of severe malaria as majority of them mentioned fever which is the main sign of uncomplicated malaria. Severe malaria presents with life threatening clinical features requiring urgent treatment (FMOH, 2005). The signs of severe malaria include anemia, hypoglycemia, breathing difficulty, renal failure and coma (FMOH, 2005). The frontline health workers should be very familiar with them.

The knowledge gap was revealed among the large number of Community Health Officers (CHO) and Community Extension Workers (CHEW) who mentioned chloroquine as a recommended drug for the management of severe malaria contrary to the policy which stipulates the use of quinine, (FMOH, 2005). The recommended drugs for the management of severe malaria are quinine, Artemeter and Artesunate injections and Artesunate suppository for pre-referral treatment only (FMOH, 2005). A large number of CHO and CHEW who have enormous PHC responsibilities in health facilities erroneously stated that chloroquine is the recommended drug for the management of malaria. There is therefore the need to bridge the knowledge gap of the health workers so as to ensure full implementation of the new policy.

Oyedeji (2011) documented the awareness, knowledge and perceptions of health workers about the use of the new antimalarial treatment policy. He noted that 49.0% correctly mentioned fever as the main manifestation of uncomplicated malaria while 51.0% were incorrect. The incorrect responses consisted of Anemia (41.0%), hypoglycemia (2.0%), breathing difficulty (2.0%) and no response (6.0%). A question was asked to assess respondents' level of knowledge about the malaria control interventions in Nigeria. Oyedeji 2011 showed that majority of the respondents correctly stated the four malaria control interventions in Nigeria based on the national antimalarial treatment policy. Prompt diagnosis and treatment (89.0%) topped the list of the correct interventions followed by use of ITNs/ITMs (84.0%). The respondents were then requested to state the

new first line drug for the management of uncomplicated malaria. A majority (59.8%) incorrectly mentioned Amalar which is a sulphadoxine pyrimethamine product. Only 21.0% correctly mentioned Coartem (Oyedeji, 2011).

During the study by Oyedeji 2011, questions were asked to probe into detailed knowledge of national antimalarial treatment policy and in order to do this, statements were made either true or false. Many respondents (41.0%) wrongly stated that chloroquine is still the first-line drug for the management of uncomplicated malaria. Majority (74.0%) correctly stated that SP is recommended for all pregnant women as Intermittent Preventive Treatment (IPT) for malaria and a large number of respondents (68.0%) correctly stated that pregnant women should receive at least two doses of IPT with SP during the 2nd and 3rd trimesters. Over half (56.0%) did not know that quinine is considered safe in pregnancy and can be used in all trimesters. Most (91.0%) of respondents correctly responded that mothers should be taught to recognize the signs of severe malaria. Few (14.8%) of the respondents did not know that Artemisinin-based combination drugs are to be taken every day for three days (Oyedeji, 20011).

Also responses of various categories of health workers on the new ACT related drugs promoted for the management of uncomplicated malaria were documented by Oyedeji (2011). Options were provided and respondents were requested to choose whether it was correct or not. There were also provisions for those not sure and those who would not want to respond. The listed correct new ACTs being promoted for the management of uncomplicated malaria were Amodiaquine-Artesunate and Artesunate-Mefloquine. The other listed drugs are not being promoted for the management of uncomplicated malaria. The results showed that four of the five doctors (80.0%) mentioned Amodiaquine-Artesunate. The drug was mentioned by 68.0% nurse, 49.0% CHOs and 59.0% CHEWs. With respect to Artesunate-Mefloquine, three out of the five doctors (60.0%) correctly listed it while mention of Artesunate-Mefloquine was made by 52.0% nurses, 18.0% CHOs and 40.0% CHEWs. Also a question was asked to probe into respondents' knowledge of signs of severe malaria. Only doctors (80.0% and CHEWs (81.0%) had high level of knowledge of anemia as one of the signs of severe malaria. Slightly above half (54.0%) of CHEWs were aware of this. Fever is a sign of uncomplicated malaria and not severe malaria. Majority of doctors (60.0%), the nurses (78.0%), CHOs (67.0%) and CHEWs erroneously mentioned it.

2.1.7 Prescription pattern of Artemisinin based combination therapy

In many developing countries information on drugs is scarce. Health workers receive limited basic training or continuing education on drugs. Knowledge, however, is only part of the problem. In many developing countries, ownership of health facilities by medical societies or practitioners creates conflict of interests, which may explain the overuse of drugs in therapy. Prescribing and dispensing patterns are influenced by socio-cultural factors such as patient demand, the prescriber's attitude to risk, previous prescribing experiences and drug promotion. Misleading advertisements for pharmaceuticals and pressure from pharmaceutical sales men for certain drugs are common practice. Many drug advertisements in journals for medical and paramedical personnel in French-speaking African countries were found to contain incorrect or inadequate information (Amanda, Hans and Flora, 1999).

A key component in the framework for the implementation of the ACT Policy is dissemination, training and supervision of health workers consistent with the new guidelines (WHO, 2000). In a cross-sectional study on knowledge, perception and use of the new malaria treatment policy among primary health care workers by Oyedeji (2011) in Ibadan metropolis, a large majority of the respondents (64.0%) had never attended training on use of ACT and this included Nurses (66.0%) and CHEW (69.0%) who are responsible for the primary health care management of health problems. In a study by Oreagba et al (2006) in Lagos State General hospitals, it was found that prescribers or health workers had no formal training on the use of ACT. The research findings revealed that health workers who attended recent malaria seminars were more likely to agree with the policy change than those who did not attend seminars indicating that educational interventions could have a pronounced impact on the perception of health workers towards the policy change. The good news was that 94.2% of the respondents in this current study who had never attended training on ACT use were willing to attend one (Oyedeji, 2011). On probing the respondents about their history of prescription, 56.0% of them had ever prescribed any of the ACT related drugs.

In Zambia, one of the earliest countries where ACT was adopted, only 22.0% of patients eligible for ACTs actually received them even where the drugs were freely available and clinic staff knew they were being observed; this illustrates the technical difficulty on how

to deploy ACTs to maximize their effectiveness and cost effectiveness (Zurovac, Rowe, Ochola, Noor, Midia, English, Snow 2005). Of 105 respondents who had ever prescribed ACT to adults, 30.0% prescribed AL at incorrect dosage while of the 81 respondents who had ever prescribed ACT to children, 40.0% of them did it at incorrect dosage. In the study by Oreagba et al, 2006, 12.45 of the respondents in a general hospital in Lagos State prescribed ACT incorrectly. Sixty four percent (64.0%) of the 247 respondents stated that they prescribed ACT to the last patient with malaria that they managed prior to the conduct of this study. This is not quite encouraging considering the fact that there were an estimated 247 million malaria cases (5^{th} – 95^{th} centiles. 189 – 327 million) worldwide in 2006, of which 91.0% or 230 million (175 – 300 million) were due to *P. falciparum* which is sensitive to ACTs.

The percentage of malaria cases due to *P. falciparum* exceeded 75.0% in most African countries and Nigeria is one of the 19 countries which accounted for 90 0% of estimated cases (WHO, 2008). It is noteworthy that 49.0% of the 168 respondents who prescribed ACT to the last patient with malaria that they managed prior to the conduct of this study prescribed Artesunate alone compared to 27.0% who prescribed AL. Despite a decision in principle by many countries in Africa to use Artemisinin based combination therapies (ACTs), most cases of malaria are still treated with Monotherapy and in many areas most f these treatments often fail (Adjuik, Babiker; Garner; Olliaro; Taylor, and White, 2004). Oreagba et al, 2006 revealed that in their study on use of ACT in secondary health facilities that 44.0% of the health workers prescribed Artemisinin derivatives as Monotherapy while only 5.9% prescribed ACTs in spite of the high proportion (59.2%) of health workers who were favourably disposed to the National Antimalarial Policy change from chloroquine to ACTs as first line treatment.

On the frequency of prescription of ACTs, 44.0% always prescribe ACT compared to 38.0% who occasionally did so with the motivating factor being its effectiveness. The other important reason for prescribing ACT is that it was supplied by government for distribution free of charge. In the advent that this free supply ceases, health workers are likely to revert to any available antimalarial with chloroquine being a very attractive alternative. It is to be noted that a large number of the respondents ranked chloroquine as the first preferred antimalarial drug in a ranking of five antimalarial drugs followed by AL.

More so, it is to be noted according to Oreagba et al. (2006), that introduction of ACT-related drugs was not accompanied by adequate enlightenment.

Most health workers still prescribe chloroquine or Sulfadoxine Pyrimethamine (SP) which have been delisted as first line antimalarial drugs by the Federal Ministry of Health of Nigeria as far back as 2004. Continued use of chloroquine or SP by health workers may lead to progression of malaria illness to severe malaria with far reaching physical complications and deaths in under-fives if not promptly treated with ACT (FMOH, 2005; WHO, 2006).

In study aimed at describing the trend in the use of antimalarial drugs for treatment of malaria in children under 5 years from year 200 to 2006 in south-eastern Nigeria with special reference to adherence to the 2005 National Antimalaria Treatment Policy has been conducted (Ukwe et al, 2008). Quality indices studied were the use of International Non-proprietary Name (INN) in prescription, number of antimalarial drugs per episode and use of drugs from essential drug list. The result revealed that chloroquine was mostly used for treating severe malaria for children less than 5 years despite the indication of a switch to quinine and parenteral Artemisinin by the national treatment policy (Ukwe et al, 2008). Prescriptions of drugs were also not by use of INN. However, many prescribers did not practice polypharmacy and most of the drugs used in secondary health facilities for the treatment of severe malaria were in the essential drug list (Ukwe et al, 2008).

Another study on antimalarial drugs aimed at determining the drugs people take when they had malaria attack and who diagnoses and prescribes the drugs had been carried out in Calabar (Ezedinachi et al, 1991). The results revealed that malaria symptoms and the drugs consumed were diagnosed and prescribed respectively by self (54.0%), qualified medical doctor (32.0%) and others including paramedical staff (2.0%). The rest (12.0%) took traditional remedies. Antimalarial drugs (chloroquine, fansidar, camoquinne) were chosen because of their efficacy/popularity (21.0%), cheapness (43.0%) and availability (34.0%). Among those interviewed, only 21.2% took adequate curative dose of 25mg/kg chloroquine for 3 days according to WHO recommendations. Majority of the consumers took their drugs orally, but some (17.0%) had chloroquine injections administered, in some cases, by ill-qualified patent medicine dealers (Ezedinachi et al 1991).

The resuh also showed that there is an association between level of education and pattern of remedy sought by the respondents ($p<0.05$). Self-medication was practiced significantly more by those with formal education than by those without ($p<0.05$). The trend of consulting patent medicine dealers for prescription decreased with acquisition of more formal education. Conversely, significantly, more of the respondents with higher education consulted qualified medical doctors or paramedical staff ($p<0.05$). The forms of drug abuse were observed; these were utilization of sub-curative doses of chloroquine and Monotherapy. It was speculated that these two factors might have led to the several chloroquine treatment failures which had been reported in Calabar, and other areas in Nigeria (Ezedinachi et al, 1991).

Bhattarai, Bjorkman and colleagues (2007) showed that there has been a remarkable drop in malaria deaths among the Zanzibar, Tanzania children within a three-year period (2002 to 2005), to a quarter of the previous level and overall child deaths to half (Bhattarai et al, 2007). The achievement followed the introduction of ACT for improved treatment. Malaria control was further enhanced by the implementation of wide scale of Insecticide Treated Nets (ITNs). Right from 2006, people with malaria had access to ACT in Zanzibar since late 2003; children under five years old and pregnant women were given free ITNs (Bhattarai et al 2007).

In Zanzibar, the government is working on attempting to demonstrate that improvement or changes in health practitioner/provider practices, specifically through appropriate diagnosis and rational drug use, the costs attributable to ACT can be minimized and benefits attributable to ACT can be maximized through the ill-health and death prevented or successfully treated. The result would lead to significant increase in the well being of the population and budgetary gains in resource terms through the savings incurred (Mukosha, 2005). For over 40 years malaria had been treated by health workers with monotherapies, essentially in limitless supply, which are cheap enough for individual households to buy. Healthcare workers have treated almost all febrile illnesses with an antimalarial on the rational grounds that it is better to treat several viral illnesses with an antimalarial than to miss one potential infection which could be treated with chloroquine or Sulphadoxine-Pyrimethamine. Most people treated for malaria, even in the formal healthcare sector; do not actually have the disease (Amexo, Tolhurst, Barnish and Bates, 2004).

To continue this approach will lead to substantial unnecessary use of ACT and will undoubtedly threaten the affordability and sustainability of any subsidized programme. The magnitude of the shift in mindset and practice which will be required for ACTs to be only in proven cases of malaria will not be easy to achieve, however, and attempting it increase the risk that some true cases will be missed (Amexo et al, 2004)

Juma and Zurovac, 2008, evaluated health workers' adherence to malaria diagnosis and treatment recommendations three years after the policy implementation in Nairobi, Kenya. Change of Kenyan treatment policy for uncomplicated malaria from sulphadoxine-pyrimethamine to artemether-lumefantrine (AL) was accompanied by revised recommendations promoting presumptive malaria diagnosis in young children and, wherever possible, parasitological diagnosis and adherence to test results in older children and adults. In their study, a national cross-sectional, cluster sample survey was undertaken at public health facilities. Data were collected using quality-of-care assessment methods. Analysis was restricted to facilities with AL in stock. Main outcomes were diagnosis and treatment practices for febrile outpatients stratified by age, availability of diagnostics, use of malaria diagnostic tests, and test result.

In this study, the analysis included 1,096 febrile patients (567 aged <5 years and 529 aged ≥5 years) at 88 facilities with malaria diagnostics, and 880 febrile patients (407 aged <5 years and 473 aged ≥5 years) at 71 facilities without malaria diagnostic capacity. At all facilities, 19.8% of young children and 28.7% of patients aged ≥5 years were tested, while at facilities with diagnostics, 33.5% and 53.7% were respectively tested in each age group. Overall, AL was prescribed for 63.6% of children aged <5 years and for 65.0% of patients aged ≥5 years, while amodiaquine or sulphadoxine-pyrimethamine monotherapies were prescribed for only 2.0% of children and 3.9% of older children and adults. In children aged <5 years, AL was prescribed for 74.7% of test positive, 40.4% of test negative and 60.7% of patients without test performed. In patients aged ≥5 years, AL was prescribed for 86.7% of test positive, 32.8% of test negative and 58.0% of patients without test performed. At least one anti-malarial treatment was prescribed for 56.6% of children and 50.4% of patients aged ≥5 years with a negative test result (Juma and Zurovac, 2008).

In conclusion, they observed that malaria testing rates were low and, despite different age-specific recommendations, only moderate differences in testing rates between the two age

groups were observed at facilities with available diagnostics. In both age groups, AL use prevailed, and prior ineffective anti-malarial treatments were nearly non-existent. The large majority of test positive patients were treated with recommended AL; however, anti-malarial treatments for test negative patients were widespread, with AL being the dominant choice.

Recent change of diagnostic policy to universal testing in Kenya is an opportunity to improve upon the quality of malaria case management. This will be, however, dependent upon the delivery of a comprehensive case management package including large scale deployment of diagnostics, good quality of training, post-training follow-up, structured supervisory visits, and more intense monitoring (Juma and Zurovac, 2008).

2.1.8 Outcomes of Training on Health Workers' Prescription Patterns

In a study conducted by the World Health Organization (2004) to assess the effect of Integrated Management of Childhood Illness (IMCI) case management training on the use of antimicrobial drugs among health-care workers treating young children at first-level facilities, data was collected through observation-based surveys in randomly selected first-level health facilities in Brazil, Uganda and the United Republic of Tanzania were statistically analyzed.

Results show that children receiving care from health workers trained in IMCI are significantly more likely to receive correct prescriptions for antimicrobial drugs than those receiving care from workers not trained in IMCI. They are also more likely to receive the first dose of the drug before leaving the health facility, to have their caregiver advised how to administer the drug, and to have caregivers who are able to describe correctly how to give the drug at home as they leave the health facility. Therefore, IMCI case management training is an effective intervention to improve the rational use of antimicrobial drugs for sick children visiting first-level health facilities in low-income and middle-income countries (WHO, 2004).

Overall, children seen by IMCI-trained health-care workers were significantly more likely to receive the correct prescription of antibiotics (in terms of dose, frequency and formulation) than children seen by health workers not yet trained in IMCI. There were similar patterns in all three countries (pooled OR 2.7, 95% confidence interval (CI) = 1.5–

4.8). Significantly more children seen by IMCI-trained health workers received the correct prescription for antimalarials in both Uganda and the United Republic of Tanzania (with no malaria in Brazil) than did children seen by untrained health workers, although the effect was significantly stronger in the United Republic of Tanzania (OR 17.2; 95% CI = 7.6–38.8) than in Uganda (OR 3.0; 95% CI = 1.7–5.5). IMCI training was associated with significant reductions in the unnecessary use of antibiotics in all three countries (pooled OR 2.9; 95% CI = 1.9–4.2) (WHO, 2004).

Communication with children's caregivers about how to administer antimicrobials at home was significantly better for children seen by IMCI-trained health workers than for children seen by health workers who had not yet been trained. Caregivers whose children were seen by workers not trained in IMCI received little or no information about how to administer antibiotics or antimalarials. For example, 98% of caregivers of children who received an antibiotic from an IMCI-trained health worker in the United Republic of Tanzania were advised correctly on how to administer the drug, while only 18% of caregivers served by a health worker not yet trained in IMCI received this advice. Also in the United Republic of Tanzania, caregivers whose child was seen by an IMCI-trained health worker were significantly more likely to be able to report correctly as they left the facility how and when the drugs should be given to the child than were those caregivers whose child was seen by a health worker who had not been trained in IMCI. This was not the case in Uganda and Brazil (WHO, 2004).

Finally, there were significant differences by IMCI training status in the proportion of children prescribed an antibiotic or antimalarial who received the first dose before leaving the health facility in all three countries. However, the effect was significantly stronger in the United Republic of Tanzania than in Uganda and in Brazil. In the latter two countries the proportion of children who received the first dose of medication at the facility was low (21% in Uganda and 27% in Brazil) even after training in IMCI, leaving much room for improvement. Administering the first dose at the facility is recommended in the generic IMCI case-management guidelines because it ensures that the treatment begins immediately and provides an opportunity for the health care worker to demonstrate to the caregiver the correct way to administer the drug (WHO, 2004).

2.1.9 Outcome of interventions involving Medicine Sellers

Medicine sellers offer a service to patients and they are widely used for the treatment of fever and malaria in most of Africa. Their popularity alone does not justify their use, but indicates the importance of ensuring that they have the capacity to provide safe and appropriate medicines in correct amounts in the communities they serve

In a study conducted by Catherine Goodman, William Brieger, Alasdair Unwin, Anne Mills, Sylvia Meek and , George Greer, (2007) to find out what medicine sellers in Sub-Saharan Africa know about malaria treatment and how their practice can be improved with major focus on categories of interventions to improve malaria-related activities of medicine sellers in sub0saharan Africa, a total of 16 interventions to improve malaria-related activities of medicine sellers in sub-Saharan Africa were identified. Five were based in Nigeria, four in Kenya, two each in Uganda and Ghana, and one each in Tanzania, Madagascar, and Zambia. The interventions varied considerably in scope and scale. All involved a combination of training, job aids, and demand generation/ consumer information, with some including pre-packaged drugs. Franchise/accreditation networks were developed in three cases. In terms of health problems addressed, nine focused specifically on malaria treatment, two included acute respiratory infections (ARIs) and/or diarrhea as well, and five had a more general primary health care orientation.

All but one intervention involved working with existing medicine sellers, the exception being Child and Family Wellness (CFW) shops in Kenya where new outlets were established.

In six interventions, medicine sellers were the primary focus, and in an additional six they had a major role, complemented with other strategies to improve medicine use. In the four remaining projects, medicine sellers had only a partial role as an adjunct to the main community health intervention. The number of medicine sellers involved ranged from 12 to more than 3,000. The earliest began in 1990, although all but three were initiated in 2000 or later, demonstrating that widespread interest in this area is a relatively recent phenomenon (Goodman et al, 2007).

Four major intervention components were identified and they include the following: 1) training/capacity building, 2) demand generation, 3) quality assurance, and 4) creating an enabling environment.

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Four major intervention components were identified and they include the following: 1) training/capacity building, 2) demand generation, 3) quality assurance, and 4) creating an enabling environment.

All projects had an element of training and capacity building, including workshops, peer or in-shop education, and job aids. The three most common elements of training content were drug use, communication, and referral. Other topics included common health problems, safety, pharmacy law, management skills, and procedure unique to the intervention (e.g., franchising procedures). Management skills included finance, record keeping, business ethics, and stock maintenance. Six projects conducted in-shop or peer education visits. For 10 interventions, it was stated that take-home materials and job aids were provided to trainees (Goodman et al, 2007).

In one intervention, negotiation sessions were conducted, an approach in which the public health objectives and the factors influencing private practitioner behavior are taken into account in jointly devising what improvements to introduce. Demand generation was addressed in 12 interventions using 2 approaches. Ten projects included mass media or public information components. For example, the KidCare intervention to socially market pre-packaged antimalarial drugs in Nigeria involved TV, radio, mobile video units, posters, billboards, leaflets, flyers, point of sale stickers, danglers, promotional material, and special events, with messages focusing on product information, malaria, and its treatment and prevention. Five projects trained community volunteers to promote patronage of trained medicine sellers and appropriate medicines. Demand was also stimulated through subsidies on pre-packaged antimalarial drugs in Madagascar and at the initial introduction of pre-packaged drugs in Nigeria (Goodman et al, 2007).

Three projects reported that some form of consumer accountability was built into the design, including the use of community-based organizations to identify, recruit, and monitor medicine sellers. Four projects mentioned the use of existing, or formation of new medicine seller associations, to assist in establishing norms and supporting/expanding training. Monitoring and supervision post-training was built into nine projects. Five projects addressed drug quality and packaging: four specifically focused on promoting pre-packaged antimalarial drugs, and the fifth focused on pooled procurement that was used for CAREshop franchised sellers to obtain bulk discounts and ensure drug quality.

Formal evaluations were identified for 11 interventions and are classified according to their study design. Evaluations were defined as those that documented changes over time (pre-post -six evaluations), compared an intervention area with a control area (controlled-

one evaluation), or compared changes over time in an intervention area with changes over time in a control area (pre-post with control-4 evaluations), and documented impact in terms of knowledge, behavior, or community drug use. Of the studies involving baseline and follow-up data, the time between intervention implementation and the follow-up survey ranged from zero (immediate assessment of knowledge post-training) to a year or more.

None of the projects attempted to assess the impact on malaria morbidity or mortality, instead assuming that improved access to appropriate knowledge and/or improved antimalarial drug use would improve child survival. Of the potential outcome measures, community drug use could be considered most closely linked to health outcomes, but such measures were used in only two evaluations. The impact on consumer knowledge was documented by two studies, on provider knowledge by five studies, and on provider behavior by two studies.

2.1.10 Antimalarial Medicine Sellers' Knowledge

Studies show that medicine seller knowledge of drugs and doses is often poor. For example, among retailers in rural Tanzania, knowledge of signs and symptoms of malaria was adequate, but 90% did not know precise chloroquine doses for children. In Nigeria, only 1 of 49 patent medicine vendor owners knew the correct dose of chloroquine for a three-year-old child. Inadequate medicine seller knowledge is likely to be exacerbated by the recent introduction of ACT in sub-Saharan Africa because these have new dosage regimens, and more than one product may be available with different dosages. For example, in Nigeria 95% of medicine sellers incorrectly considered Artesunate monotherapy to be an ACT. Another important determinant of provider behavior is medicine sellers' beliefs about patients' attitudes and preferences. For example, even if they are aware that an oral therapy would be appropriate, they may sell injectable formulations if they know that patients believe injections to be more effective. However, careful interpretation of claims of such consumer pressure is required because providers may choose to blame consumers for their own profit-maximizing strategies

Pre-training and post-training assessment of medicine seller knowledge was conducted through testing in five interventions, with several studies demonstrating improvements. For example, trained PMVs in Igbo-Ora, Nigeria, had significantly higher scores in a test on simple medicine use and appropriate practices for malaria management (increase from 46% to 70%), and in Kisii, Kenya, the percentage of sellers who knew the correct chloroquine dose for children less than five years of age increased from 0% to 59%. In Ghana, there was an increase in the proportion of franchised CARE shops scoring more than 60% on a test on managing simple ailments from 35% to 82% (Goodman et al, 2007).

2.2 Antimalarial Medicine Sellers' Performance

Seller performance was assessed for five interventions. Because medicine sellers have incentives to put on their best behavior before an open observer, or present a wishful self-image under questioning, all studies evaluated provider behavior through mystery shoppers/simulated clients (Goodman et al, 2007).

All interventions reported improvements in medicine seller performance. For example, in Bungoma, Kenya, the proportion of sellers stocking recommended antimalarial drugs was 62% in outlets that had received job aids compared with 23% in controls. In Tanzania, the proportion of drug stores stocking unregistered medicines was 2% in accredited stores compared with 10% in controls. The proportion giving appropriate drugs for uncomplicated malaria increased from 2% to 73% after negotiation sessions in Luwero, Uganda. The proportion of sellers recommending or giving a correct antimalarial drug dose also showed substantial improvements, increasing from 9% to 53% after training and introduction of pre-packed antimalarial drugs in Abia, Nigeria, and from 0% to 50% after negotiation sessions in Uganda (Goodman et al, 2007). There were also improvements in the provision of advice to consumers. The Ugandan negotiation sessions increased the proportion of sellers who explained how to give the medicine from 8% to 49%.

In Abia, Nigeria, the proportion of sellers who asked whether the customer understood the information provided increased from 35% to 54% for uncomplicated malaria, but only from 29% to 33% for complicated malaria.

Not all indicators showed universally positive changes. For example, performance on referral practices was disappointing in Abia, Nigeria, where there were decreases in both the proportion explaining danger signs to caregivers and the proportion referring cases of

convulsions. In Kilifi, Kenya, the proportion asking about danger signs was higher in intervention shops compared with controls (26% versus 0%) but still remained unacceptably low (Goodman et al. 2007).

In Tanzania, there was concern that referral rates for uncomplicated malaria may have increased too much, with 52% of accredited drug stores referring clients rather than providing antimalarial drugs themselves compared with 21% in controls, although it had been anticipated that most cases could be appropriately managed at medicine seller level. Experience with preventive practices was also mixed, with three interventions showing little or no improvement in the proportion of sellers advising caregivers about prevention.

2.2.1 Sustainability of Interventions

The evidence of sustained improvement in medicine seller performance and lasting impact on caregiver behavior is limited, especially once outside involvement from researchers and/or donors has ceased. However, in Kilifi, Kenya, persistent improvements in appropriate treatment were demonstrated over several years. Because the primary work of the medicine seller is to run a business, one aspect of potential sustainability that can be relatively easily assessed is whether sellers perceive commercial benefits from participation, such as increased prestige and/or higher profits. In general, sellers were highly enthusiastic, and in several cases expressed a desire for further training because they believed that the process either increased their turnover or gave them increased credibility within the community (Goodman et al, 2007). However, high attrition rates among medicine sellers posed a challenge for sustainability in southern Nigeria, where 53% of sellers dropped out, and in Ibgo-Ora, Nigeria, sustaining knowledge gains when apprentices graduated were problematic. In Kilifi, Kenya, 30% of trained shopkeepers had stopped selling drugs in the first year of the intervention, although this was reduced to 5% in subsequent years by selection of more stable retailers.

2.1.2 Cost of Interventions

Another key factor influencing sustainability is the intervention cost. Cost data were available from six interventions, although comparison between studies is hampered by variation in the scope of costs included.

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The evaluation of general shopkeeper training in Kilili, Kenya, provided the most comprehensive cost data, and was the only study to estimate the cost-effectiveness of the intervention in terms of treatment outcomes. During the early implementation phase, the full economic cost per year to the provider (including annualized development and set-up year costs) was $87.82 per trained shop, $0.46 per capita, and $4.00 per additional febrile episode appropriately treated (year 2000 US$) . It was estimated that if the project were implemented at scale and run entirely by Ministry of Health staff, the costs would decrease to $18.41 per trained shop, $0.10 per capita, and $0.84 per additional febrile episode appropriately treated, with the latter figure varying between $0.37 and $1.36 in the sensitivity analysis (Goodman et al, 2007). The investigators used a simple model to estimate the cost per death and disability-adjusted life year (DALY) averted, which predicted a cost per death averted of $505.42 for the early implementation phase and $105.92 for operation at scale, and a cost per DALY averted of $18.38 and $3.85, respectively, both of which would be considered highly cost-effective in relation to commonly used benchmarks.

Other training interventions provided a range for the cost per seller trained of $8–23. Training retailers and providing information, education, and communication materials in Kisii, Kenya, was estimated to cost $8 per trainee (2002 US$) (Catherine et al, 2007). Another Kenyan intervention in Bungoma found that providing training and materials to wholesalers cost $9–11 per retailer reached (2000 US$), excluding the time of district health personnel and outside technical advisors. In Abia, Nigeria, where training on the use of new pre-packaged antimalarial drugs was offered to medicine sellers as part of a social marketing campaign, $22.64 was spent directly on training and behavior change materials for each seller recruited (excluding staff time, travel, and program development costs) (2003 US$). Finally, negotiation sessions to improve key child care practices in Luwero, Uganda, cost $21 per provider, excluding the cost of community information (2003 US$) (Goodman et al, 2007)

In deciding on the appropriate scope for an intervention, it is useful to categorize interventions as targeted at either behavior change or role change. Behavior change interventions focus on improved sales practices, such as selling an effective antimalarial drug, not selling antibiotics, distributing pre-packaged drugs, and asking appropriate

questions. Role change interventions train medicine sellers to be active health care providers, as shown in the various franchising studies, and may require enabling legislation to legitimize their expanded role. Those focused on behavior change can provide short-term and relatively rapid responses through brief, highly focused training. In contrast, role change interventions involve more extensive engagement with the health system, and more fundamental changes to the sellers' organization and management of their businesses. These may lead to broader benefits in the long-term, but are likely to have greater cost and capacity requirements (Goodman et al, 2007).

However, it should not be assumed that knowledge assessed at the end of a period of training will be fully transferred into practice once the trainee returns to his or her place of work. This may be addressed to some degree through ongoing refresher training, continued monitoring of performance, and supervision of trained sellers. However, where sellers lack financial incentives to behave as they have been trained, such problems are likely to prove persistent (Catherine et al, 2007).

Despite the limited number of evaluations conducted, there is credible evidence that well-planned and implemented interventions can improve quality of service. Experience from the 16 malaria-related medicine seller interventions identified in sub-Saharan Africa indicated that where medicine sellers were taught about approved drugs, had the opportunity to stock such drugs, and saw the benefits of providing guidance on dosing; the proportion of clients that received the correct dose of an effective drug could be substantially increased (Catherine et al, 2007). This provides a strong rationale for further exploring the largely untapped potential of medicine seller interventions to contribute to the achievement of the RBM targets.

2.3 Human resource management interventions to improve health workers' performance

Improving health workers' performance is vital for achieving the Millennium Development Goals. In the literature on human resource management (HRM) interventions to improve health workers' performance in Low and Middle Income Countries (LMIC), hardly any attention has been paid to the question how HRM interventions might bring about outcomes and in which contexts (Marjolein, Barend and

Gert. 2007). Such information is, however, critical to assess the transferability of results. Marjolcin et al. 2007 in their review set out to explore whether or not the application of a realist perspective to published research could improve the understanding of how HRM interventions impact on health worker performance through the analysis of the context and the mechanisms that brought about change. A realist review not only asks whether an intervention has shown to be effective, but also through which mechanisms an intervention produces outcomes and which contextual factors appear to be of critical influence (Marjolcin et al. 2007).

In the study, forty-eight published studies were reviewed and the results showed that HRM interventions can improve health workers' performance, but that different contexts produce different outcomes. Critical implementation aspects were involvement of local authorities, communities and management; adaptation to the local situation; and active involvement of local staff to identify and implement solutions to problems. Mechanisms that triggered change were increased knowledge and skills, feeling obliged to change and health workers' motivation (Marjolcin et al, 2007). Mechanisms to contribute to motivation were health workers' awareness of local problems and staff empowerment, gaining acceptance of new information and creating a sense of belonging and respect. In addition, staff was motivated by visible improvements in quality of care and salary supplements. Only a limited variety of HRM interventions have been evaluated in the health sector in LMIC

They selected 48 articles for analysis from 6,177 titles. The interventions were categorized inductively into seven types of interventions and classified according to the three HRM-intervention levers:

- The most commonly evaluated interventions were job related, including continuing education (n = 21) and supervision (n = 2).
- Support-system-related interventions were limited to payment of incentives (n = 4).
- Three interventions covered the creation of an enabling environment, by decentralization of HRM functions (n = 2) and by regulations (n = 1).
- Eighteen interventions addressed all three levers, consisting of combined interventions, which included different HRM components such as training, distributing job aids and system strengthening (n = 11) and quality improvement interventions (n = 7).

Continuing education: in the work of Marjolein et al. 2007. all 21 training courses were intemctive and included field practice. The duration of the courses varied from three- to four-hour workshops (n = 4). to courses of 1–11 days (n= 16) and one distance course of 10 months. Five studies were Randomized Controlled Trials (RCTs) eight were case control studies. and eight had a quasiexperimental design. In most cases (n = 17) results were measured by observing performance. likely to have influenced behaviour. In 12 studies. results could be partially explained by other, concurrent, interventions.

Overall, studies indicated that continuing education could improve knowledge. skills and performance of certain tasks in the short term. Outcome varied considerably between studies and within studies (Marjolein et al. 2007). For instance. a study in Mexico demonstrated different improvements of case management of acute respiratory infections and diarrhoea. The proportion of health care providers correctly performing specific tasks improved by 18% to 39% depending on tasks and type of provider. Training in communication showed improvement in the short term. When training included local problem solving, results could persist after nine months. Continuing education of untrained (auxiliary) nurses could improve their performance. outperforming physicians in certain tasks. Contextual influence was reported in various studies. Better performance after training was associated with supervision. In India performance after training in communication declined over time likely due to poor patient flow or high administrative workload. In South Africa. TB treatment outcomes only marginally improved after participatory training of nurses. because of weak management and organizational problems in facilities (Marjolein et al, 2007).

2.3.1 Integrated Management of Childhood Illness

IMCI training was less effective in Brazil and Uganda than in Tanzania. For instance. the odds ratio of a child needing antibiotics and receiving the right prescription from trained health workers as compared to untrained health workers was 4.4 in Tanzania, 2.1 in Uganda and 1.9 in Brazil (Marjolein et al. 2007). Contextual factors which, according to the authors, could have contributed to differences in outcome were high staff turnover in Brazil and abolition of user fees in Uganda. In addition to health workers' training, a need to influence the context was reported in several studies, either by strengthening health systems (9×) or by developing community interventions (2×).

According to the authors, important implementation aspects of the interventions contributing to change were:

- using a participatory approach, developing course contents based on local problems, adapting material to the local situation, and involving local stakeholders in developing and implementing the intervention (12×);
- Practicing tasks in the field under supervision during training, as a follow-up upon completion of training, or offering the possibility of discussing field experience after training (10×).
- Developing cascade training, with health care workers trained as trainers.

Mechanisms through which training produced outcomes were discussed by authors in four studies and explicitly researched in three studies. Improvement of health worker performance was triggered by three mechanisms: improved knowledge and skills, critical awareness on functioning of health services and being empowered to implement change. For example, Onyango-Ouma reported that training resulted in staff being more open, working better together and looking for solutions to problems, which resulted in improved provider-patient relations and reduced waiting times. Lewin et al (2005) identified that training created awareness among staff to improve patient-provider relations which lead in certain instance to changes in organization of care and in others not as staff did not see themselves as agents of change

Supervision

One Randomized Controlled Trials and one case control study investigated supervision in public facilities, which was evaluated within six to eight months of completion with intrusive data collection methods. The RCT showed differences of 14% to 47% in adherence to various aspects of stock management protocols and standard treatment guidelines compared to the control groups (Marjolein et al, 2007). A critical contextual factor was the presence of regular drug supplies.

Important implementation aspects of the intervention that contributed to change according to the authors were the use of community involvement and of participatory methods. Mechanisms for change were explored by Sermun et al in Thailand and discussed by Trap et al. According to the authors, positive change occurred due to increased skills and

knowledge. In addition, Sennun reported that change was positively influenced by health workers having a sense of belonging, as well as mutual respect between supervisors and health workers.

Payment of incentives

Marjolein et al, 2007 identified four studies that evaluated the results of paying incentives to health workers. Three of the interventions introduced user fees and paid staff from patients' fees, community cost-sharing schemes or from a drug revolving fund. All four studies used quasi-experimental designs. Two measured long-term results (eight years and three years, respectively), and two evaluated results after one year of implementing the intervention. The studies indicated that paying incentives can improve performance of a facility and can increase job satisfaction, staff motivation or patient satisfaction.

For instance, in Cambodia, payment of staff accompanied by other interventions such as organizational changes increased the average number of deliveries significantly from 319 to 585 per month and the average bed occupancy rate from 50.6% to 69.7% (Marjolein et al, 2007). Several contextual factors were reported to influence success of the interventions. For example, utilisation of services was not necessarily influenced by user fees when patients were accustomed to paying informal fees, whereas utilisation of certain services dropped in urban areas in Uganda and in rural Nigeria after introduction of user fees.

In Nigeria, delay or non-payment of salaries and drug stock-outs caused a decline in staff motivation over time, with a negative influence on performance (Marjolein et al, 2007). Critical aspects related to the implementation of the intervention contributing to positive outcomes, reported in these studies, include:

- Availability of extra funding (3×), which can be difficult when funding depends on contributions from the community;
- Training staff in accounting when they are responsible for financial management (1×);
- Assuring results-oriented assessment linked to payments (1×); and
- Support and involvement of the community in financial management (1×).

Mechanisms that lead to unproved performance were researched in three studies. The authors showed that linking individual salary supplements to functioning of health facilities can improve staff performance. The mechanism that enabled this link was staff motivation leading to development of staff initiatives to improve quality or to increased presence at work. In Cambodia, staff motivation to develop initiatives appeared to be a result of staff awareness that they are able to influence use and quality of care and of staff empowerment to introduce change. Self-confidence to continue developing initiatives for change was created when these changes actually improved quality of care.

On the contrary, in Nigeria the authors showed that staff was motivated to increase drug sales and financing due to government focus on cost recovery and health workers' interest for revenue generation; this lead to over- and irrational prescribing behaviour and a preference for curative services (Marjolein et al. 2007).

Regulation

One RCT evaluated the effectiveness of inspection visits, selective punishments and the provision of regulatory documents on the practice of private pharmacies in Laos. Evaluation occurred immediately after the intervention and showed improved practices, such as an increase of 34% in the availability of essential dispensing material and of 19% in order in the pharmacy. Adding intensive supervision of drug inspectors caused a significant change only in availability of essential dispensing material (Marjolein et al, 2007).

2.3.2 Combined intervention

Eleven published studies on combined interventions met criteria set for the study. These interventions all included a training component. Additional HRM components were the provision of guidelines and/or structured feedback (n = 4); feedback with enforcement of regulations or a contract (n= 3); improved monthly supervision, drug availability and guidelines (n = 2); and a comprehensive approach, with community involvement, strengthening of health systems or decentralization of treatment at local level (n= 2). Study designs included RCTs (n = 5), a case control study (n = 1) and quasi-experimental designs (n = 5). Nine studies evaluated within eight months of completion of the intervention, a period too short to conclude on sustained behaviour change. Nine studies

had intrusive data collection methods or external, concurrent events, likely influencing results.

Results appeared to be positive in the short term. Comprehensive approaches – combining interactive and participatory training with strengthening of health systems – showed the potential to significantly improve health workers' performance (Marjolein et al. 2007). For instance, in Bangladesh the mean index of correctly assessing sick children improved from 18 to 73 and for treatment from 8 to 54. In Morocco, the mean percentage of recommended tasks performed was 79% among the intervention group and 21% in the control group. Several contextual factors were reported to influence results. For instance, in Niger, trained health workers only referred 23% of children with a general danger sign due to long distances and poor quality of referral sites. In Vietnam, private pharmacies gave more weight to professional associations than in Thailand and this positively influenced their adherence to guidelines. In Morocco, correct prescribing was associated with children with high fever, with younger children, with a lower patient load and with longer consultation times (Marjolein et al. 2007).

Critical success factors for intervention implementation were:

- Including a component to strengthen health systems, such as improving drug availability, equipment and supervision; and
- Involving local stakeholders such as communities, staff, local health officials or local professional associations, and adapting the intervention to the local situation (8×).

Mechanisms through which combined interventions produced positive change in health worker performance were discussed in six studies. Two main mechanisms triggering change could be identified: acceptance of new information by target groups of the intervention and feeling obliged to apply new skills and knowledge in own practice. Acceptance is likely to be influenced by the perceptions on case management of professional health care providers who participated in the intervention, by existing clinical rules among health care providers and consensus among faculty in own facility regarding clinical guidelines or participation in development of guidelines. Feelings among private providers that they were obliged to change was caused by establishing accountability mechanisms through social pressure and social obligation, through awareness raising that

improved practice would improve reputation among customers or through sanctions and conviction (Marjolein et al. 2007).

Quality Improvement

Seven Quality Improvement (QI) interventions were identified, all using a participatory approach, analyzing performance data by staff involved in service delivery, and identification and implementation of local opportunities to improve performance. Study designs included quasi-experimental studies (n = 4), case control studies (n = 2) and one RCT, and evaluations occurred mostly (n = 4) after one year (Marjolein et al, 2007). Five research teams were either involved in the implementation of the study or used intrusive data collection methods.

The results of one study might be partially attributed to a concurrent intervention. Research indicated that QI improved the performance of tasks and case management, and that it could be successful in different contexts: QI implemented in hospitals in Ghana and Jamaica caused significant changes in obstetric care in both countries, such as an increase from 65% to 93% of patients with genital tract sepsis treated with broad-spectrum antibiotics. Critical implementation aspects of the interventions contributing to success included:

- Involving staff, communities and local health authorities in setting standards (3×);
- Receiving support from the management of the facility and senior officials (2×); and
- Using available funds and developing feasible plans for local teams (2×).

Mechanisms which triggered health workers to change were discussed in three studies. Identified mechanisms were increased job satisfaction in El Salvador and improved staff morale due to feedback meetings in Ghana and Jamaica and due to community involvement and ownership in Congo. In Congo additional mechanisms contributing to change were increased knowledge due to training and acceptance of indicators and willingness to adhere to self-set standards (Marjolein et al, 2007).

The findings show that HRM interventions can contribute positively to health workers' performance and the most important results were that:

- Combined interventions of participatory, interactive training, job aids and strengthening health systems can be successful in improving health workers' performance;
- Continuing education as a single intervention is likely to be effective in the short term and can improve the performance of untrained health care providers, however, to sustain effectiveness, additional interventions addressing health systems or community issues are required;
- QI, based on local performance analysis by teams, and payment combined with additional interventions such as organizational change, can improve health workers' performance; and
- Training to identify problems and develop local solutions or to improve communication is not likely to be effective when local conditions are not addressed.

However, different contexts produced different outcomes. Commonly reported critical implementation aspects that contributed to success could be extrapolated and these were the involvement of local authorities, communities and management, adaptation to the local situation, and the active involvement of local staff to identify and implement solutions to problems. In addition, the studies provide examples of contextual factors influencing the outcome. However, it was not possible to identify patterns in how contexts influenced outcome of interventions due to their limited descriptions and the fact that there were few similar interventions implemented in different contexts (Marjolein et al, 2007).

The review teased out three mechanisms that were triggered by HRM interventions and brought about change in health workers' performance, although mechanisms were only to a limited extent discussed and even to a lesser extent researched. These mechanisms were: increased knowledge and skills, improved motivation and feeling of being obliged to change. Increased knowledge and skills through training was an important mechanism to contribute to improved performance, but not sufficient. These findings corroborate earlier studies that continuing education is only effective to a limited extent. The published studies reported positive outcomes when training included a participatory approach, material adapted to the local situation and practice during or after training. These intervention components indicate the use of an adult learning approach, which is reported to be effective when training adults. However, only three studies explicitly reported that

training was based on specific learning theories. In most reported interventions, staff motivation to implement knowledge and skills appeared an additional mechanism enabling change (Marjolein et al. 2007).

2.3.2 Impact of training in clinical and microscopy diagnosis of childhood malaria on antimalarial drug prescription and health outcome at primary health care level in Tanzania

Prescribing antimalarial medicines based on parasite confirmed diagnosis of malaria is critical to rational drug use and optimal outcome of febrile illness. The impact of microscopy-based versus clinical-based diagnosis of childhood malaria was assessed at primary health care (PHC) facilities using a cluster randomized controlled training intervention trial.

Billy, Maryceline, Marian, Max, Amos, Lars, Goran, Zul and Anders in their intervention study aimed to assess the impact of training in microscopy and clinical diagnosis on antimalarial drug prescriptions and health outcomes in childhood malaria at PHC level, selected sixteen PHC facilities in rural Tanzania and they were randomly allocated to training of health staff in clinical algorithm plus microscopy (Arm-I, n = 5) or clinical algorithm only (Arm-II, n = 5) or no training (Arm-III, n = 6). Febrile under-five children presenting at these facilities were assessed, treated and scheduled for follow up visit after 7 days. Blood smears on day 0 were only done in Arm I but on Day 7 in all arms. Primary outcome was antimalarial drug prescription. Other outcomes included antibiotic prescription and health outcome. Multilevel regression models were applied with PHC as level of clustering to compare outcomes in the three study arms.

The study result showed that a total of 973, 1,058 and 1,100 children were enrolled in arms I, II and III, respectively, during the study period. Antimalarial prescriptions were significantly reduced in Arm-I (61.3%) compared to Arms-II (95.3%) and III (99.5%) (both $P < 0.001$), whereas antibiotic prescriptions did not vary significantly between the arms (49.9%, 54.8% and 34.2%, respectively). In Arm-I, 99.1% of children with positive blood smear readings received antimalarial prescriptions and so did 11.3% of children with negative readings. Those with positive readings were less likely to be prescribed antibiotics than those with negative (relative risk = 0.66, 95% confidence interval: 0.55,

0.72). On day 7 followup, more children reported symptoms in Arm-I compared to Arm-III, but fewer children had malaria parasitaemia (p = 0.049). The overall sensitivity of microscopy reading at PHC compared to reference level was 74.5% and the specificity was 59.0% but both varied widely between PHCs (Billy et al. 2008).

Microscopy based diagnosis of malaria at PHC facilities reduces prescription of antimalarial drugs, and appears to improve appropriate management of non-malaria fevers, but major variation in accuracy of the microscopy readings was found. Lack of qualified laboratory technicians at PHC facilities and the relatively short training period may have contributed to the shortcomings. Therefore, interventions to improve rational use of antimalarial drugs in a sustainable and cost-effective way are of crucial importance (Billy et al. 2008).

Improved Malaria Case Management after Integrated Team-based Training of Health Care Workers in Uganda

Training of health workers and improving diagnostic capabilities have been identified as potential avenues for improving malaria case management. The results of observational studies suggest a need for more integrated training approaches and supportive supervision. However, recent intervention studies highlight the challenges faced in changing in health workers' diagnostic and prescribing practices (Hamer, Ndhlovu, Zurovac, Fox, Yeboah-Antwi, Chanda, Sipilinyambe, Simon and Snow, (2007).

In response to concerns about the need for improved case management in Uganda, Hamer, et al, (2007) designed and prospectively evaluated a training curriculum for health workers at facilities with existing laboratory services. In the study, the impact of the training was evaluated on the quality of case management in eight health facilities approximately one year after the implementation of artemether-lumefantrine as the recommended first-line treatment for uncomplicated malaria. Outcomes were measured using an existing targeted surveillance system that captures data on outpatient demographics, diagnoses, and treatments prescribed.

The training intervention was implemented at eight sentinel sites that were established in 1998 by the Uganda Ministry of Health. Sites were selected to represent the diversity of geography and malaria transmission intensity in Uganda. All sites are government-run

health centers IV, with the exception of Kabale, which is a regional referral hospital, and all have a functional laboratory with microscopy services. At the time of the study, rapid diagnostic tests were not in use at any of the sites. Health centers IV have a catchment population of approximately 100,000 people and are typically staffed by one medical officer, two clinical officers, five nurses, five midwives, four nursing assistants, one dental officer, one laboratory technician, one laboratory assistant, one records officer, one health educator, and one health assistant. Kabale regional referral hospital has a catchment population of approximately two million persons (Hamer et al, 2007).

The aim of the training was to improve health workers' performance of clinical and laboratory tasks relevant to malaria case management, and to encourage a shared understanding of the management approach and the role of each staff member. The curriculum and training materials were developed and delivered through the Joint Uganda Malaria Training Program (JUMP), a partnership between UMSP and the Infectious Diseases Institute (IDI) of Makerere University. The course was team-based and targeted three categories of staff typically working in health facilities in Uganda: clinicians (medical officers, clinical officers, nurses, and midwives), laboratory staff, and records clerks. The course includes both didactic and practical hands-on sessions. Training modules include information on malaria transmission and epidemiology, Uganda malaria policy, medical ethics, clinical management of malaria, preparation of blood smears, microscopy skills, and medical record keeping (Hamer et al, 2007). The modules on clinical management of malaria included a session on management of patients with fever but with a negative blood slide for malaria parasites.

To ensure consensus among key stakeholders and cohesion with national case management guidelines, the training materials were developed through an iterative process with input from many sources. Existing resource materials and guidelines issued by the Uganda Ministry of Health, the World Health Organization, including the Integrated Management of Childhood Illness (IMCI) strategy, and other training and public health institutions were reviewed. A curriculum development specialist led the process in which training modules were written by experts in malaria epidemiology, laboratory diagnosis, and antimalarial treatment, and were edited by colleagues with field and training experience. Two national stakeholders' meetings were held to formally review and revise

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subsequent curriculum drafts, informed by pilot trainings of 50 health workers. The final curriculum and training materials were approved by Uganda's National Malaria Case Management Technical Working Group, the MCP, and other stakeholders in Uganda (Hamer et al, 2007).

Each site was visited by the JUMP team prior to training as part of a baseline needs assessment. A total of 170 health workers received training from the 8 sentinel site health facilities from December 2006 through June 2007. Training consisted of a six-day course conducted at the IDI and UMSP core facilities at Mulago Hospital in Kampala. To minimize disruption of patient services, the staff at each health facility was divided into two groups and trained in two back-to-back week-long sessions. Trainees were assessed for learning attainment in terms of knowledge, skills, and attitudes through performance on written pre-test and post-test, participation in clinical and case discussions, and attendance of at least 90% of the sessions. Two follow-up support supervision visits approximately 6 and 12 weeks after the initial training course were conducted at the sentinel sites by JUMP team members to reinforce training messages, assess skills, and provide individual feedback (Hamer et al, 2007).

Hamer et al, 2007 observed that the sensitivity of field microscopy, i.e., correctly identifying the presence of malaria parasites, was relatively high before training (greater than 85% at 5 of 7 sites) and did not improve significantly after training. One site had a non-significant improvement in sensitivity from 66.7% to 85.7% and two sites had a significant decrease in sensitivity. The specificity of field microscopy, i.e., correctly reading a blood smear as negative, was also high before training (greater than 90% at 5 of 7 sites) and did not improve significantly after training (with a significant decrease in specificity at one site, Nagongera).

Prior to training, the proportion of patients prescribed antimalarial drug treatment whose prescription included an appropriate regimen ranged widely from 73.1% to 96.6% in patients < 5 years of age and from 40.0% to 98.7% in patients ≥ 5 years of age. After training, results were mixed across the sites with statistically significant improvements at 2 of the 8 sites in patients < 5 years of age and at 4 of the 8 sites in patient's ≥ 5 years of age. The remainder of the comparisons was not significant, with the exception of Aduku

where there was a significant decrease in the proportion of patient's prescribed appropriate therapy. With the site as the unit of analysis, the proportion of patients prescribed antimalarial treatment whose prescription included an appropriate regimen increased from 86.3% pre-training to 89.0% post-training ($P = 0.39$) for patients < 5 years of age and from 78.6% to 79.5% for patients ≥ 5 years of age ($P = 0.86$) (Hamer et al. 2007).

According the researchers, there are relatively few published studies evaluating the impact of training on malaria case management. A prospective study in Guinea-Bissau found reduced mortality after a training and implementation of standardized guidelines for malaria management in a hospital setting. A survey study of the impact of IMCI training in Uganda noted significant associations between training and health workers' demonstrated ability to correctly classify children's illnesses, to provide correct treatment of those requiring an antibiotic or antimalarial, and to advise caregivers effectively. Other studies that have considered training as a factor in quality of case management illustrate the challenges in altering health workers' diagnostic and prescribing practices (Hamer et al, 2007).

However, a retrospective assessment found a significant decrease in malaria over-diagnosis associated with a sustained training and supportive supervision effort. Panjo and others also highlighted the importance of follow-up visits, finding that the quality of care was higher at facilities with at least one supervision visit every six months compared with other facilities. In summary, earlier studies demonstrate that case management training may lead to improvements in health care, although challenges remain in optimizing the impact of such training efforts (Hamer et al, 2007).

The results of the study by Hamer et al, 2007 confirm the potential for training to effect significant improvements in some areas of malaria case management across sites that represented a wide range of malaria transmission intensities. Particularly encouraging are the increase in the proportion of patients suspected of having malaria referred for laboratory confirmation, and the reduction in antimalarial drug treatments prescribed to patients with negative blood smears. After training, the proportion of patients suspected of having malaria referred for microscopy increased by approximately 50%, and the proportion of patients with a negative blood smear prescribed antimalarial drug therapy

decreased by approximately 60%. When the data from all 8 health facilities combined were extrapolated, these improvements resulted in 8,151 fewer prescriptions for antimalarial drug therapy among the 67,705 patients over the 120 days after training. The training program did not have a significant impact on the proportion of patients with positive blood smears who were prescribed antimalarial drug therapy. However, the pre-training standard for this indicator was already high, with more than 90% of patients with a positive blood smear prescribed antimalarial drug therapy (Hamer et al. 2007).

The training program was less successful in improving the proportion of patients prescribed appropriate antimalarial drug therapy and the diagnostic accuracy of field microscopy. Prior to training the proportion of patients whose prescription included an appropriate antimalarial drug regimen were 86% in children < 5 years of age and 79% in those ≥ 5 years of age. Most appropriate prescriptions were for the government's newly recommended first-line treatment, artemether-lumefantrine (83%), and the remaining appropriate prescriptions were for quinine, the government's recommended second-line treatment. These results were better than those in a recent study from Zambia in which 27% of children weighing 5-9 kg and 42% of children weighing ≥ 10 kg with uncomplicated malaria were treated with artemether-lumefantrine (Hamer et al. 2007).

The Zambian study was conducted two years after the facilities began the process of implementing this drug as the recommended first-line therapy. At the time of this study, most patients not given appropriate therapy were prescribed chloroquine plus sulfadoxine-pyrimethamine (87%), the previous first-line treatment of uncomplicated malaria in Uganda. Although data were not collected systematically about case management decisions, health workers reported that the primary reason for not prescribing appropriate therapy was that supplies of artemether-lumefantrine were depleted, which occurred variably from site to site both before and after the training period. For example, Aduku experienced a long period of depletion of artemether-lumefantrine after the training, which could explain the significant decrease in appropriate antimalarial drug therapy at that site (Hamer et al. 2007).

Failure to improve the diagnostic accuracy of field microscopy after training was also felt to be caused by a combination of surprisingly good pre-training performance and limitations extrinsic to the training intervention. The overall sensitivity and specificity

prior to training of 86% and 90%, respectively, was considerably higher than reported accuracy of field microscopy from other studies in Africa (Hamer et al. 2007).

Hamer et al. 2007 concluded that the results of the study demonstrate that a relatively brief integrated training program, with supportive follow-up supervision, can achieve a significant impact on the quality of malaria case management. Improved use of laboratory confirmation of malaria cases and reduced prescription of antimalarial drugs for patients with negative blood smears are critical for rational use of antimalarial drugs and effective patient care. For optimal impact, integrated training must be accompanied by investment in other components of the health care system, including adequate staffing and reliable supplies of drugs and laboratory materials (Hamer et al. 2007).

In a district of Haryana state in northern India, Improvement in the knowledge and skills of 50 primary health care workers following the interrupted 5-day training was compared with that of 35 primary health care workers after the conventional 8-day Integrated Management of Neonatal and Childhood Illness (IMNCI) training package by Kumar, Aggarwal and Kumar, (2009). The average score increased significantly ($P < 0.05$) from 46.3 to 74.6 in 8-day training and from 40.0 to 73.2 in 5-day training.

Knowledge score improved for all health conditions, like anaemia, diarrhoea, immunization, malnutrition, malaria, meningitis and possible severe bacterial infection, and for breastfeeding in 8-day as well as in 5-day training. Average skills score for respiratory problems increased from 38 to 57 in 8-day training and from 41 to 91 in 5-day training. Corresponding increases in skill scores for diarrhoea assessment were from 28 to 67 and 48 to 75, and for breastfeeding assessment from 33 to 84 and 42 to 86 in 8-day and 5-day training, respectively. Average counseling skill score also rose from 42 to 89 in 8-day and from 37 to 78 in 5-day training. A direct cost saving of US$813 for a batch of 25 trainees and an indirect cost saving of 3 days per trainee and resource person makes the interrupted 5-day IMNCI training more cost-effective (Kumar et al, 2009)

A study to evaluate the knowledge, attitudes and perceptions of epilepsy in primary care system health professionals prior to and after an educational intervention, by Fernandes, Noronha, Sander and Bell, (2007). They delivered educational interventions to three groups of people with an interest in epilepsy: (1) Information courses for physicians (241

subjects); (2) Social re-integration course for health professionals and community leaders (631 subjects); (3) "Training the Trainers" Course for physicians (11 subjects).

The development of educational modules followed three main steps: (1) identification of target groups, (2) definition of the objective of the intervention; (3) definition of the teaching contents. The overall goal was to educate health care workers to provide bio-psycho-social management for people with epilepsy and to provide self-sustained education within the network (Fernandes et al, 2007). The primary care setting, particularly in the Family Physician Program model, includes a team of multi-disciplinary professionals, which can be divided into physicians and other health professionals, particularly health agents and community leaders. The courses were developed for these three groups.

Module 1: Information courses for physicians

The course was of eight hours duration and could be delivered to 35-40 people at a time. The main purpose was to provide pragmatic information on the management of people with epilepsy, including: The nature of epilepsy, Epilepsy diagnosis, Epileptic seizures, Treatment, Epilepsy in special situations (women, older people, and children), Myths and beliefs and Psycho-social aspects (stigma, quality of life).

For physicians, the main diagnostic aspect of this module was centered on three questions: *is it epilepsy?* (yes or no); *is the seizure partial or generalized?*; *what is the cause of epilepsy?* (Symptomatic, idiopathic, or cryptogenic). With regard to the second question, the professional is advised to ask directly whether the patient has absence spells or myoclonic jerks, as the answer has implications for choosing the antiepileptic drug. The answers to these questions provide a framework of epilepsy management. Where doubt persists, patients should be referred to neurologists (Fernandes et al, 2007).

Module 2: Social re-integration course for health professionals and community leaders

The course was of three hours duration and could be delivered to 60 to 80 people at a time. The objective was to educate these professionals on the main bio-psycho-social aspects of epilepsy to promote the dissemination of correct information in the community. After this course, the health care workers should be able to provide and articulate social support to people with epilepsy (Fernandes et al, 2007). The themes covered were: epilepsy (definition, prevalence, seizures and treatments), psycho-social aspects (social difficulties,

prejudice and stigma) and strategies to deal with prejudice and stigma. The aim was to promote advocacy groups for people with epilepsy to enable social re-integration. This module highlighted the importance of working in groups for people with epilepsy, enabling the professionals to set up advocacy groups in their communities, to empower patients and their families on their rights and duties as citizens.

In addition to these educational courses, Fernandes et al, (2007) devised a course to provide self-sustained education within the healthcare network. The aims were to train a physician to provide education to the rest of the team.

Module 3: "Training the trainers" course for physicians

This course was of 20 hours duration (three days) and could be delivered to up to 30 people at a time. It is important that there was a prior agreement with the site health manager to allow the information courses to run, and that there was a supply of support materials. This module aimed to prepare physicians to pass on the information on epilepsy to other health staff, providing a self-sustained education program within their health network. This course covered the following aspects: medical aspects (epilepsy diagnosis, epileptic seizures and prevalent syndromes, special situations, treatment with anti-epileptic drugs (AEDs), differential diagnosis, investigations; psychological aspects (self-esteem, self-confidence, depression, anxiety, stigma and quality of life); social aspects (social inclusion).

In addition, participants received teaching material to enable them to run information courses in their communities. This consisted of a CD with the lectures as power-point presentations, a booklet with the main aspects taught in the module and a guideline for AED prescription with four first line AEDs *(carbamazepine, sodium valproate, phenobarbital and phenytoin)* Specific booklets were also prepared for the other courses. The results of the trial by Kumar et al, 2009 were largely positive, and showed that the modules seem to improve knowledge, and change attitudes towards and perception of epilepsy, as shown by the significant differences between the pre-test and post-test scores in the modules. On average physicians improved by 16%; and health agents improved by 14%. It is important to highlight that the interval between the questionnaires was six months in each group. Thus these data suggest that people retain knowledge. Nevertheless,

the knowledge of health agents even after the training was still below 50%. and some questions were still answered inappropriately by some physicians. These facts reinforce the necessity of continuous education in order to correct oversights and improve the management of people with epilepsy (Fernandes et al, 2007). During the evaluation process, health professionals completed a quantitative and qualitative questionnaire to assess their knowledge attitudes and perception (KAP) of epilepsy prior to the training (pre-test) and 6 months after it (post-test).

Comparison of knowledge scores prior to (mean=55.8, standard deviation=14.0) and after (mean=71.5, standard deviation=12.0) the intervention showed that physicians had improved knowledge after the training (t-test=7.8, p<0.001). The same pattern occurred with the health professionals; the knowledge score prior to (mean=22.3, standard deviation=12.5) and after (mean=36.6, standard deviation=12.5) the intervention showed that health professionals had improved knowledge after the training (t-test=12.4, p<0.001). Improvements in attitudes and perception also occurred after the courses (Fernandes et al, 2007).

During the evaluation process, health professionals completed a quantitative and qualitative questionnaire to assess their knowledge, attitudes and perception (KAP) of epilepsy prior to the training (pre-test) and 6 months after it (post-test). The qualitative assessment of the training the trainers' module suggests that these low cost courses are highly effective and can quickly expand the information programme (Fernandes et al, 2007). Originally 11 physicians were trained and, after the course, these professionals trained a further 810 new health professionals, including workers of the primary care teams.

Fernandes et al, (2007) concluded that training courses can promote increased knowledge, attitude and perception in a cost effective way in the primary care setting and that a continuous education program is required to improve the management of people with epilepsy.

In a qualitative study of factors affecting the prescription of Artemether-lumefantrine to determine why health workers don't prescribe ACT by Wasunna, Zurovac, Goodman and Snow between January and March 2007, a36 in-depth interviews were conducted in five rural districts with health workers who attended in-service training and were non-adherent

to the new guidelines. A further 20 interviews were undertaken with training facilitators and members of District Health Management Teams (DHMTs) to explore reasons underlying health workers' non-adherence.

It was observed that the potential factors leading to provider non-adherence emerging from the in-depth interviews have been organized into eight broad themes: health worker perceptions of AL; concerns over cost; fear of stock-outs; excess stocks of non-recommended antimalarials; ambiguous training messages; perceived severity of illness; patient pressure to obtain certain types of anti-malarial; and health system weaknesses (staffing versus work load and supervision) (Wasunna, et al 2008).

The study has addressed this gap for the case of prescription of ACTs, by investigating health workers' perceptions and understanding of the new antimalarial treatment policy and reasons underlying their non-adherence to the national antimalarial treatment guidelines and it was reported that mixed or ambiguous messages delivered during in-service training had a clearly negative impact on health workers' prescription practices. These included information on the continued efficacy of amodiaquine, compulsory parasitological testing of patients and differential diagnosis of fevers in children (Wasunna, et al 2008).

In Makueni District, health workers were universally told that amodiaquine was still effective and could be used in the treatment of uncomplicated malaria. This statement is incorrect, since Makueni was among the first districts in Kenya reporting increased levels of *Plasmodium falciparum* resistance (22%) to amodiaquine as early as in 1997. Furthermore, such messages clearly contradict the new guidelines, where amodiaquine is not recommended in the treatment of uncomplicated malaria. With regard to fever in children below five years, some health workers reported that they were told to rule out other causes of fever before prescribing AL. This contradicts the main recommendations stipulated in the new guidelines and accompanying algorithms, where presumptive treatment with AL for all childhood fevers in high malaria risk areas is recommended. Inappropriate messages on compulsory malaria diagnosis before prescribing AL are also highlighted in this study. Health workers reported that they were told during the training that testing in patients five years and above was compulsory regardless of the availability

of diagnostics (Wasunna, et al 2008). This contradicts the national treatment guidelines which recommend that:

"Patients above 5 years of age with positive test result should be treated with AL however, where diagnostics are not available, in the absence of other obvious cause of fever AL should be prescribed presumptively for all febrile patients above 5 years of age"

This confusion was likely to lead to frequent provision of amodiaquine and SP for adult patients. These problems highlight the importance of the quality of training, a factor rarely captured in quantitative studies on provider behaviour. It appears that in many cases the training was effective in getting across the messages delivered; the problem was that some messages were often inaccurate. This implies a need for greater quality control during the training, perhaps through greater time spent on initial training of trainers, and monitoring of cascade training sessions by more senior staff. It also emphasizes the importance of follow up supervision of health workers in facilities, to monitor their practice, and give them the opportunity to ask further questions and resolve any confusion (Wasunna, et al 2008).

2.3.4 Training messages

Some of the key messages delivered during training influenced health workers' prescribing decisions. Incorrect messages were reportedly received, for example that compulsory parasitological testing was required before prescribing AL, and that amodiaquine was still effective. Around half of the HWs stated these messages as reasons for not prescribing AL. It was widely reported by both those receiving and providing training that there was a key emphasis during in-service training on obtaining confirmed parasitic diagnosis using microscopy or rapid diagnostic tests (RDTs) before prescribing AL (Wasunna, et al 2008). The following are some of the comments made by the participants who were beneficiaries of the training:

"In the first place when we got this AL we were told not to use them unless we get those kits (RDTs)" (HW, Kwale)

"We said they have to test before you put the patient on the drug (AL) and the test has to be positive. We are also encouraging the use of RDTs even at the dispensary level. So we said there is no reason for not testing because in the event that you do not have a

microscope you can use the RDT. That one we emphasized that you have to be tested before prescribing AL". (Training facilitator (TF), Bondo).

DHMT members indicated that this restriction had prevented many health workers from prescribing AL because they were waiting for RDTs to be supplied to their health facilities, particularly to those without microscopy. The importance of confirmed diagnosis was particularly emphasized for patients of five years and above. For this age group health workers reported being told it was compulsory to test before prescribing AL, regardless of the availability of diagnostics. Only a few health workers said that they could treat presumptively with AL if diagnostics were not available. They, therefore, often defaulted to using monotherapies for older patients (Wasunna, et al 2008).

"We were told that "we don't give Coartem (AL) before testing" for patients over five years and adults, so our drug of choice remains as SP, amodiaquine and quinine. Coartem doses for patients over five and adults are all in the stores as we wait for the RDTs". (HW, Kwale)

In Makueni, health workers reported that they had been told by training facilitators that amodiaquine was still effective and they could, therefore, still prescribe it (this was confirmed in interviews with training facilitators) (Wasunna, et al 2008).

"We were told that amodiaquine still can cure malaria because 92% of the patients get cured when using amodiaquine while with Coartem it is 96%. That is why we are still using them". (HW, Makueni)

Most health workers reported that they were told by training facilitators to treat all childhood fevers presumptively as malaria using AL, in accordance with algorithms developed in the national guidelines and harmonized with the Integrated Management of Childhood Illness (IMCI) fever algorithms. However, some health workers reported that they had been told by training facilitators to rule out other diagnoses before prescribing AL in febrile children. They were, therefore, employing some degree of clinical judgment (Wasunna, et al 2008).

"What we were telling them, is that when a child comes with fever, you rule out it is not fever as a result of other illness, that is they were to treat as per IMCI guidelines. However, we told them every person must be tested to rule out that is not malaria, and then if it is meningitis or if it is bacterial infection they can treat according to the IMCI guidelines. They should not treat fever as malaria". (TI, Kisii)

2.3.5 TRAINING

Definitions and General Training Considerations

A. Some Definitions

In general, *training* refers to instruction and practice for acquiring skills and knowledge of rules, concepts, or attitudes necessary to function effectively in specified task situations. With regard to occupational safety and health, training can consist of instruction in hazard recognition and control measures, learning safe work practices and proper use of personal protective equipment, and acquiring knowledge of emergency procedures and preventive actions. Training could also provide workers with ways to obtain added information about potential hazards and their control; they could gain skills to assume a more active role in implementing hazard control programs or to effect organizational changes that would enhance worksite protection (Geigle, 2009).

Performance represents observable actions or behaviors reflecting the knowledge or skill acquired from training to meet a task demand. With regard to occupational safety and health, performance can mean signs of complying with safe work practices, using protective equipment as prescribed, demonstrating increased awareness of hazards by reporting unsafe conditions to prompt corrective efforts, and executing emergency procedures should such events occur.

Motivation refers to processes or conditions that can energize and direct a person's behaviors in ways intended to gain rewards or satisfy needs. Setting goals for performance coincident with learning objectives and use of feed-back to note progress have motivational value. With regard to occupational safety and health, motivation can mean one's readiness to adopt or exhibit safe behaviors, take precautions, or carry out self-protective actions as instructed. Bonuses, prizes, or special recognition can act as

motivational *incentives* or rewards in eliciting as well as reinforcing these behaviors when they are displayed (Geigle, 2009).

Geigle (2009) opines that knowledge or skills acquired in training may not always result in improved performance in actual work situations. This may indicate 1) lack of suitable motivation, 2) training content does not fit job demands (i.e., a problem in defining suitable training objectives, or 3) dissimilarity or conflicts between the instruction/practice in training conditions when compared to actual job conditions (i.e., a problem in transfer of training).

2.3.6 Critical Training Elements

Different authoritative reviews of the general training literature by Goldstein and Buxton (1982), Campbell (1988), Tannenbaum and Yukl (1992)), and job training in particular, emphasize the importance of certain elements as critical to an effective program
They are noted below:

1. *Needs Assessment*

According to Goldstein and Buxton (1982), Campbell (1988), Tannenbaum and Yukl (1992), training goals presuppose: 1) consistency with organizational goals, 2) the presence of jobs designed to yield performance outputs that meet the organization's goals, and 3) performance levels dependent on knowledge of the job tasks, skill, attentiveness to the work or factors where training can make a difference. On the last point, expecting training to solve problems related to internal organizational conflicts or to overcome deficiencies in equipment or work methods is unrealistic. Job analyses determine which of the relevant performance factors comprise the highest priority training needs either now or in the future. The process includes defining the tasks involved, their order of importance (in terms of frequency, criticality, complexity), and details of the steps necessary to accomplish them.

2. *Establishing Training Objectives*

According to the authors, the needs assessment provides the information to establish the objectives of the training program. These are stated as observable behaviors expected of the trainee after the instruction, and they may acknowledge the conditions under which they should be performed and the required level of proficiency.

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3. Specifying Training Content and Media

According to the general training literature, content represents the knowledge or skill that the trainee must master to be able to meet the behavioral objectives. The judgment of those who know the job demands is the most common approach to specifying training contents. Other approaches may be the products of problem solving exercises, or be based on mistakes people make in using a skill such as to design corrective learning measures. Evidence that one teaching method such as lectures, televised instruction, computer-aided instruction, or interactive video methods is superior to another is not that clear (Kearsley, 1991). Much depends on the specific training needs, makeup of trainee group and other factors. Why or how a particular method facilitates learning and how it can be made more effective are issues requiring further study.

4. Accounting for Individual Differences

According to the general literature, effective training should take account of the characteristics or attributes of the trainees. Aside from differences in aptitude, literacy, or pre-training skill levels how trainees view the training program in terms of improving their job performance or self-efficacy may dictate variable approaches.

The kind and level of training for new job applicants versus long-term or older workers reassigned to the same tasks also has to be addressed.

5. Specifying Learning Conditions

In general, instructional events comprising the training method should not inhibit, conflict with, or be unrelated to the processes that lead to mastery. If the learning is to develop capabilities in problem-solving techniques, the instructional approach should stress thinking/reasoning approaches not rote memorization. Training methods should require the trainee to use the training content in active or productive ways, e.g., restating or applying principles rather than just recalling them, or adapting the information to new situations rather than mere repetition in the same one. The current literature suggests that using learning events that require productive behavior or that provide appropriate feedback (positive/accurate/credible) and opportunities for practice under conditions that promote transfer to the actual job are ideal.

6. *Evaluating Training*

According to Kirkpatrick (1967), training evaluations in the general literature can take four forms which are viewed as a series of steps or levels. They are:

Step 1: Reaction

How did the trainees like the program? Typically this is done through evaluation sheets completed at the end of the training. Typical items inquire as to whether the material was well organized, relevant to the trainees needs, made interesting through the instructor's manner of presentation or use of visual aids, demonstrations, etc.

Step 2: Knowledge Gain (or Skills Acquired)

What principles, facts and techniques were learned? Knowledge of facts and principles is usually evaluated via pre/post paper-and-pencil tests or quizzes. Assessment of skills may be done through performance tests before and after training. An untrained or control group can be similarly tested to indicate any differences resulting from just the test-retest experience.

Step 3: Behavior Change

What changes in behavior occurred as a result of the program? For this purpose, reports by the trainees themselves (self appraisals) of their on-the-job performance or observations by their peers, supervisors, instructors can be used. A time interval between the end of training and the observations may be necessary to allow for the training to be put into practice. Post-training measures taken at different time points are also suggested to determine if the training effect is sustained or needs refreshment.

Again similar observations for a control group are recommended to acknowledge any effects from repeated testing. These control data also provide an added reference for gauging the significance of the apparent behavior changes in the training group.

Step 4: Results

This form of evaluation ask certain questions as follows: What were the tangible results of the program in terms of its objectives or goals for the organization? Did it result in reduced mortality, injuries or illness, lower medical costs, improved productivity? Extra-

or post-training factors can affect these types of outcomes, and it is not always possible to design evaluations that can isolate the specific training contribution.

Undertaking evaluations where these "extra-training factors" are held constant during the pre-and post stages of the training assessment or can be segregated as to their influence through use of suitable control groups are ideal. Needless to say, training impacts at the organization level can require an extended time line especially in using injury/illness outcomes owing to their infrequency.

2.3.7 Criteria for Rating Training Effects

Past surveys have shown that most in-house assessments of training programs measure only trainee reactions of how well they liked the instruction (Smeltzer, 1979; Smith, 1980; Parker, 1984. Alliger and Janak, 1989). Efforts to determine the extent to which the training content was absorbed or resulted in changes in actual on-the-job behaviors, or had impacts on organizational measures (e.g., quantity/quality of production, sales, absences/turnover, injury/illness rates) were rarer. Among reasons offered for the lack of more intensive efforts at evaluating training were the unquestioned beliefs that training works that workplace conditions do not readily lend themselves to systematic assessments of training, and those more rigorous attempts will entail high costs. Increasingly, however, there is the call for more extensive training evaluations to verify the benefits as witness this exercise (Blomberg, et al., 1988).

Reinforcing the above statement, trainee reactions to instruction may bear little relationship to the extent of actual learning. (Liking the instruction does not imply learning). Hence, it should not be used as the sole criterion to gauge effectiveness Similarly, pre- and post-training quizzes or tests of skill showing the gains from instruction may or may not be related to improved on-the-job performance. Needs for multiple measures of effectiveness are apparent (Blomberg, et al., 1988)

Simple performance outcome measures representing various levels of achievement may be critical to determining the validity of the instruction but may not indicate the factors that influenced these results. Provision of "process" measures, reflecting various amounts of training time, modes of training, trainer attitude/competency, can indicate why the overall

results were or were not achieved. This can be important in efforts to revise the training to improve its efficacy (Blomberg, et al., 1988).

2.3.8 Revising the Training

The evaluation of training as noted by Goldstein and Buxton (1982) offers information as to whether the instruction has had its intended effect on the measures set out for that purpose. Seldom do the data indicate a program was a complete success or a failure, given multiple criteria for gauging the results. Rather, the data may indicate better understanding, retention or application of some course material as compared with others. Gaps or variations in knowledge or competencies resulting from the training may reflect needs to consider more training time, alternative instructional techniques, or more capable instructors.

2.3.9 Developing Learning Activities

Sequencing training content and material is almost as important as the content itself. And, it can defeat the purpose of a training program if it is not carefully thought out. Trainers should be concerned about the logical sequencing of training, because if the lesson does not unfold in a building, reinforcing way, learning may be less effective (Goldstein and Buxton, 1982). Consider the following basic sequencing strategies:

1. *General to the specific.* This activity move gradually to the many and varied specific on-the-job applications of the concepts discussed
2. *Simple to the complex.* The design begins with a fairly simple conceptual overview of the subject to be learned. In our lockout/tagout training, we might talk about how to "lock out" a coffee maker before covering lockout procedures for a more complicated machine. As an example, all of these topics may be effectively taught using this strategy
3. *Theory to practical application.* You might introduce learners about general energy sources before covering more specific sources of energy expected while conducting lockout/tagout procedures. All of these topics are among those that may be effectively taught using this strategy.
4. *Known to unknown* concepts, ideas, or processes. For instance, we all know machinery requires some form of energy to work, but in many instances, we may not

realize that multiple energy sources involved. Once again, these topics, and many others, may be effectively taught using this strategy:

5. *Step by Step.* For On-the-Job Training (OJT), sequence the content so that it corresponds to the steps of the task. Of course, when we train lockout/tagout procedures or how to use hazardous chemicals, it's very important to perform all steps correctly in their proper order.

What are the criteria for an effective learning objective?

An effective learning objective describes outcomes in terms of observable, measurable behaviors. They should be based on job data, not on conjecture or existing trainer guides. The objective should specify the knowledge, skills, and abilities (SKAs) that make performing the task possible.

Let's use the following learning objective to get a better idea about the five criteria (Goldstein and Buxton, 1982). The numbers within the objective refer to the related criteria discussed below:

(1) At the end of the training session, (2) without help, (3) each student (4) will list (5) in proper order, all steps of the accident analysis procedure.

Now, let's take a look at the five criteria of an effective learning objective:

1. The objective states a time limit.

Example: *"At the end of the training session"*

2. The objective specifies the conditions of performance.

Example: *"without help"*

The condition identifies any prerequisite information or experience necessary for the training event. It specifies what tools, working aids, assistance, supervision, and physical environment is given to the learner to perform. It describes the assistance or supervision (if any) the learner will receive to perform (Goldstein and Buxton, 1982).

3. The objective identifies the performer(s).

Example: *"each student"*

4. The objective contains one or more action verbs. Example: *"will list"*

Example: *"will list"* is one example.

5. The objective specifies an acceptable standard of performance.

Establish quantitative and qualitative criteria for acceptable performance. Criteria should describe how well the learner must perform such as:

a) Written exam - complete a multiple choice test in terms of percent correct
b) Oral exam - discuss key elements
c) Skill demonstration - perform steps of a task

2.3.10 Conceptual Framework

The conceptual framework adopted for this research work is the PRECEDE Model. This is an acronym which stands for Predisposing, Reinforcing, Enabling Constructs in Educational/Environmental Diagnosis and Evaluation.

PRECEDE Model is a health planning model and not a theory. It offers a framework for identifying intervention strategies to address specific factors relating to a health problem in an ecological perspective.

- Components of interest: Reinforcing factors, Predisposing factors & Enabling factors
- Concept: Attitudes of significant others (heads of facility, professional peers).

Predisposing factors which in this context refer to factors that can either facilitate or hinder health workers likelihood of exposure to awareness, knowledge and motivation to adopt the use of the new antimalarial treatment policy have not been adequately assessed. These factors include knowledge regarding malaria treatment policy, attitude about treatment pattern, perception about treatment pattern and demography of health workers.

Enabling factors These are factors generally focus on resources such as skills, money, time. They come before the behaviour that allows a motivation or aspiration to be realized and include health workers skills in the use of the new antimalarial treatment policy and its availability. Examples of these factors include continuing education for health workers, training and policy reinforcement and reforms.

Reinforcing factors are factors which occur after the behavior which provide the continuing incentive, reward or punishment for that behavior and either contribute to its persistence of extinction. These factors include attitudes/behaviors of significant others (e.g. heads of facility, professional peers), support received system as in level of supervision or concerns expressed and encouragement, in-house training by supervisors.

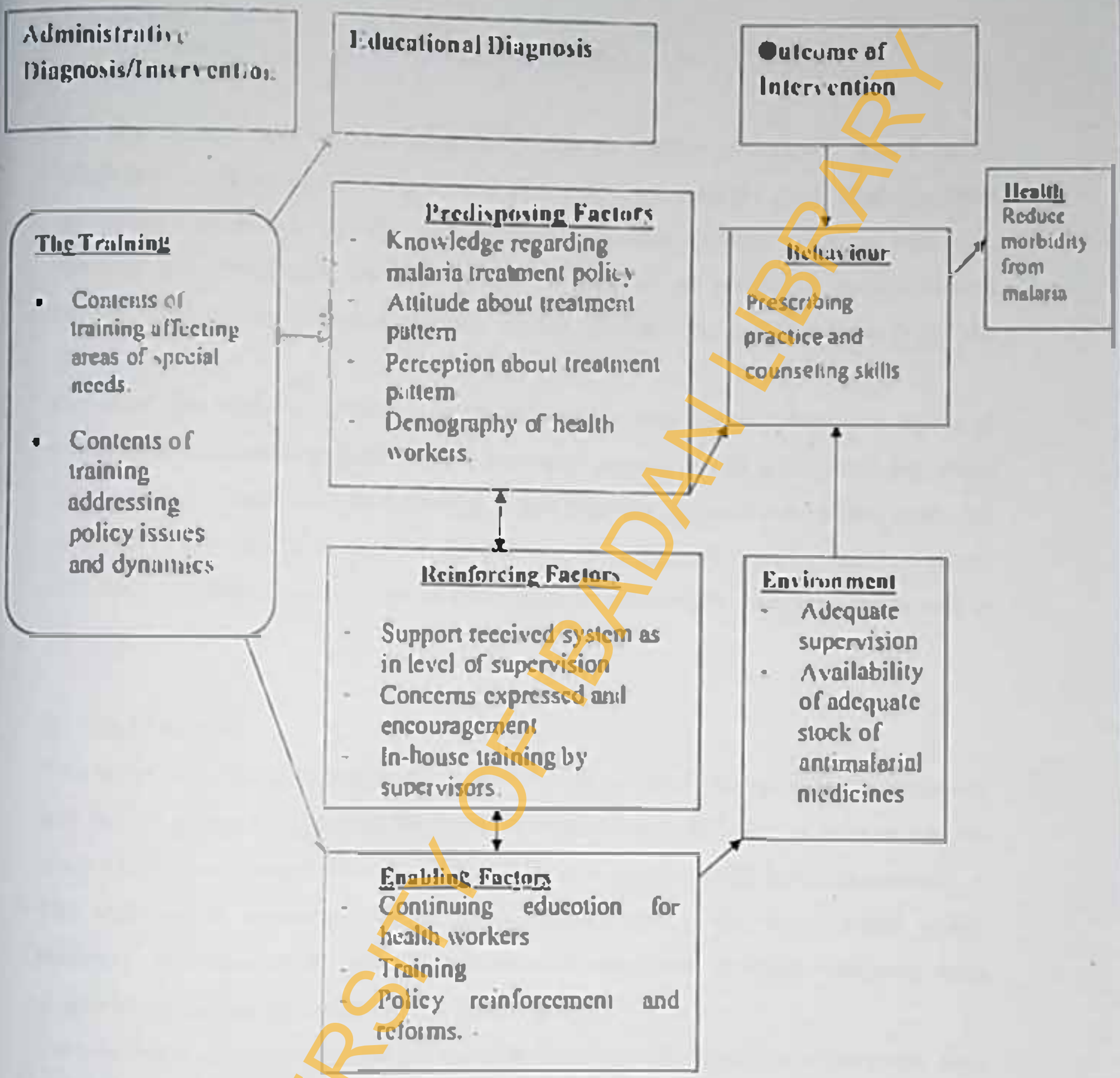

Figure 2.1: PRECEDE Model adapted to explain knowledge, perceptions and use of National Antimalarial Treatment Policy among health workers in Ibadan Metropolis

CHAPTER THREE

METHODOLOGY

This chapter describes the methodology adopted in the conduct of the study. It includes the design and the scope of the study as well as the description of the study area. The other components are as follows: the study population, sample size and sampling technique, methods and instruments for data collection, validity and reliability, data collection process, data management and analysis, ethical consideration and limitation (s) of the study.

However, this study is limited in scope to training intervention which was aimed at influencing knowledge, perceptions and pattern of prescription of antimalarial medicines among frontline health workers relating to the Nigerian national anti-malaria treatment policy. It is also limited in scope to the outcome of training on frontline health workers' knowledge, perception and pattern of prescription of anti-malarial treatment policy only in the study LGAs.

3.1 Study Design

This study was a quasi-experimental in design with two study groups – the experimental and control groups respectively. However, in other to avoid diffusion of information, the study LGAs were grouped into two clusters (cluster A and cluster B) based on proximity. The intervention (training) was therefore implemented in the experimental group. However, pre-intervention, post-intervention and immediate outcome indicators were measured in both the experimental and control groups.

The intervention group was exposed to training on the current anti-malarial treatment policy while the control group received no such intervention.

3.2 Study Area and Scope

The study participants were drawn from the primary health care centers in the two LGAs, Ibadan North West and Ibadan South East LGAs.

3.3 Description of the Study Area

Ibadan North West LGA

Ibadan Northwest LGA is one of the LGAs located in Ibadan metropolis with the headquarters in Onireke. It has a population of 154, 029 people of which 78, 619 are females while 75, 410 are males (National Population Commission, 2006). The inhabitants of Ibadan Northwest LGA are mostly Yoruba while the main occupation of the people include trading and working in the civil service.

Ibadan North West LGA bounded on the north by Ido LGA, in the south by Ibadan Southeast LGA, on the west by Ibadan Southwest LGA, and on the east by Ibadan Northeast LGA. There are also six primary healthcare facilities in the LGA. Several private health care facilities and herbal homes also exist in the LGA. There are 4 Federal health facilities, 3 State owned health facilities and 35 registered private health institutions in the LGA. Categories of primary health staff in the PHC facilities include: 1 Medical doctor, 24 Nurses, 12 CHOs, 54 SCHEW.

The LGA is made up of 11 political wards. A large number (98%) of the communities in the LGA are in the inner core indigenous areas of Ibadan characterized by poorly planned housing and absence of good drainage system. The rest consist of transitory and peripheral areas which are mostly populated by the non-indigenes. Christianity and Islam are the two dominant religions though traditional religion still has a stronghold especially in the inner core communities (Oyo State Ministry of Health- (OSMOH)-2010).

Ibadan South East LGA

Ibadan South East LGA was created by the Federal Military Government of Nigeria on 27th September, 1991. It headquarters is at Mapo Hill. It has an area of 17 km^2 and a population of 266, 15[illegible] made up of 139, 622 males and 143, 476 females (National Population Commission, 2006). It has seven PHC facilities and 141 health workers. The major communities in the LGA include Bere, Mapo, Oke-Ado, Oje, Idikan, Oke Aremo, Esu Awole, Elefa, Idi Arere among others. The housing conditions are generally poor and houses in the area are made of mud plastered with cement and have rusted corrugated iron roofs. The local government has 12 political wards with 7 Primary Health Centers/Maternity center and 44 registered private health institutions. The categories of

primary health care staff are: 1 Medical doctor, 16 nurses, 21 CHO and 103 SCHEW (OSMOH, 2010)

3.4 Study population

The study population consists of health workers who were providing health care services in the government owned Primary Health Care (PHC) facilities in the selected LGAs. The categories of health workers who participated in the study were nurses/midwives, Community Health Officers (CHO) and Community Health Extension Workers (CHEW). They were health care workers who were involved in the prescription of antimalarial medicines in the health facilities selected for the study.

3.5 Inclusion Criteria

The inclusion criteria adopted for participation in this research included being a health staff who:

- were not on leave,
- nurse/midwives, community health workers/officer who prescribed and dispensed medicines
- gave their consent to participate in the study
- would not be retiring by 2014

3.6 Exclusion Criteria

The exclusion criteria adopted for participation in this research included being a health staff who were not:

- health assistants
- pharmacy technicians
- medical doctors
- environmental health officers
- not willing to participate in the study

3.7 Sampling Process

In other to avoid diffusion of information, the study LGAs were grouped into two clusters (cluster A and cluster B) based on proximity. Cluster A comprised of Ibadan North, Ibadan North West and Ibadan North East LGAs while cluster B comprised of Ibadan South West and Ibadan South East LGAs. One LGA was purposively selected from cluster A which had three LGAs for pretesting of the instrument for data collection.

One LGA in cluster A and another LGA in cluster B which if selected would be far apart and so will not be free of diffusion of information from one to the other were purposively selected. This exercise resulted in the selection of Ibadan North West and Ibadan South East LGAs. Balloting was then used to select Ibadan North West as the experimental group while Ibadan South East served as the control.

Steps adopted for sampling process included the following:

Step 1:

The total population of the PHC staff who met the selection criteria was purposively selected following a survey of the number of health workers and primary health care facilities in the study LGAs with the consultation and support of the PHC Coordinators. The actual number of PHC facilities and PHC workers was obtained from staff distribution list kept by the PHC Coordinator in each of the LGA.

Step2:

This involved enumeration of the categories of health workers directly involved in the treatment of malaria and the prescribing of antimalarial drugs in the study LGAs. Total number of frontline health workers in both experimental and control population therefore formed the purposive sampling frame from which both the experimental and study populations were drawn. On the whole, 30 health providers were purposively selected to participate in the study in the experimental LGA while 30 health care providers were selected from the control

Establishment of rapport with PHC Coordinators and trainees

This approach was deemed necessary as a first step to gain support and collaboration with the LGA health authorities and the participants in the study LGAs. The investigator therefore identified the PHC Coordinators who in turn linked him up with the primary health care facilities Proposed for the study in each LGA. The PHC Coordinators were

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duly informed about the study, its objectives, design and nature of the training intervention. Official permission to carry out the study was sought and obtained from the LGAs through the PHC Coordinators. Consequently, the PHC Coordinators summoned all the PHC facilities in their LGA to a meeting so as to intimate them about the study. The PHC Coordinators also gave a brief about the study objectives, design and nature of the training intervention.

The PHC Coordinators were informed about the inclusion and exclusion criteria for the study as well as the pivotal role of the PHC workers in the successful implementation of the intervention.

The researcher solicited the approval and support of the LGA authority through the PHC Coordinator for provision of venue for the training. The PHC Coordinators were actively involved at every stage of the training design and development such as needs assessment, curriculum development, selection of participants, selection of training methodology and implementation.

Recruitment of Trainees and Control Participants

In order to recruit the trainees and the control participants, the investigator paid visits to PHC Coordinators in the study LGAs. Having a good grasp of the inclusion criteria for participation in the study, the PHC Coordinators recommended the categories of health staff to participate in the study. This applied to both the experimental and control groups. The PHC Coordinators were also briefed about the series of recruitment activities which involved: selection of the trainees which was based on their job description and availability, diagnosis of the nominated health workers' training needs, training intervention and assessment of the immediate outcome of the training intervention. The selected participants were duly informed that participation in the training was voluntary and optional. A total of 60 participants at pre and post-test stages were purposively selected from primary health facilities in the 2 study LGAs in Ibadan Metropolis.

3.8 Methods and Instruments for Data Collection

Baseline Data Collection/Training needs assessment

A semi-structured interview was the method used for respondents' training needs assessment. This involved the use of a semi-structured self-administered questionnaire.

The questionnaire played a dual role of needs assessment and pre-post-test instrument. The semi-structured questionnaire had five (5) sections, sections A, B, C, D and E. Section A of the instrument contained questions on the demographic characteristics of health workers; section B was used to probe into their awareness of the National Antimalarial treatment policy; section C focused on the respondents' knowledge of the new treatment policy.

Section D was used to document respondents' knowledge about the recommended ACTs for the home treatment of uncomplicated malaria with focus on the first-line medicine for the management of uncomplicated and severe malaria, the recommended chemoprophylaxis for special at risk group of patients and the prescribing pattern of ACTs. Finally, section E contained questions on the prescription pattern of health care workers for uncomplicated malaria.

Recruitment and Training of Research Assistants

Four research assistants (3 females, 1 male) who were holders of the Master of Public Health from the University of Ibadan were recruited and trained and used to facilitate the administration of the questionnaire. They were trained on issues which included the following: ways of establishing rapport with respondents; interviewing skills; how to secure respondents' informed consent; how to ask questions; and how to correlate the questionnaire by the respondents.

Reliability and Validity

3.9 Validity

In order to ensure the validity of the instrument, the semi-structured questionnaire (i.e. pre-and post-test instrument), was reviewed and critiqued by my supervisor and other experts namely, medical statisticians, health education specialists and experts in malaria treatment, prevention and control. Inputs made by these persons were used to modify the instrument according. Also, the instrument was pre-tested in the field before administering it to the respondents in the experimental and control groups.

3.10 Reliability

The questionnaire was administered on 10% of total sample size (60) of the PHC workers in Ibadan North East LGA that were not involved in the study. The conduct of the pretest

was facilitated by the trained research assistants. The exercise served as an experiential learning opportunity for the research assistants. The responses were coded, entered in a computer and analyzed with the aid of SPSS software by a statistician. The reliability of the questionnaire was assessed using the Cronbach's Alpha test and the instrument was found to have a reliable value of 0.98. Questions that were not clear to respondents were modified using the outcome of the pre-test.

Planning Phase

Planning included the following activities: the needs assessment, curriculum development, training implementation and the post-training evaluation.

Training Needs Assessment (NA)

The researcher in conjunction with the PHC Coordinators of the participating LGA developed a time table for facilitating the conduct of the training needs assessment. The validated instrument was used to conduct the training needs assessment. The head of each participating health facility was requested to ensure that the nominated health workers for the training were available (as reflected in the time table) to participate in the pre-test.

The nomination of trainees was done in such a way that it would not adversely affect the daily activities of the participating health facilities due to acute shortage of staff. The conduct of needs assessment started with the experimental group followed by the control group. However, a briefing explaining the purpose of the pre-test, 'voluntary' nature of participation and confidentiality of their responses was done before administering the pre-test questionnaire on each of the nominated workers in both the experimental and control groups. Participants were informed that the exercise was not an examination, but that the results would be used to design and develop a training curriculum for training them.

The completed copies of the pre-test were edited and the responses coded into a computer. The data were analyzed using descriptive and t-test statistics.

Training Curriculum Development

At this phase, the training curriculum was developed and this comprised of the training objectives, training contents, and training methodologies.

3.10 Training/Programme Objectives

Training objectives were formulated for the training. The formulated training objectives were that: at the end of the training, participants should be able to:

- State correctly the aims of the new antimalarial treatment Policy.
- Mention correctly the main features of uncomplicated malaria
- State correctly the general signs of malaria
- Correctly list categories of persons highly vulnerable to malaria as contained in the Policy.
- List the current medicines for managing uncomplicated malaria as stated in the policy.
- State correctly the first line antimalarial medicine for treating uncomplicated malaria according to the Policy.
- State correctly the alternative medicine for treating uncomplicated malaria
- List correctly ACT and non-ACT related medicines according to the Policy
- List correctly diagnostic management of malaria in line with Policy provisions.
- List main manifestation/feature (s) of uncomplicated and severe malaria
- Prescribe correctly the recommended ACTs for the management of uncomplicated malaria according to the policy.
- Prescribe correctly ACTs according to the Policy stipulation.
- Correctly state what colour indicators mean in the MCI according to treatment algorithm.

Training Contents

The content of the training was informed by the content and provisions of the current antimalaria treatment policy as well as the results of the training needs assessment. The results of the needs assessment were used to carry out the task analysis which formed the basis for curriculum development. The training contents consisted of all learning opportunities planned for the trainees and was guided by the contents and provisions of the new treatment policy and the result of the needs assessment. The training methods and training aids were also guided by the results of the needs assessment. (See appendix VI for detailed training curriculum)

Finally, the training manual was developed by the researcher with inputs and contributions from the PHC Coordinator in the study LGAs and the target audience using the current antimalarial treatment policy as a guide.

Training implementation phase

A three-man planning committee comprising of the PHC Coordinator, the LGA Social Mobilization Officer and a representative of the trainees was constituted. The committee was saddled with the responsibility of planning for the training logistics.

The training committees met to take decisions on possible barriers to the training such as non-availability of training venue, mobilization of trainees to the venue and lack of power supply and adequate measures were taken to address them. A co-facilitator for the training who was the LGA's Roll Back Malaria focal person was recruited and trained using the developed curriculum.

Copies of an action plan for the training were given to the PHC Coordinators. This was to ensure proper planning and mobilization of the trainees by the PHC Coordinators in their respective LGAs. The number of days health workers would be allowed to be absent from their health care facilities (which will not adversely interrupt the normal routine or activities) was decided by the PHC Coordinators and this informed the fixture and the duration of the two day training. Training implementation kicked off following the pre-training activities. The training started with the opening ceremony followed by climate setting, setting up of welfare committee and formulation of ground rules to guide the conduct of trainees throughout the training sessions.

Invitation was extended to the Department of Health Promotion and Education, University of Ibadan, and the LGA Health authorities to attend the opening ceremony.

The welfare committee helped in organizing the training modalities such as tiding up of the training venues, maintaining attendance forms, compliance to the ground rules and ensuring the general welfare of the participants. Training materials used included pictures, power point slides, fliers, and manuals. There was recapitulation to round up the presentation for each lesson delivered. Energizers such as songs and exercises were used

intermittently to keep the trainees alert while there were rewards in the forms of claps and praises for every contribution made by the trainees.

At the end of each training section, the training committee met to evaluate each day's work and relevant inputs were made where necessary by the facilitators to improve the quality of subsequent sessions. There were practical hands-on sessions on malaria diagnosis using Rapid Diagnostic Test (RDT) followed by demonstration on antimalaria medicines prescription. The trainees took turns during these sessions just before the post-test was administered. These sessions were facilitated by the LGA's Roll Back Malaria focal person with the support from the facilitators.

Post-Training/Outcome Evaluation Phase

Evaluation in the form of pre-test and posttest was conducted before and at the end of the training intervention respectively. There was an inbuilt evaluation schedule with which the trainees anonymously evaluated the training generally. Here, open-ended questions were used to enhance free responses and views among the trainees. The inbuilt evaluation assessed the following aspects of the training intervention: objectives, content of training, training methods, involvement of trainees, relevance of the training, transferability of knowledge and skills, language used, length of training, training climate, what the trainees like about the training programme, suggestions to improve future trainings, additional lessons they will like to be added and what they benefit from the training (Oshiname and Brieger, 1990).

The pre-test and post-test questionnaires were administered to both the experimental and control groups before and after the training programme. The data generated at the pre-and post-tests were further subjected to the following analyses using t-test statistics:

a) Pre-test comparison of the experimental and control groups' mean knowledge scores
b) Pre-and post-test comparison of the experimental group's mean knowledge scores;
c) Pre- and post-test comparison of the control group's means knowledge scores;
d) Post-test comparison of the experimental and control groups' mean knowledge scores.

3.11 Data Management

The quality of information collected was promptly checked in the field by the researcher and data quality related errors were promptly corrected. The instrument was hand-coded by the researcher using a coding guide. A serial number was assigned to each questionnaire to facilitate data entry, validation and analysis. The qualitative data collected was collated, screened, coded and entered into the computer using the Statistical Package for Social Science (SPSS) version 15 and Epi info version 6. The knowledge section comprised of 42 items which were assigned a score for the marking scheme/knowledge scale of 66 points (see appendix IV).

3.12 Data Analysis

Data were collected using a pretested interviewer-administered questionnaire which included questions on knowledge and perception of current National Antimalarial Treatment Policy and antimalarial prescribing patterns amoog health workers. Respondents' knowledge was measured using a 66-point knowledge scale consisting of identification, rationale and management of malaria using the NATP. Knowledge scores <33 and ≥33 were rated as poor and good, respectively.

The open ended sections of the questionnaire were coded. The SPSS version 15 and Epi info version 6 was therefore used to facilitate the analysis of the data. Data was analyzed using t-test, ANOVA and chi-square statistics at $p = 0.05$. Copies of the questionnaires have been stored in a place that is safe from destruction by water or fire and where unauthorized persons would not have access to them, they will be destroyed immediately after the defense of the dissertation. The findings of study are summarized and presented in tables and charts in chapter four.

3.13 Ethical Clearance/Consideration

Ethical approval was sought from the UCH/University of Ibadan Ethical Review Committee. The purpose of this was to ensure that this intervention respected and conformed to the generally accepted scientific principles and international ethical guidelines relating to human subject research (see appendix VII) for the letter of approval issued in the UCH/University of Ibadan ethics review committee). Informed consent was obtained from the study participants and they were put at liberty of withdrawal without

coercion of any sort from the research at any time they so desired. Confidentiality of each participant's response and other personal private information given was maintained during and after the collection of data. Only registration number was assigned to each questionnaire and no name was required on the questionnaires. (See appendix I) for the informed consent form.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics

The socio-demographic profile of respondents is presented in table 4.1. There was a preponderance of females at pre intervention (87.5%) and post intervention (93.8%). About 71.9% of the respondents at pre and post interventions were Christians. Majority of the respondents at pre and post interventioos were Yoruba. Most respondents (93.8%) were females and over 40% were above 40 years of age. About 46% were Community Health Extension Workers while 6% were Nurses.

However, at pre-intervention, the proportion of respondents aged over 40 years were 42.5% and 30.0% respectively with no significant difference. Overall, there was no significant difference in the ages of the correspondent in the experimental and control groups at pre intervention. Similarly, there was no significant difference in the ages of the respondents at post intervention.

At pre intervention, the proportion of the experimental and control groups who were working in PHC was 60% and 76.7% respectively. At post intervention, 53.1% were in PHC among the experimental group while among the control group 78.6% were in PHC.

Overall, the results showed that there was no significant difference in the type of health facilities where the respondents were working. (See detail in table 4.1)

Table 4.1 Respondents' Socio-demographic characteristics

Variables	Pre-intervention				Post-intervention			
	Expt	Control	X^2	P value	Expt.	Control	X^2	P value
Age (Yrs)								
≤30	4(10.0)	4(13.3)	4.798	0.187	3(9.4)	4(14.3)	3.750	0.290
31-40	10(25.0)	14(46.7)			10(31.2)	14(50.0)		
41-50	17(42.5)	9(30.0)			13(40.6)	8(28.6)		
>50	9(22.5)	3(10.0)			6(18.8)	2(7.1)		
Gender								
Male	5(12.5)	6(20.0)	0.728	0.394	2(6.2)	4(14.3)	1.071	0.301
Female	35(87.5)	24(80.0)			30(93.8)	24(85.7)		
Religion								
Christianity	23(57.5)	16(53.3)	0.121	0.728	23(71.9)	16(57.1)	1.425	0.233
Islam	17(42.5)	14(46.7)			9(28.1)	12(42.9)		
Ethnic group								
Ibo	1(2.5)	3(10.0)	1.790	0.181	0(0.0)	1(1.7)	1.162	0.281
Yoruba	39(97.5)	27(90.0)			32(100.0)	27(96.4)		
Marital status								
Single	6(15.0)	2(6.7)	1.176	0.278	0(0.0)	1(3.6)	1.162	0.281
Married	34(85.0)	28(93.3)			32(100.0)	27(96.4)		
Professional status								
Nurse/midwife	2(5.0)	2(6.7)	1.212	0.750	0(0.0)	2(7.1)	3.107	0.375
CHO	11(27.5)	11(36.7)			9(28.1)	10(35.7)		
SCHEW	15(37.5)	11(36.7)			15(46.9)	11(39.3)		
JCHEW	12(30.0)	6(20.0)			8(25.0)	5(17.9)		
Pharm Tech/Health Asst								
Length of practice (yrs)								
0-10	13(32.5)	16(53.3)	3.361	0.186	8(25.0)	15(53.6)	5.157	0.076
11-20	11(27.5)	7(23.3)			11(34.4)	6(21.4)		
>20	16(40.0)	7(23.3)			13(40.6)	7(25.0)		
Type of facility								
PHC	24(60.0)	23(76.7)	2.158	0.142	17(53.1)	22(78.6)	4.250	0.039
Maternity/Health centre/post	16(40.0)	7(23.3)			15(46.9)	6(21.4)		

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Gender								
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Female	35(87.5)	24(80.0)			30(93.8)	24(85.7)		
Religion								
Christianity	23(57.5)	16(53.3)	0.121	0.728	23(71.9)	16(57.1)	1.425	0.233
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Yoruba	39(97.5)	27(90.0)			32(100.0)	27(96.4)		
Marital status								
Single	6(15.0)	2(6.7)	1.176	0.278	0(0.0)	1(3.6)	1.162	0.281
Married	34(85.0)	28(93.3)			32(100.0)	27(96.4)		
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JCHEW	12(30.0)	6(20.0)			8(25.0)	5(17.9)		
Pharm Tech/Health Asst.								
Length of practice (yrs)								
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11-20	11(27.5)	7(23.3)			11(34.4)	6(21.4)		
>20	16(40.0)	7(23.3)			13(40.6)	7(25.0)		
Type of facility								
PHC	24(60.0)	23(76.7)	2.158	0.142	17(53.1)	22(78.6)	4.250	0.039
Maternity/Health centre/post	16(40.0)	7(23.3)			15(46.9)	6(21.4)		

4.2 Awareness of antimalarial treatment policy

Respondents' awareness of antimalarial treatment policy is shown in table 4.2. At pre intervention 87.5% of the experimental group was aware of the NATP, while among the control it was 76.7%. At post intervention the proportion of the experimental and control groups who were aware of the NATP were 100% and 89.3% respectively with a significant difference. Only 12.5% of the experimental group and 23.3% of the control group had not heard about the policy at pre intervention.

Table 4.2: Respondents' Awareness of the Nigerian antimalarial treatment policy

Ever heard	Pre intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
Yes	35(87.5)	23(76.7)			32(100.0)	25(89.3)	3.609	0.057
No	5(12.5)	7(23.3)	0.416	0.234	0(0.0)	3(10.7)		

4.3 Availability of new anti-malarial treatment policy among the respondents

The proportion of the experimental and control groups who have seen a copy of the NATP at pre intervention were 52.5% and 36.7% respectively. At post intervention the proportion of the experimental and control groups who have seen a copy of the NATP were 84.4% and 75.0% with no significant difference among both the experimental and control groups.

Only 45.0% of the experimental and 36.7% of the control groups were in health facilities where a copy of the policy was available. Majority (55.0%) of the experimental and control (63.3%) were in health facilities with no copies of the policy. At post intervention the respondents who had copies of the policy among the experimental and control groups were 81.2% and 67.9% respectively. There was no significant difference among the experimental and control groups that had a copy of the ATP.

At post intervention, all the respondents in the experimental group (100%) and 53.6% in the control had read a copy of the policy with no significant difference (See table 4.3 for other details).

Table 4.3: Availability of anti-malarial treatment policy

	Pre-intervention				Post intervention			
Variables	**Expt.**	**Control**	**X^2**	**P value**	**Expt.**	**Control**	**X^2**	**P value**
Seen a copy of the policy								
Yes	21(52.5)	11(36.7)	1.732	0.188	27(84.4)	21(75.0)	0.820	0.365
No	19(47.5)	19(63.3)			5(15.6)	7(25.0)		
Facility have a copy								
Yes	18(45.0)	11(36.7)			26(81.2)	19(67.9)	1.429	0.232
No	22(55.0)	19(63.3)	0.491	0.484	6(18.8)	9(32.1)		
Procured a copy								
Yes	14(35.0)	7(23.3)	1.111	0.292	21(65.6)	13(46.4)	2.241	0.134
No	26(65.0)	23(76.7)			11(34.4)	15(53.6)		
Read a copy								
Yes	16(40.0)	9(30.0)	0.747	0.388	32(100.0)	15(53.6)	18.967	0.001
No	24(60.0)	21(70.0)			0(0.0)	13(46.4)		

4.4 Respondents' Awareness about ACT related medicines

Respondents' awareness of the ACT related medicines at pre- and post- interventions are presented in table 4.4.

At pre intervention there was no significant difference between the experimental (95.0%) and control (96.7%) in respect of awareness of Artemeter Lumefantrine (AL) related medicines. At post intervention however, the proportion of respondents among the experimental and control groups who had heard about AL were 96.9% and 82.1% respectively with a significant.

The proportions of the experimental and control groups who had heard about Arthemeter Mefloquine (AM) at pre intervention were 40.0% and 53.3% respectively. At post intervention the proportion of the experimental group who had heard about AM was 93.5% while only 25.0% of the control heard about the AM. The difference was significant.

Similarly, the proportions of the experimental and control groups who had heard about Dihydroartemisinin at pre intervention were 17.5% and 13.3% respectively. The difference was significant. Details are contained in the table under reference.

Table 4.4: Respondents' Awareness about ACT related drugs

Variables	Pre-intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
Ever heard about AL.								
Yes	28(95.0)	29(96.7)	0.116	0.733	31(96.9)	23(82.1)	3.601	0.058
No	2(5.0)	1(3.3)			1(3.1)	5(17.9)		
Ever heard about AA								
Yes	32(80.0)	27(90.0)	1.294	0.255	31(96.9)	25(83.3)	3.601	0.058
No	8(20.0)	3(10.0)			1(3.1)	5(16.7)		
Heard about AM								
Yes	16(40.0)	16(53.3)	1.228	0.268	29(93.5)	7(25.0)	29.063	0.001
No	24(60.0)	14(46.7)			2(6.5)	21(75.0)		
Heard about Dibydroart emisin								
Yes	7(17.5)	4(13.3)	0.225	0.635	29(90.6)	3(10.7)	38.314	0.001
No	33(82.5)	26(86.7)			3(9.4)	25(89.3)		

4.5 Availability of capacity building for health workers on ACT

Significantly, more experimental group (47.5%) ever attended training on ACT compared with the control (16.7%) at pre intervention. Similarly, significantly more of the experimental group (96.9%) compare with the control (53.6%) had attended training on the use of ACT.

At pre intervention, significantly more respondents among the control group (100%) compared with the experimental group (70.0%) had been taught how to use ACT. At post intervention the proportion of the respondents in the experimcotal group who reported that they were taught how to use ACT increased to 100%. Details are contained in table 4.5.

Table 4.5: Previous attendance of the training programmes on use of ACT by respondents

Variable	Pre intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
Ever attended training on ACT								
Yes	19(47.5)	5(16.7)	7.234	0.007	31(96.9)	15(53.6)	15.654	0.001
No	21(52.5)	25(83.3)			1(3.1)	13(46.4)		
Ever taught how to use ACT								
Yes	28(70.0)	30(100.0)	10.862	0.001	32(100.0)	28(100.0)		
No	12(30.0)	0(0.0)			0(0.0)			

4.6.1 Knowledge of respondents on the provisions of the national-antimalarial treatment policy

Table 4.63 shows details about respondents' knowledge on the new national antimalarial treatment policy. Among the control group the proportion of respondents who mentioned fever as the main feature of uncomplicated malaria at pre and post interventions were 80.0% and 75.0% respectively.

There was a significant difference in the mention of fever as the main feature of uncomplicated malaria by the experimental and control groups at pre and post interventions. The difference in correct mention of prompt diagnosis as a provision of the ATP among the experimental (95.0%) and control (86.7%) groups was not significant at pre intervention. The difference became significant at post intervention with all respondents in the experimental group (100%) and only 25.0% in the control group correctly stating that prompt diagnosis was a component of the policy provision.

At pre intervention the proportions of the experimental and control groups that correctly mentioned that appropriate case management was in the policy were 80.0% and 83.3% respectively with no significant difference. At post intervention the respondents with the correct responses among the experimental and control groups were 100% and 78.0% with a significant difference.

4.6.1 Knowledge of respondents on the provisions of the national antimalarial treatment policy

Table 4.6a shows details about respondents' knowledge on the new national antimalarial treatment policy. Among the control group the proportion of respondents who mentioned fever as the main feature of uncomplicated malaria at pre and post interventions were 80.0% and 75.0% respectively.

There was a significant difference in the mention of fever as the main feature of uncomplicated malaria by the experimental and control groups at pre and post interventions. The difference in correct mention of prompt diagnosis as a provision of the ATP among the experimental (95.0%) and control (86.7%) groups was not significant at pre intervention. The difference became significant at post intervention with all respondents in the experimental group (100%) and only 25.0% in the control group correctly stating that prompt diagnosis was a component of the policy provision.

At pre intervention the proportions of the experimental and control groups that correctly mentioned that appropriate case management was in the policy were 80.0% and 83.3% respectively with no significant difference. At post intervention the respondents with the correct responses among the experimental and control groups were 100% and 78.0% with a significant difference.

Table 4.6a: Respondents' Knowledge on the provisions of the antimalaria treatment policy

Policy provisions	Pre-intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
Encourage rational drug-use								
True*	32(80.0)	21(70.0)	3.935	0.140	27(84.4)	20(71.4)	5.036	0.081
False	6(15.0)	3(10.0)			4(12.5)	2(7.1)		
Don't know	2(5.0)	6(20.0)			1(3.1)	6(21.4)		
Main feature of uncomplicated malaria								
Anaemia	4(10.0)	1(3.3)	5.833	0.212	1(3.1)	4(14.3)	7.153	0.128
Fever*	32(80.0)	24(80.0)			30(93.8)	21(75.0)		
Hypoglycemia	3(7.5)	2(6.7)			1(3.1)	0(0.0)		
breathing difficulties	1(2.5)	0(0.0)			0(0.0)	1(3.6)		
no response	0(0.0)	3(10.0)			0(0.0)	2(7.1)		
Prompt diagnosis								
True of policy*	38(95.0)	26(86.7)	3.697	0.157	32(100.0)	7(25.0)	36923	0.001
Not true policy	1(2.5)	0(0.0)			0(0.0)	21(75.0)		
Don't know	1(2.5)	4(13.3)						
Appropriate case management								
True *	32(80.0)	25(83.3)	0.780	0.677	32(100.0)	22(78.6)	7.619	0.022
Not true	1(2.5)	0(0.0)			0(0.0)	1(3.6)		
Don't know	7(17.5)	5(16.7)			0(0.0)	5(17.9)		
Use of ITNs								
True*	39(97.5)	25(83.3)	5.751	0.056	32(100.0)	27(96.4)	1.162	0.281
Not true	1(2.5)	1(3.3)			0(0.0)	1(3.6)		
Don't know	0(0.0)	4(13.3)						
Use of IPT								
True*	22(55.0)	26(86.7)	8.446	0.015	30(93.8)	26(92.9)	0.019	0.990
Not true	3(7.5)	0(0.00			1(3.1)	1(3.6)		
Don't know	15(37.5)	4(13.3)			1(3.1)	1(3.6)		

* Correct responses.

4.6.2 Respondents' Knowledge on the provisions of the antimalaria treatment policy relating to prevention

Respondents' knowledge on the provisions of the antimalarial treatment policy relating to prevention is shown in table 4.6b. at pre intervention all members of the experimental (100%) and 96.7% of the control correctly stated that the use of ITN is a provision of the policy. The difference was not, however, significant. The trend was similar at post intervention as all the experimental (100%) and 96.7% of the control correctly mentioned ITN as a provision of the policy with no significant difference. At pre intervention, the proportions of the experimental and control groups who correctly stated that use of IPT in pregnancy is a provision of the policy were significant at 83.3% and 83.3% respectively with no significant difference. At post intervention significantly more of the experimental (100%) and 85.7% of the control correctly stated this. See table 4.6b for details.

Table 4.6b: Respondents' Knowledge on the provisions of the antimalaria treatment policy relating to prevention

Policy provisions	Pre-intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
Use of ITN reduce malaria								
True*	40(100.0)	29(96.7)	1.353	0.245	32(100.0)	27(96.4)	1.162	0.281
Don't know	0(0.0)	1(3.3)			0(0.0)	1(3.6)		
Environmental management								
True*	32(80.0)	28(93.3)	9.022	0.011	32(100.0)	24(85.7)	4.898	0.027
False	8(20.0)	0(0.0)			0(0.0)	4(14.3)		
Don't know	0(0.0)	2(6.7)			0(0.0)			
IPT in pregnancy								
True*	34(85.0)	25(83.3)	11.17	0.004	32(100.0)	24(85.7)	4.898	0.027
False	6(15.0)	0(0.0)	2		0(0.0)	4(14.3)		
Don't know	0(0.0)	5(16.7)						
Use of PP and knock down insecticide								
True*	25(62.5)	22(73.3)	18.58	0.001	29(90.6)	17(60.7)	10.60	0.005
False	14(35.0)	0(0.0)	7		2(6.2)	1(3.6)	8.0	
Don't know	1(2.5)	8(26.7)			1(3.1)	10(35.7)		

* Correct responsesy.cx

4.7 Respondents' Knowledge about the Alternative medicine of choice for malaria treatment according to the Policy

Respondents' know about the alternate medicine of choice according to the policy provision are shown in table 4.7. At pre intervention, the proportion of respondents in the experimental and control groups who correctly mentioned Artemether Amodiaquine (AA) as the alternate medicine of choice according to the policy were 5.0% and 6.7% respectively. At post intervention significantly more of the experimental group (18.8%) and 7.1% of the control correctly mentioned this. See table 4.7 for other details. In addition, at post intervention no respondent in the experimental group mentioned Fansidar as the alternate medicine of choice for treating malaria compared with 3.6% in the control group who mentioned this. This is not significantly different. See table 4.7 for other details.

Table 4.7: Respondents' Knowledge on the Alternative drug of choice for malaria treatment according to the Policy

Alternative drug of choice	Pre-intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
Lumartem	3(7.5)	0(0.0)	36.381	0.006	0(0.0)	0(0.0)		
Quinine	8(20.0)	29(96.7)			8(25.0)	4(14.3)	24.081	0.030
ACT	9(22.5)	0(0.0)			4(12.5)	3(10.7)		
Camoquine								
Lumefantuine	2(5.0)	0(0.0)						
Coartem	1(2.5)	0(0.0)			0(0.0)	0(0.0)		
Fansidar	1(2.5)	1(3.3)			0(0.0)	3(10.7)		
DART	2(5.0)	0(0.0)			0(0.0)	1(3.6)		
Lonart	1(2.5)	0(0.0)			1(3.1)	0(0.0)		
Artemeter					0(0.0)	0(0.0)		
Amodiaquine*	2(5.0)	2(6.7)						
IPT	1(2.5)	0(0.0)			6(18.8)	2(7.1)		
Arsunate	1(2.5)	0(0.0)			0(0.0)	0(0.0)		
Camoquine	1(2.5)	1(3.3)			1(3.1)	0(0.0)		
Artemeter	1(2.5)	0(0.0)			0(0.0)	0(0.0)		
Sulfadoxine	0(0.0)	5(16.7)			0(0.0)	0(0.0)		
Pyrimethamine	0(0.0)	1(3.3)			1(3.1)	0(0.0)		
Amalar	0(0.0)	1(3.3)			0(0.0)	0(0.0)		
Arsinsio	0(0.0)	1(3.3)			0(0.0)	0(0.0)		
No response	7(17.5)	14(46.7)			4(12.5)	13(46.4)		

*Correct response

4.8 Respondents' Knowledge on the categories of persons that are highly vulnerable to malaria as contained in the Policy

Table 4.8 presents the respondents' knowledge on the categories of persons that are highly vulnerable to malaria according to the policy. At pre intervention, the proportions of experimental and control groups who correctly mentioned PLWHA as a vulnerable group according to the policy were 75.0% and 80.0% respectively. While at post intervention the proportions were 100% and 71.4% among the experimental and control groups respectively with an increase in knowledge among the experimental group and a marginal decline in knowledge in the control group. There is a significant difference.

In addition, at pre intervention, the proportions of the experimental and control groups who correctly mentioned that persons with sickle cell anaemia are among the vulnerable group according to the policy were 72.5% and 83.3% respectively with a significant difference. At post intervention significantly more of the experimental (93.8%) and 64.3% correctly mentioned this.

Similarly, at pre intervention the proportions of the experimental and control groups who correctly mentioned that non-immune visitors are among the vulnerable group according to the policy were 35.0% and 60.0% respectively. However, at post intervention significantly more of the experimental (81.2%) and 32.1% correctly mentioned this with a significant difference in the two groups. See table 4.8 for reference.

Table 4.8: Respondents' Knowledge on the categories of persons that are highly vulnerable to malaria as contained in the Policy

Vulnerable Groups	Pre-intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P valu
Pregnant women								
True*	38(95.0)	29(96.7)	2.838	0.242	31(96.9)	28(100.0)	0.890	0.346
False	2(5.0)	0(0.0)			1(3.1)	0(0.0)		
Don't know	0(0.0)	1(3.3)						
U5 children								
True*	38(95.0)	28(93.3)	0.088	0.957	32(100.0)	28(100.0)	0(0.0)	0(0.0)
False	1(2.5)	1(3.3)						
Don't know	1(2.5)	1(3.3)						
PLWHA								
True*	30(75.0)	24(80.0)	0.389	0.823	32(100.0)	21(71.4)	10.549	0.005
False	9(22.5)	5(16.7)			0(0.0)	7(25.0)		
Don't know	1(2.5)	1(3.3)			0(0.0)	1(3.6)		
Persons with sickle cell anaemia								
True*	29(72.5)	25(83.3)	1.469	0.480	30(93.8)	18(64.3)	8.371	0.015
False	10(25.0)	4(13.3)			2(6.2)	8(28.6)		
Don't know	1(2.5)	1(3.3)			0(0.0)	2(7.1)		
Persons with leprosy								
True	14(35.0)	11(36.7)	0.805	0.669	17(53.1)	12(42.9)	2.561	0.278
False*	25(62.5)	17(56.7)			14(43.8)	12(42.9)		
Don't know	1(2.5)	2(6.7)			1(3.1)	4(14.3)		
Non-immune visitors								
True*	14(35.0)	18(60.0)	6.216	0.045	26(81.2)	9(32.1)	14.857	0.001
False	24(60.0)	9(30.0)			5(15.6)	15(53.6)		
Don't know	2(5.0)	3(10.0)			1(3.1)	4(14.3)		

* Correct responses.

4.9 Knowledge of respondents on national malaria control policy

Respondents' knowledge relating to the main aim of the National Antimalarial Treatment Policy (NATP) at pre and post interventions is presented in table 4.9. At pre intervention, the proportion of respondents in the experimental group who correctly stated that one of the main aims of the NATP is to reduce malaria mortality and morbidity was 95.0% while the proportion among the control that stated this was 86.7%. There was no significant difference among the two groups.

At post intervention, 100% of the experimental and 78.8% of the control correctly reported that one of the main aims of the NATP is to reduce malaria mortality and morbidity with a significant difference.

In addition, at pre intervention the proportions of respondents in the experimental and control groups who correctly stated that one of the main aims of the NAPT is to halt progression of malaria were 72.5% and 76.7% respectively. While the proportions who correctly stated this among the experimental and control groups at post intervention were 71.9% and 57.1% with a significant difference in the two groups.

Similarly, the was a significant difference in the proportions of respondents who correctly stated that use of IPT among pregnant women is one of the policy aims among the experimental (100%) and control (82.2%) groups respectively at post interventions. There is a significant difference between the two groups. See table 4.9 for other details.

Table 4.9: Respondents' Knowledge relating to the main aims of the Policy

Main aims of the Policy	Pre-intervention				Post intervention			
	Expt.	Control	X^2	p value	Expt.	Control	X^2	p value
Reduce malaria mortality and morbidity								
True*	38(95.0)	26(86.7)	4.241	0.120	32(100.0)	22(78.8)	7.619	0.022
False	2(5.0)	1(3.3)			0(0.0)	2(7.1)		
Don't know	0(0.0)	3(10.0)			0(0.0)	4(14.3)		
Halt progression of malaria								
True*	29(72.5)	23(76.7)	1.290	0.525	23(71.9)	16(57.1)	6.268	0.044
False	10(25.0)	5(16.7)			9(28.1)	7(25.0)		
Don't know	1(2.5)	2(6.7)			0(0.0)	5(17.9)		
Reduce impact of placental infection								
True*	23(57.5)	22(73.3)	16.669	0.001	31(96.9)	16(57.1)	14.384	0.001
False	16(40.0)	1(3.3)			1(3.1)	4(14.3)		
Don't know	1(2.5)	7(23.3)			0(0.0)	8(28.6)		
Use of IPT for pregnant women								
True*	35(87.5)	21(70.0)	3.306	0.192	32(100.0)	23(82.1)	6.234	0.044
False	2(5.0)	4(13.3)			0(0.0)	1(3.6)		
Don't know	3(7.5)	5(16.7)			0(0.0)	4(14.3)		
Minimize anti-malarial drug resistance								
True*	25(62.5)	19(63.3)	13.024	0.001	28(87.5)	22(78.6)	2.464	0.292
False	15(37.5)	4(13.3)			3(9.4)	2(7.1)		
Don't know	0(0.0)	7(23.3)			1(3.1)	4(14.3)		

* Correct responses.

4.10 Respondents' Knowledge of the Antimalarial Treatment Policy

Table 4.10 presents respondents' knowledge relating to non-ACT related medicines according to the treatment policy at pre and post interventions.

At pre intervention, the proportion of respondents in the experimental group who correctly stated that Chloroquine (CQ) is not a first line medicine for treating malaria according to the policy was 82.50% while the propotion among the control that correctly stated this was 46.7%. There was a significant difference among the two groups.

At post intervention, significantly more of the experimental group (96.9% and 89.3% of the control correctly stated that Chloroquine (CQ) is not a first line medicine for treating malaria according to the policy with no significant difference.

Similarly, at pre intervention the proportions of respondents in the experimental group and control who correctly stated that quinine is in all trimesters were 50.0% and 73.3% respectively. There was no significant difference in the groups. While at post intervention, the proportions who correctly stated this were 87.5% and 89.3% respectively with no significant difference.

In addition, at pre intervention the proportions of respondents in the experimental and control groups who correctly stated that SP is not used for malarial treatment according to the policy were 40.0% and 26.7% respectively. While the proportions who correctly stated this among the experimental and control groups at post intervention were 87.5% and 53.6% with a significant difference in the two groups. See table 4.10 for other details.

Table 4.10: Respondents' Knowledge on non-ACT related drugs according to the policy

Prevention/treatment	Pre-intervention				Post intervention			
	Expt.	Control	X^2	p value	Expt.	Control	X^2	p value
CQ is first line								
True	6(15.0)	12(40.0)	10.262	0.006	1(3.1)	3(10.7)	1.382	0.240
False*	33(82.5)	14(46.7)			31(96.9)	25(89.3)		
	1(2.5)	4(13.3)			0(0.0)	0(0.0)		
Discourage SP at 1st trimester								
True*	26(65.0)	25(83.3)	3.258	0.196	27(84.4)	21(75.0)	2.494	0.287
False	6(15.0)	3(10.0)			5(15.6)	5(17.9)		
Doo't know	8(20.0)	2(6.7)			0(0.0)	2(7.1)		
2 doses of IPT to pregnant women								
True *	30(75.0)	27(90.0)	3.065	0.216	32(100.0)	25(89.3)	3.609	0.165
False	2(5.0)	0(0.0)			0(0.0)	1(3.6)		
Don't know	8(20.0)	3(10.0)			0(0.0)	2(7.1)		
Quinine is safe in all trimesters								
True*	20(50.0)	22(73.3)	4.188	0.123	28(87.5)	25(89.3)	1.577	0.455
False	10(25.0)	3(10.0)			4(12.5)	2(7.1)		
Don't know	10(25.0)	5(16.7)			0(0.0)	1(3.6)		
SP is for malaria treatment								
True	14(35.0)	20(66.7)	7.789	0.020	4(12.5)	11(39.3)	8.970	0.011
False*	16(40.0)	8(26.7)			28(87.5)	15(53.6)		
Doo't know	10(25.0)	2(6.7)			0(0.0)	2(7.1)		

* Correct responses

4.11 Respondents' Knowledge on the treatment of malaria according to the policy

Table 4.11 presents respondents' knowledge relating to treatment of malaria according to the policy at pre and post interventions.

At pre intervention, the proportion of respondents in the experimental group who correctly stated that ACTs are safe according to the policy was 37.5% while the proportion among the control that correctly stated this was 86.7% with a significant difference among the two groups. Similarly at post intervention, significantly more of the experimental group (81.2%) and 71.4% of the control correctly stated that ACTs are safe according to the policy with a significant difference.

Additionally, at pre intervention the proportions of respondents in the experimental and control groups who correctly stated rectal artesunate should be given to patients according to the policy were 52.2% and 53.3% respectively. There was a significant increase (62.5%) in the proportions of respondents who correctly stated this among the experimental and as against the marginal decrease (46.4%) among the control at post intervention with a significant difference in the two groups.

At post intervention significantly more of the experimental (96.9%) and 60.7% correctly stated that ACT should be repeated if a patient vomits after 30 minutes of administration of medicine. This is significant difference in the two groups at $p<0.05$ as shown in table 4.11.

Table 4.11: Respondents' Knowledge on the treatment of malaria relating to ACTs administration according to the policy

Prevention/treatment	Pre-intervention				Post intervention			
	Expt.	Control	X^2	p value	Expt.	Control	X^2	p value
ACTs are considered safe								
True*	15(37.5)	26(86.7)	17.56	0.001	26(81.2)	20(71.4)	11.13	0.004
False	12(30.0)	3(10.0)	7		6(18.8)	1(3.6)	7	
Don't know	13(32.5)	1(3.3)			0(0.0)	7(25.0)		
Treat malaria patients with ACT within 24 hours								
True*	36(90.0)	26(86.7)	0.733	0.693	31(96.9)	25(89.5)	2.387	0.303
False	1(2.5)	2(6.7)			1(3.1)	1(3.6)		
Don't know	3(7.5)	2(6.7)			0(0.0)	2(7.1)		
Parenteral treatment for malaria injection								
True*	27(67.5)	25(83.3)	2.672	0.263	25(78.1)	17(60.7)	3.689	0.158
False	3(7.5)	2(6.7)			4(12.5)	3(10.7)		
Don't know	10(25.0)	3(10.0)			3(9.4)	8(28.6)		
Give rectal-Artesunate								
True*	21(52.5)	16(53.3)	0.025	0.987	20(62.5)	13(46.4)	9.129	0.010
False	5(12.5)	4(13.3)			11(34.4)	6(21.4)		
Don't know	14(35.0)	10(33.3)			1(3.1)	9(32.1)		
Repeat ACT if patient vomits after 30 mins								
True*	27(67.5)	17(56.7)	1.599	0.450	31(96.9	17(60.7)	12.67	0.002
False	10(25.0)	8(26.7)			0(0.0)	7(25.0)	3	
Don't know	3(7.5)	5(16.7)			1(3.1)	4(14.3)		
Refer if vomiting persist while taking ACT								
True*	36(90.0)	27(90.0)	1.215	0.545	31(96.9)	22(78.6)	8.299	0.010
False	3(7.5)	1(3.3)			0(0.0)	6(21.4)		
Don't know	1(2.5)	2(6.7)			1(3.1)	0(0.0)		

* Correct responses.

4.1.2 Respondents' Knowledge relating to diagnostic treatment of malaria according to the policy

Table 4.1.2 presents respondents' knowledge relating to diagnostic treatment of malaria according to the policy at pre and post interventions.
The proportions of respondents in the experimental and control groups who correctly affirmed that microscopy is the gold standard for malaria diagnosis were 57.0% and 40.0% respectively at pre interventions. This is a significant difference between the two groups. At post intervention, the proportions among the experimental and control correctly affirmed this were 96.0% and 66.0% respectively with significant difference in the groups.

In additionally, at pre intervention the proportions of respondents in the experimental and control groups who correctly stated the policy allows malaria diagnosis for malaria treatment were 67.7% and 66.7% respectively with no significant difference. While at post intervention, there was a significant increase (90.0%) in the proportion of respondents who correctly stated this among the experimental as against the marginal increase (60.7%) in the control at post intervention with a significant difference in the two groups.

At pre intervention significantly all the experimental (100.0%) and 71.4% correctly stated the parasitological confirmation for treating malaria in children is not recommended according to the policy. This is significant difference in the two groups at $p<0.05$. See table 4.12 for other details.

Table 4.12: Respondents' Knowledge relating to diagnosis of malaria according to the policy

Relating to diagnosis	Pre-intervention				Post intervention			
	Expt.	Control	X^2	p value	Expt.	Control	X^2	p value
Microscopy is gold standard								
True*	28(70.0)	12(40.0)	6.323	0.042	31(96.9)	13(46.4)	19.491	0.001
False	5(12.5)	7(23.3)			1(3.1)	12(42.9)		
Don't know	7(17.5)	11(36.7)			0(0.0)	3(10.7)		
Policy allows syndromic diagnosis								
True*	27(67.5)	20(66.7)	0.773	0.680	29(90.6)	17(60.7)	9.406	0.001
False	3(7.5)	4(13.3)			3(9.4)	5(17.9)		
Don't know	10(25.0)	6(20.0)			0(0.0)	6(21.4)		
Parasite confirmation for children								
True	31(77.5)	26(86.7)	1.309	0.520	32(100.0)	20(71.4)	10.549	0.005
False*	1(2.5)	1(3.3)			0(0.0)	2(7.1)		
Don't know	8(20.0)	3(10.0)			0(0.0)	6(21.4)		

* Correct responses.

4.13 Respondents' Knowledge relating to other treatment guidelines for managing malaria

Table 4.13 presents respondents' knowledge relating to other treatment guidelines for managing malaria at pre and post interventions.

At pre intervention the proportions of respondents in the experimental and control group who correctly affirmed that of single drug for treating malaria is discouraged were 55.0% and 63.3% respectively. This is not significant between the two groups. While at post intervention, the proportions among the experimental and control who correctly affirmed this were 87.5% and 71.4% respectively with no significant difference.

The proportions of respondents at pre intervention in the experimental and control groups who stated correctly that proguanile is effective for treating malaria in persons with sickle cell anaemia were 40.0% and 76.7% respectively with a significant difference. While at post intervention, there was a significant increase (96.9%) in the proportion of respondents who correctly stated this among the experimental group and compared with the 42.9% in the control with n significant difference in the two groups.

Similarly, at post intervention the proportions of respondents in the experimental and control group who correctly affirmed that malaria diagnosis is on IMCI treatment algorithm were 65.6% nnd 50.0% respectively. There is a significant difference in the two groups. See table 4.13 for other details.

Table 4.13: Respondents' Knowledge relating to other guidelines for manging malaria

Prevention/treatment	Pre-intervention				Post intervention			
	Expt.	Control	X^2	p value	Expt.	Control	X^2	p value
Use of single drug is discouraged								
True*	22(55.0)	19(63.3)	1.141	0.565	28(87.5)	20(71.4)	2.898	0.235
False	11(27.5)	5(16.7)			4(12.5)	7(25.0)		
Don't know	7(17.5)	6(20.0)			0(0.0	1(3.6)		
Teach mothers signs of malaria								
True*	34(85.0)	28(93.3)	1.176	0.555	31(96.9)	22(78.6)	5.620	0.060
False	3(7.5)	1(3.3)			1(3.1)	2(7.1)		
Don't know	3(7.5)	1(3.3)			0(0.0)	4(14.3)		
Proguanil is effective in sickle cell patients								
True*	16(40.0)	23(76.7)	10.297	0.006	31(96.9)	12(42.9)	21.725	0.001
False	4(10.00	0(0.0)			1(3.1)	7(25.0)		
Don't know	20(50.0)	7(23.3)			0(0.0)	9(32.1)		
Malaria diagnosis is on JMCI								
True*	25(62.5)	24(80.0)	2.578	0.276	21(65.6)	14(50.0)	16.779	0.001
False	4(10.0)	2(6.7)			11(34.4)	3(10.7)		
Don't know	11(27.5)	4(13.3)			0(0.0)	11(39.3)		
Encourge rational useof antimalarials								
True*	27(67.5)	25(83.3)	2.266	0.322	31(96.9)	24(85.7)	2.636	0.268
False	3(7.5)	1(3.3)			0(0.0)	1(3.6)		
Don't know	1025.0)	4(13.3)			1(3.1)	3(10.7)		

* Correct responses.

4.14.1 Colour and malaria management in Integrated Management of Childhood Illnesses (IMCI)

1. Red colour indication in malaria management

Figure 4.1a presents respondents' knowledge relating to colour indication in malaria management according to malaria treatment guideline at pre intervention.

At pre intervention the proportions of respondents in the experimental and control group who correctly affirmed that red colour in IMCI requires urgent treatment and referral were 72.5% and 83.3% respectively with the control having higher knowledge score.

Additionally, only 3.3% of the control correctly stated that red colour requires urgent treatment and referral. See figure 4.1a for other details.

Figure 4.1a Proportion of respondents at pre intervention who correctly affirmed that red color indication and malaria management in IMCI requires urgent treatment and referral.

Figure 4.1b presents respondents' knowledge relating to red colour indication in malaria management according to malaria treatment guideline at post intervention.

The proportions of respondents in the experimental and control groups who correctly affirmed that red colour in IMCI requires urgent treatment and referral were 96.9% and 67.9% respectively with the experimental group having higher knowledge score.

In addition, only 10.7% of the control correctly stated that red colour requires urgent treatment and referral. See figure 4.1b for other details.

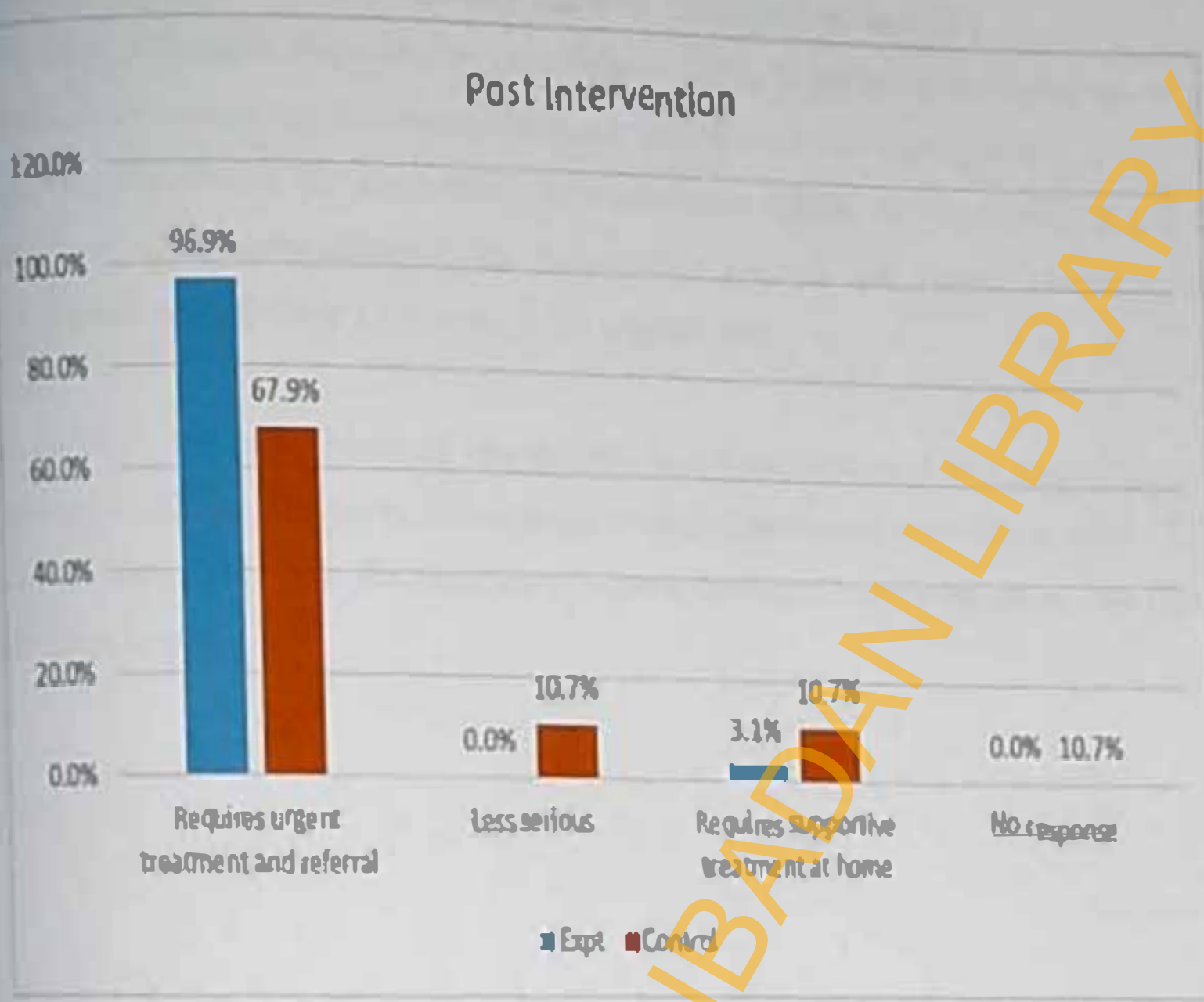

Figure 4.1b Proportion of respondents at post intervention who correctly affirmed that red colour indication in malaria management requires urgent treatment and referral.

4.1.4.2 Green colour indication and malaria management in IMCI

Figure 4.1c presents respondents' knowledge relating to green colour indication in malaria management according to malaria treatment guideline at post intervention.

At pre intervention, the proportions of respondents among the experimental and control groups who correctly affirmed that green colour requires less serious attention and does not require referral were 17.5% and 6.7% respectively.

In addition, the proportions of respondents in the experimental and control groups who wrongly affirmed that green colour requires urgent treatment and referral were 17.5% and 63.3% respectively with the experimental group having a fewer proportion. See figure 4.1c for other details.

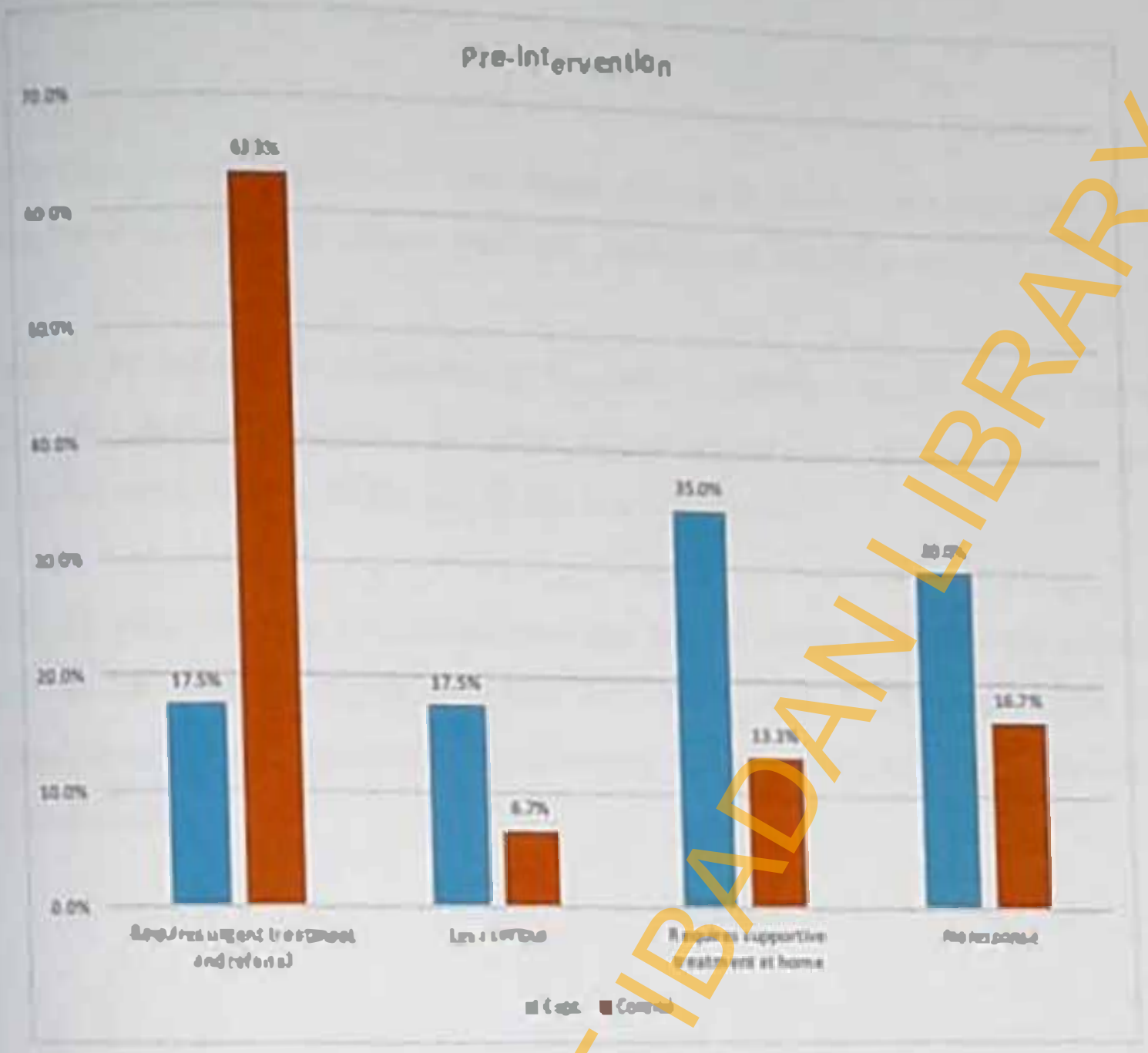

Figure 4.1c: Proportions of respondents among the experimental and control groups who correctly affirmed that green colour indication requires less serious attention at pre intervention.

Figure 4.1d presents respondents' knowledge relating to green colour indication in malaria management according to malaria treatment guideline at post intervention.

At post intervention, the proportions of respondents among the experimental and control groups who correctly affirmed that Green colour requires less serious attention and does not require referral were 93.8% and 28.6% respectively.

While the proportions in the experimental and control groups who wrongly affirmed that green colour requires urgent treatment were 0.0% and 32.1% respectively with no respondent in the experimental group affirming wrongly to the statement. See figure 4.1d for other details.

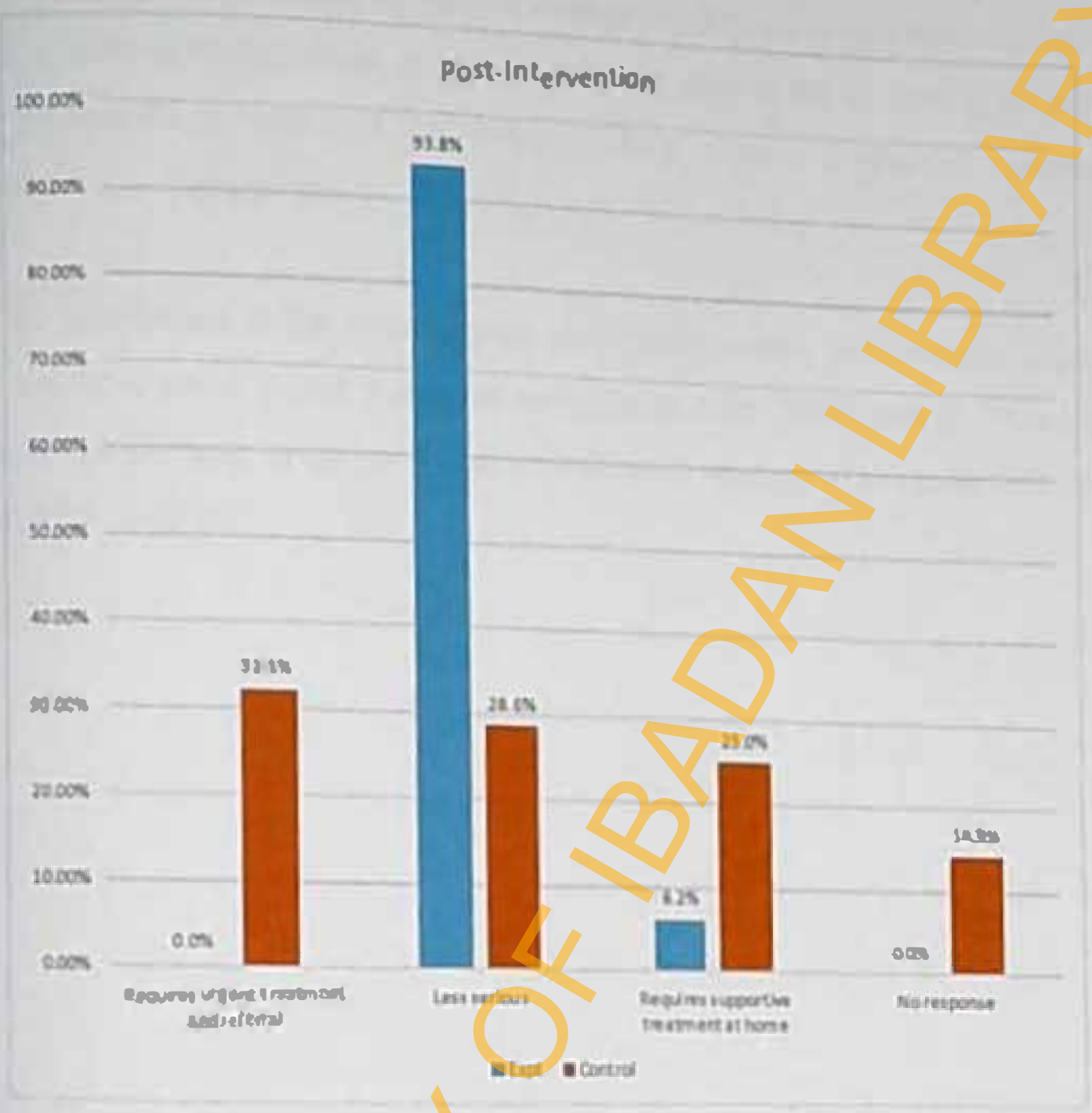

Figure 4.1d: Proportions of respondents among the experimental and control groups who correctly affirmed that green colour indication requires less serious attention at post intervention.

4.14.3 Yellow color and malaria management

Figure 4.1e presents respondents' knowledge relating to yellow colour indication in malaria management according to malaria treatment guideline at post intervention. The proportions of respondents at pre intervention among the experimental and control groups who correctly affirmed that yellow colour requires supportive treatment were 12.5% and 6.7% respectively.

While the proportions in the experimental and control groups who wrongly affirmed that yellow colour requires urgent treatment and referral were 30.0% and 63.3% respectively with higher proportions in the control group affirming wrongly to the statement. See figure 4.1e for other details.

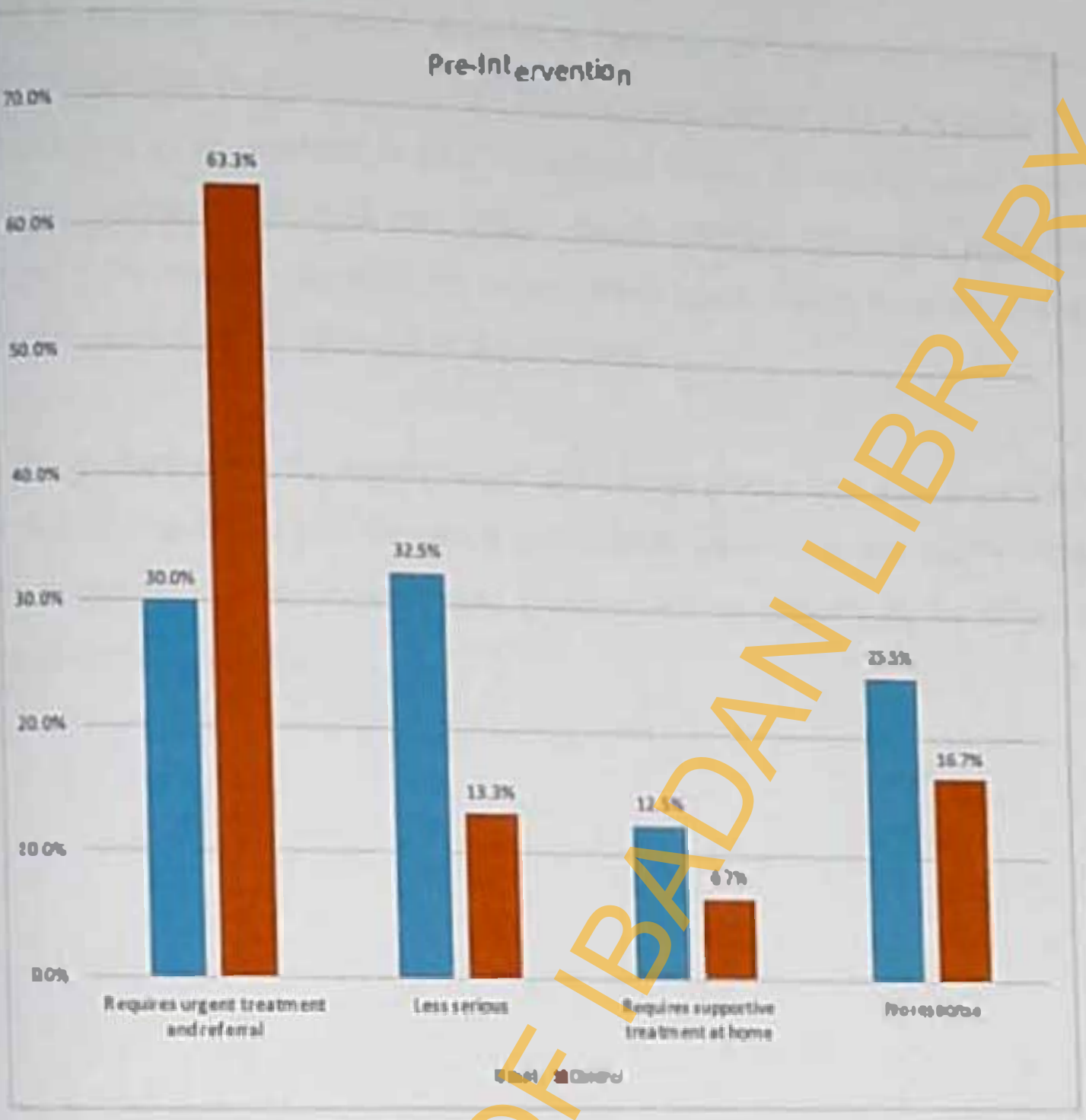

Figure 4.1e: Proportions of respondents in the experimental and control groups who correctly indicated that yellow colour requires supportive treatment at pre intervention.

Figure 4.1f presents respondents' knowledge relating to yellow colour indication in malaria management according to malaria treatment guideline at post intervention. The proportions of respondents at post intervention among the experimental and control groups who correctly affirmed that yellow colour requires supportive treatment were 96.9% and 3.6% respectively with the experimental group having a higher proportion of respondents who correctly affirmed to the statement.

While the proportions in the experimental and control groups who wrongly affirmed that yellow colour requires urgent treatment and referral were 0.0% and 64.3% respectively with no respondent in the experimental group affirming wrongly to the statement. See figure 4.1f for other details.

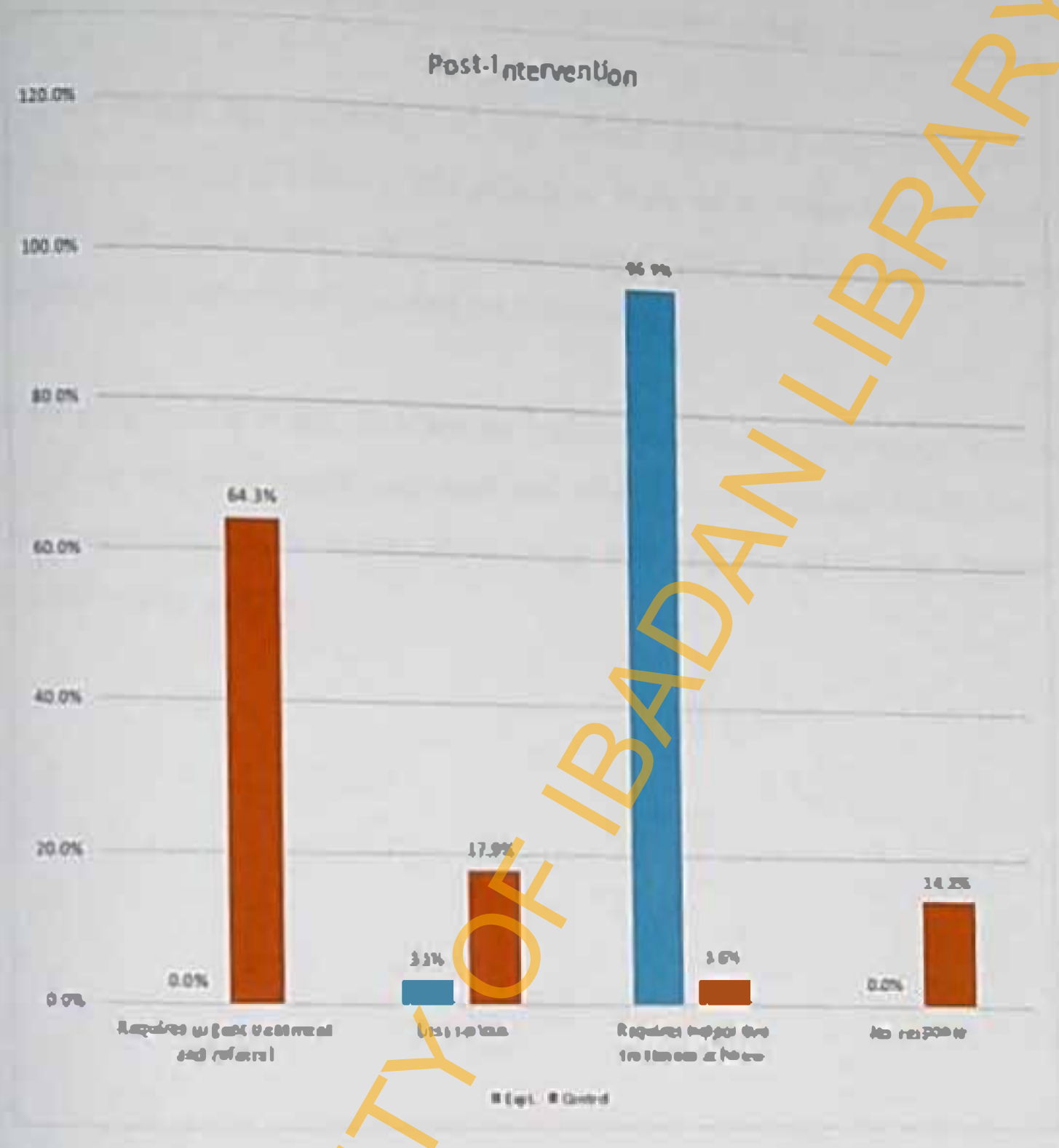

Figure 4.1f: Proportions of respondents in the experimental and control groups who correctly indicated that yellow colour requires supportive treatment at post intervention.

4.15 Respondents' knowledge on general danger signs/symptoms of malaria

Figure 4.2 presents respondents' knowledge about general danger signs of malaria at pre and post interventions among the experimental and control groups.

At pie intervention, the proportions of respondents among the experimental and control groups who correctly affirmed]child unable to drink as a danger sign of malaria were 96.9% and 3.6% respectively with the experimental group having a higher proportion of respondents who correctly affirmed to the statement.

While the proportions in the experimental and control groups who wrongly affirmed that yellow colour requires urgent treatment and referral were 0.0% and 64.3% respectively with no respondent in the experimental group affirming wrongly to the statement. See figure 4.2 for other details.

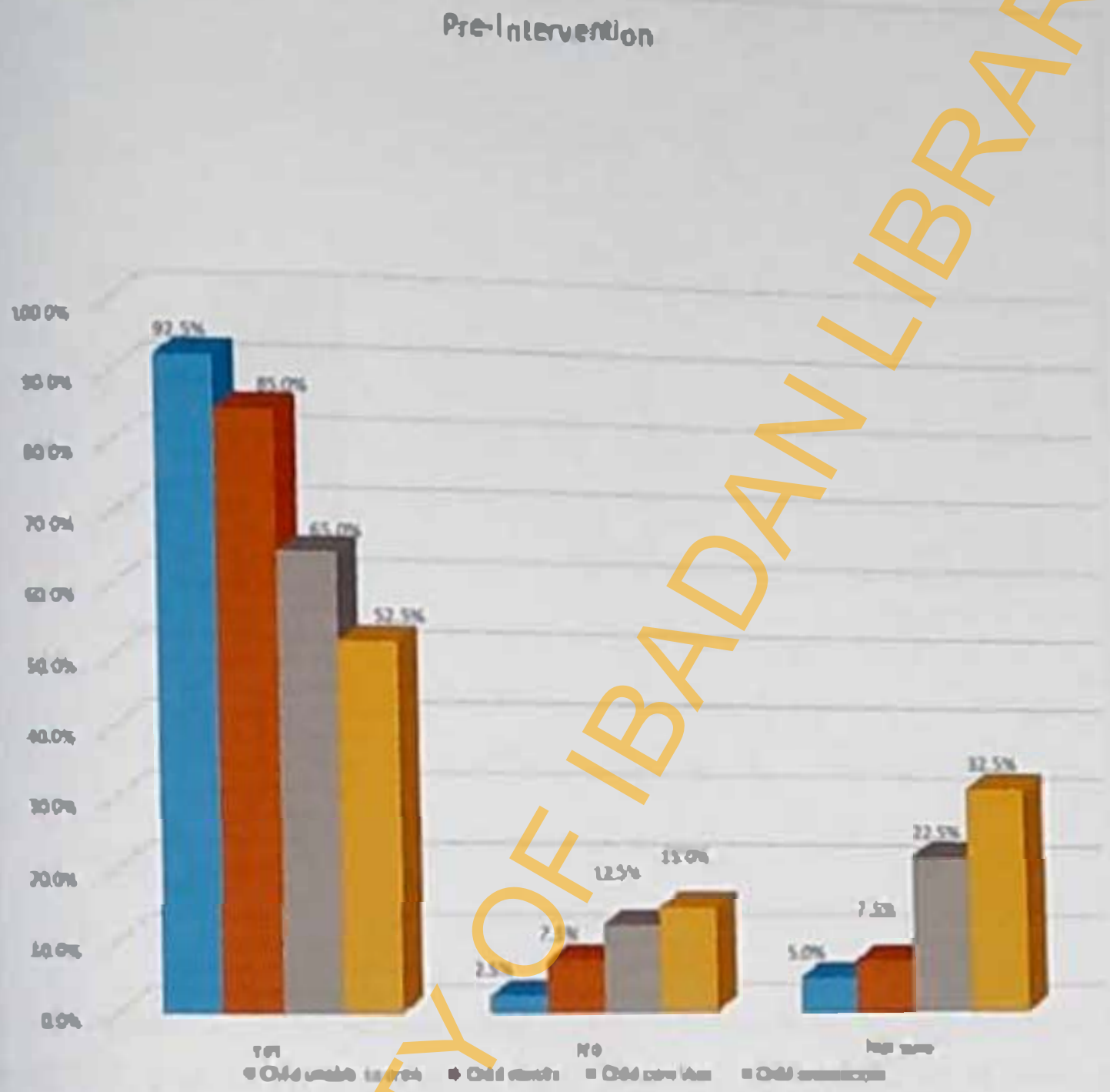

Figure 4.2: Proportion of respondents who mentioned child being unconscious, convulsing and vomiting everything as general signs/symptoms of malaria in a child at pre intervention.

At post intervention compared to pre intervention, almost all the respondents in the experimental and control groups mentioned child being unconscious, convulsing and vomiting everything as general signs of malaria in a child.

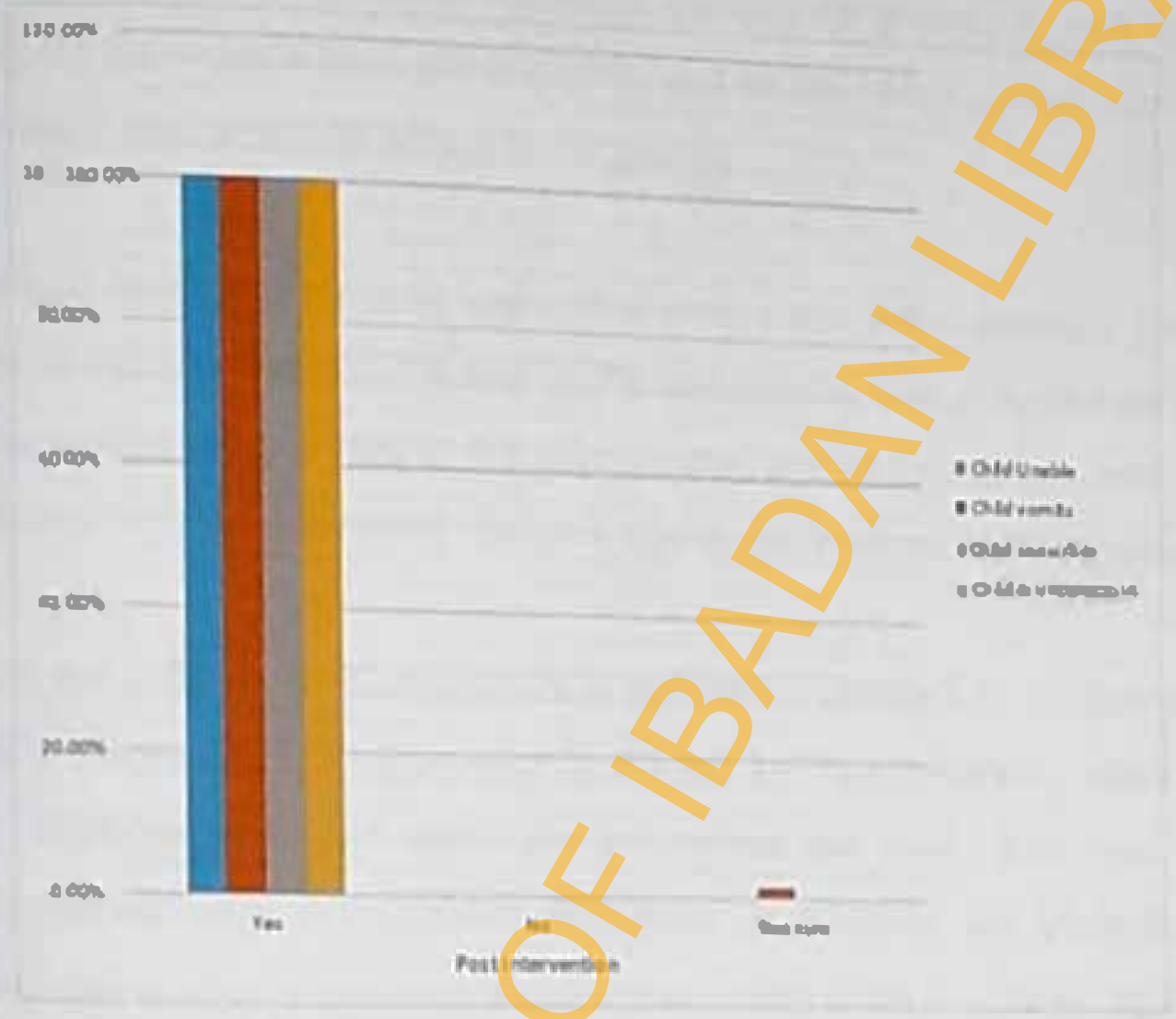

Figure 4.3: Proportion of respondents who mentioned child being unconscious, convulsing and vomiting everything as general signs/symptoms of malaria in a child at post intervention.

4.16 Respondents' knowledge of general signs of malaria

Table 4.14 presents respondents' knowledge about general signs of malaria at pre and post interventions among the experimental and control groups.

At pre intervention, the proportions of respondents among the experimental and control groups who stated correctly that hypoglycemia is a danger sign of malaria were 40.0% and 80.0% respectively with a significant difference between the groups. At post intervention, significantly all the experimental group (100%) and 64.3% of the control correctly stated this. There was a significant difference in the groups.

The proportions in the experimental and control groups who stated correctly that fever is a danger sign of malaria were 87.5% and 36.7% respectively with a significant difference. At post intervention, proportions in the experimental and control groups who stated this were 46.9% and 89.3% respectively. This is a significant difference in the groups.

Similarly the proportions in the experimental and control groups who stated correctly that headache is a danger sign of malaria were 75.0% and 33.3% respectively with a significant difference. While at post intervention the proportions that stated this were 40.6% and 89.3% respectively with a significant difference. In addition, the proportions in the experimental and control groups who stated correctly that coma is a danger sign of malaria were 35.0% and 73.3% respectively with no significant difference. At post intervention, proportions significantly all the experimental group (100%) and 75.0% of the control stated this. This is a significant difference in the groups. See figure 4.14 for other details.

Table 4:14: Respondents' knowledge of general signs of malaria

	Pre-intervention				Post Intervention			
General signs of malaria	Exht.	Control	X^2	P value	Expt.	Control	X^2	P value
Anaemia								
Yes*	38(95.0)	28(93.3)	4.172	0.124	32(100.0)	25(89.3)		
No	2(5.0)	0(0.0)			0(0.00	2(7.1)	3.609	0.165
Not sure	0(0.0)	2(6.7)			-	1(3.6)		
Hypoglycemia								
Yes*	16(40.0)	24(80.0)			32(100.0)	18(64.3)		
No	22(55.0)	1(3.3)	21.061	0.001	0(0.0)	8(28.6)	13.714	0.001
Not sure	2(5.0)	5(16.7)			-	2(7.1)		
Fever								
Yes*	35(87.5)	11(36.7)			15(46.9)	25(89.3)		
No	4(10.0)	17(56.7)	19.880	0.001	15(46.9)	1(3.6)	14.548	0.001
Not sure	1(2.5)	2(6.7)			2(6.2)	2(7.1)		
Breathing difficulty								
Yes*	25(62.5)	24(80.0)	13.875	0.001	32(100.0)	23(82.1)	6.234	0.013
No	13(32.5)	0(0.0)			0(0.0)	5(17.9)		
Not sure	2(5.0)	6(20.0)			0(0.0)	3(10.7)		
Renal failure								
Yes*	16(40.0)	23(76.7)	19.406	0.001	32(100.0)	18(64.3)	13.714	0.001
No	21(52.5)	1(3.3)			0(0.0)	9(32.1)		
Not sure	3(7.5)	6(20.0)			0(0.0)	1(3.6)		
Headache								
Yes*	30(75.0)	10(33.3)	13.665	0.001	13(40.6)	25(89.3)	19.610	0.001
No	10(25.0)	17(56.7)			16(50.0)	0(0.0)		
Not sure	0(0.0)	3(10.0)			3(9.4)	3(10.7)		
Coma								
Yes*	14(35.0)	22(73.3)	22.501	0.001	32(100.0)	21(75.0)	9.057	0.011
No	21(52.5)	0(0.0)			0(0.0)	4(14.3)		
Not sure	5(12.5)	0(0.0)				3(10.7)		
Loss of appetite								
Yes*	29(72.5)	12(40.0)	9.428	0.009	14(43.8)	22(78.6)	10.653	0.005
No	11(27.5)	15(50.0)			16(50.0)	3(10.7)		
Not sure	0(0.0)	3(10.0)			2(6.2)	3(10.7)		

* Correct responses.

4.17 Comparison of knowledge of participants using t-test (independent) statistic

Table 4.15a and 4.15b present comparisons of knowledge of participants using t-test (independent) statistic at pre and post interventions among the experimental and control groups.

The comparison of respondents mean knowledge scores showed significant increase in the knowledge of respondents at $p<0.001$ with respect to the current antimalarial treatment policy using the t-test statistics at pre and post intervention periods. See tables 4.15a and 4.15b for details.

Table 4.15a: Comparison of respondents' mean knowledge scores at pre-and post-intervention.

Knowledge score	Mean/SD	T-test	P value	95% CI	
				Lower	Upper
Expt. Group	47.2±7.9	-1.454	0.151	-8.461	1.328
Control group	50.8±12.5				

Table 4.15b: Comparison of respondents' knowledge scores at post-intervention

Knowledge score	Mean/SD	T-test	P value	95% CI	
				Lower	Upper
Expt. Group	63.7±4.1	10.439	0.001	12.329	18.179
Control group	48.5±6.9				

4.18 Perception of health workers about the use of ACT

Table 4.16 presents respondents' perception about the use of ACT at pre and post interventions among the experimental and control groups.

At pre intervention, the proportions of respondents among the experimental and control groups that were not sure of the reason for non-prescription of ACT with respect to its affordability were 90.0% and 13.3% respectively with a significant difference between the groups. At post intervention, the proportions of the experimental and control that were not sure of this were 59.4% and 14.3% respectively. There was a significant difference in the groups.

The proportions of the respondents at pre intervention in the experimental and control groups who strongly agreed that ACT is too expensive were 7.5% and 0.0% respectively with a significant difference. At post intervention, proportions in the experimental and control groups who agreed on this were 0.0% and 7.1% respectively. This is a significant difference in the groups. See figure 4.16 for other details.

Table 4.16: Respondents' perception relating to Availability & affordability of ACT

Availability & affordability of ACT	Pre-intervention				Post intervention			
	Expt.	Control	X^2	p value	Expt.	Control	X^2	p value
ACT isn't prescribed as its unaffordable								
Strongly agree	2(5.0)	0(0.0)	52.578	0.001	2(6.2)	2(7.1)	15.920	0.003
Agree	2(5.0)	1(3.3)			0(0.0	3(10.7)		
Not sure	36(90.0)	4(13.3)			19(59.4)	4(14.3)		
Disagree	0(0.0)	23(76.7)			4(12.5)	11(39.3)		
Strongly disagree	0(0.0)	2(6.7)			7(21.9)	8(28.6)		
ACTs is too expensive								
Strongly agree	3(7.5)	0(0.0)	52.270	0.001	0(0.0)	2(7.1)	17.540	0.002
Agree	0(0.0)	1(3.3)			0(0.0)	3(10.7)		
Not sure	33(82.5)	5(16.7)			21(65.6)	5(17.9)		
Disagree	0(0.0)	24(80.0)			5(15.6)	12(42.9)		
Strongly disagree	4(10.0)	0(0.0)			0(0.0)	0(0.0)		
ACT's available every where								
Strongly agree	32(80.0)	3(10.0)	35.389	0.001	27(84.4)	16(57.1)	5.830	0.120
Agree	4(10.0)	20(66.7)			4(12.5)	9(32.1)		
Not sure	4(10.0)	6(20.0)			1(3.1)	2(7.1)		
Disagree	0(0.0)	1(3.3)			0(0.0)	1(3.6)		

4.19 Respondents' perception relating to effects or efficacy of ACT

Table 4.17 presents respondents' perception about the effects or efficacy of ACT at pre and post interventions among the experimental and control groups.

At pre intervention, the proportions of respondents among the experimental and control groups who are of the view that ACT is more effective than other antimalarial medicines were 67.5% and 6.7% respectively with a significant difference between the groups. At post intervention, the proportions of the experimental and control that were of this view were 84.4% and 35.7% respectively. There was a significant difference in the groups.

Similarly, the proportions of the respondents at pre intervention in the experimental and control groups who were of the view that ACTs have less side effects than other antimalarial medicines were 57.5% and 3.3% respectively with a significant difference. While at post intervention, proportions in the experimental and control groups who shared this view were 68.8% and 35.7% respectively. This is a significant difference in the groups. See figure 4.17 for other details.

Table 4.17: Respondents' perception relating to effects or efficacy of ACT

Perceived effects of ACTs	Pre-intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
ACTs delay drug resistance								
Strongly agree	14(35.0)	1(3.3)	39.073	0.001	5(15.6)	4(14.3)	18.833	0.001
Agree	14(35.0)	4(13.3)			2(6.2)	3(10.7)		
Not sure	12(30.0)	5(16.7)			18(56.2)	2(7.1)		
Disagree	0(0.0)	20(66.7)			3(9.4)	11(39.3)		
Strongly disagree	0(0.0)	0(0.0)			4(12.5)	8(28.6)		
ACT prevents severe malaria								
Strongly agree	9(22.5)	1(3.3)	43.050	0.001	7(21.9)	2(7.1)	20.469	0.001
Agree	15(37.5)	3(10.0)			2(6.2)	5(17.9)		
Not sure	16(40.0)	4(13.3)			16(50.0)	2(7.1)		
Disagree	0(0.0)	21(70.0)			4(12.5)	9(32.1)		
Strongly disagree	0(0.0)	1(3.3)			3(9.4)	10(35.7)		
ACT is more effective than other medicines								
Strongly agree	27(67.5)	2(6.7)	28.233	0.001	27(84.4)	10(35.7)	16.618	0.002
Agree	8(20.0)	22(73.3)			4(12.5)	12(42.9)		
Not sure	5(12.5)	5(16.7)			1(3.1)	1(3.6)		
Disagree	0(0.0)	1(3.3)			0(0.0)	2(7.1)		
Strongly disagree	0(0.0)	0(0.0)			0(0.0)	3(10.7)		
ACTs have less side effects than other drugs								
Strongly agree	23(57.5)	1(3.3)	29.473	0.001	22(68.8)	10(35.7)	11.016	0.026
Agree	9(22.5)	21(70.0)			3(9.4)	9(32.1)		
Not sure	8(20.0)	4(13.3)			6(18.8)	4(14.3)		
Disagree	0(0.0)	4(13.3)			0(0.0)	3(10.7)		
Strongly disagree	0(0.0)	0(0.0)			1(3.1)	2(7.1)		
Effects of ACT are not known								
Strongly agree	16(40.0)	2(6.7)	36.570	0.001	5(15.6)	5(17.9)	12.815	0.012
Agree	7(17.5)	4(13.3)			1(3.1)	8(28.6)		
Not sure	17(42.5)	5(16.7)			16(50.0)	5(17.9)		
Disagree	0(0.0)	19(63.3)			4(12.5)	7(25.0)		
Strongly disagree	0(0.0)	0(0.0)			6(18.8)	3(10.7)		

4.20 Respondents' perception relating to prescription of ACT and other medicines

Table 4.18 presents respondents' perception relating to prescription of ACT and other antimalarial medicines at pre and post interventions among the experimental and control groups.

At pre intervention, the proportions of respondents among the experimental and control groups that agreed that ACT should be prescribed were 0.0% and 6.7% respectively with a significant difference between the groups. At post intervention, the proportions of the experimental and control that that agreed about this were 0.0% and 17.9% respectively. There was a significant difference in the groups.

Similarly at pre intervention, the proportions of respondents among the experimental and control groups that agreed that ACT should be prescribed after CQ fails were 12.5% and 6.7% respectively with a significant difference between the groups. At post intervention, the proportions of the experimental and control that that agreed about this were 0.0% and 10.7% respectively. There was a significant difference in the groups. See figure 4.18 for other details.

Table 4.18: Respondents' perception relating to prescription of ACT and other medicines

Prescription of ACTs & other medicines	Pre-intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
Do not prescribe ACT								
Strongly agree	2(5.0)	1(3.3)	52.500	0.001	2(6.2)	2(7.1)	29.464	0.001
Agree	0(0.0)	2(6.7)			0(0.0)	5(17.9)		
Not sure	38(95.0)	4(13.3)			20(62.5)	0(0.0)		
Disagree	0(0.0	23(76.7)			4(12.5)	12(42.9)		
Strongly disagree	0(0.0)	0(0.0)			6(18.8)	9(32.1)		
ACTshould be prescribe after CQ fails								
Strongly agree	8(20.0)	1(3.3)	46.311	0.001	5(15.6)	5(17.9)	19.232	0.001
Agree	5(12.5)	2(6.7)			0(0.0)	3(10.7)		
Not sure	27(67.5)	4(13.3)			17(53.1)	2(7.1)		
Disagree	0(0.0)	22(73.3)			3(9.4)	11(39.3)		
Strongly disagree	0(0.0)	1(3.3)			7(21.9)	7(25.0)		
CQ is the medicine of choice for malaria								
Strongly agree	8(20.0)	1(3.3)	40.565	0001	2(6.2)	4(14.3)	9.424	0.051
Agree	8(20.0)	3(10.0)			2(6.2)	1(3.6)		
Not sure	24(60.0)	5(16.7)			18(56.2)	6(21.4)		
Disagree	0(0.0)	21(70.0)			4(12.5)	10(35.7)		
Strongly disagree	0(0.0)	0(0.0)			6(18.8)	7(25.0)		
HWs should prescribe ACT								
Strongly agree	11(27.5)	1(3.3)	44.445	0.001	2(6.2)	6(21.4)	22.796	0.001
Agree	3(7.5)	5(16.7)			0(0.0)	5(17.9)		
Not sure	26(65.0)	4(13.3)			20(62.5)	2(7.1)		
Disagree	0(0.0)	19(63.3)			5(15.6)	9(32.1)		
Strongly disagree	0(0.0)	1(3.3)			5(15.6)	6(21.4)		
Use of ACT is unnecessary imposition by Government								
Strongly agree	6(15.0)	3(10.0)	30.297	0.001	3(9.4)	3(10.7)	8.931	0.063
Agree	4(10.0)	1(3.3)			0(0.0)	2(7.1)		
Not sure	30(75.0)	9(30.0)			19(59.4)	7(25.0)		
Disagree	0(0.0)	17(56.7)			4(12.5)	8(28.6)		
Strongly disagree	0(0.0)	0(0.0)			6(18.8)	8(28.6)		

4.21 Prescription pattern of health care workers for uncomplicated malaria

Table 19 presents prescription pattern of antimalarial medicines among the respondents for uncomplicated malaria at post intervention among the experimental group only. At pre and post interventions, the proportions of respondents who had ever prescribed ACT at one time were (90.0%) and (93.8%) respectively with significant difference. In the experimental group, there was a significant increase in the proportion of respondents at post intervention (65.6%) compared to pre intervention (40.0%) who prescribed Arthemeter Lumefantrine (AL) on 1 tablet (day and night) dose for 3 days for children aged 6 months to 3 years of age with weight of 5-14kg.

Similarly, there was an increase in the proportion of respondents in the experimental group at post intervention (78.1%) compared to pre intervention (40.0%) who prescribed Arthemeter Lumefantrine on 2 tablets (day and night) dose for 3 days for persons aged 4 to 8 years of age with weight 15-24kg. There was an increase in the proportion of respondents in the experimental group at post intervention (68.0%) compared to pre intervention (40.0%) who prescribed Arthemeter Lumefantrine on 3 tablets for a start after 8hr (morning, afternoon and night) for 3 days for persons aged 9 to 14 years of age with weight 25-34kg and this was significance at p=0.001

At post intervention there were more (90.6%) and 42.5% of respondents in the experimental group who prescribed Aarthemeter Amodiaquine (AL) on one tablet (day and night) dose for 3 days for children above 14 years of age with weight 35kg. Significantly, on the last time respondents prescribed any ACT to clients, there was an increase in the proportion of respondents post intervention (76.7% vs 65.0%) who prescribed ACT always /everyday, bi-weekly and 1 month ago compared to (41.4% vs 44.8%) at pre intervention in the experimental and control respectively.

Similarly, there was an increase in the frequency of respondents who prescribed ACT always (86.7% vs 70.6%) at post intervention compared to baseline (83.3% vs 82.4%). See table 4.19 for other details.

Table 4.19: Pattern of prescription of ACT related medicines among the experimental and control groups at pre and post intervention.

Pattern	Pre intervention				Post-intervention			
	Expt.	Ctrl	X^2	P value	Expt.	Ctrl	X^2	P value
ACT ever prescribed								
Yes	36(90.0)	17(56.7)	10.359	0.001	30(93.8)	17(60.7)	9.603	0.002
No	4(10.0)	13(43.3)			2(6.2)	11(39.3)		
AL (6mth-3yrs; 5-14kg)								
Yes	16(40.0)	8(26.7)	1.353	0.245	21(65.6)	7(25.0)	9.902	0.002
No	24(60.0)	22(73.3)			11(34.4)	21(75.0)		
AL (4-8) yrs; 15-24kg)								
Yes	16(40.0)	8(26.7)	1.353	0.245	25(78.1)	7(25.0)	16.934	0.001
No	24(60.0)	22(73.3)			7(21.9)	21(75.0)		
AL (9-14yrs; 25-34kg)								
Yes	16(40.0)	8(26.7)	1.353	0.245	22(68.8)	7(25.0)	11.446	0.001
No	24(60.0)	22(73.3)			10(31.2)	21(75.0)		
AL (>14yrs; >35kg)								
Yes	17(42.5)	8(26.7)	1.872	0.171	29(90.6)	7(25.0)	26.797	0.001
No	23(57.5)	22(73.3)			3(9.4)	21(75.0)		
AA (6mth-3yrs; 5-14kg)								
Yes	6(15.0)	7(23.3)	0.787	0.375	14(43.8)	5(17.9)	4.627	0.031
No	34(85.0)	23(76.7)			18(56.2)	23(82.1)		
AA (4-8yrs; 15-24kg)								
Yes	6(15.0)	7(23.3)	0.787	0.375	14(43.8)	6(21.4)	3.348	0.067
No	34(85.0)	23(76.7)			18(56.2)	22(78.6)		
AA (9-14yrs; 25-34kg)								
Yes	6(15.0)	6(20.0)	0.302	0.583	14(43.8)	5(17.9)	4.627	0.031
No	34(85.0)	24(80.0)			18(56.2)	23(82.1)		
AA (>14yrs; >35kg)								
Yes	7(17.5)	6(20.0)	0.071	0.790	0(0.0)	0(0.0)	0(0.0)	0(0.0)
No	33(82.5)	24(80.0)						
When last prescribe any ACT								
Always/everyday	12(41.4)	13(44.8)	0.773	0.856	23(76.7)	13(65.0)	4.248	0.236
Within two weeks	6(20.7)	6(20.7)			5(16.7)	3(15.0)		
>1 month ago	4(13.8)	2(6.9)			1(3.3)	0(0.0)		
NR	7(24.1)	8(27.6)			1(3.3)	4(20.0)		

Note: AL-Arthemeter Lumefantrine AA-Artesunate Amodiaquine AM-Artesunate Mefloquine
AF-A...

Table 4.19: Pattern of prescription of ACT related medicines among the experimental and control groups at pre and post intervention.

Pattern	Pre intervention				Post-intervention			
	Expt.	Ctrl	X^2	P value	Expt.	Ctrl	X^2	P value
ACT ever prescribed								
Yes	36(90.0)	17(56.7)	10.359	0.001	30(93.8)	17(60.7)	9.603	0.002
No	4(10.0)	13(43.3)			2(6.2)	11(39.3)		
AL (6mth-3yrs; 5-14kg)								
Yes	16(40.0)	8(26.7)	1.353	0.245	21(65.6)	7(25.0)	9.902	0.002
No	24(60.0)	22(73.3)			11(34.4)	21(75.0)		
AL (4-8yrs; 15-24kg)								
Yes	16(40.0)	8(26.7)	1.353	0.245	25(78.1)	7(25.0)	16.934	0.001
No	24(60.0)	22(73.3)			7(21.9)	21(75.0)		
AL (9-14yrs; 25-34kg)								
Yes	16(40.0)	8(26.7)	1.353	0.245	22(68.8)	7(25.0)	11.446	0.001
No	24(60.0)	22(73.3)			10(31.2)	21(75.0)		
AL (>14yrs; >35kg)								
Yes	17(42.5)	8(26.7)	1.872	0.171	29(90.6)	7(25.0)	26.797	0.001
No	23(57.5)	22(73.3)			3(9.4)	21(75.0)		
AA (6mth-3yrs; 5-14kg)								
Yes	6(15.0)	7(23.3)	0.787	0.375	14(43.8)	5(17.9)	4.627	0.031
No	34(85.0)	23(76.7)			18(56.2)	23(82.1)		
AA (4-8yrs; 15-24kg)								
Yes	6(15.0)	7(23.3)	0.787	0.375	14(43.8)	6(21.4)	3.348	0.067
No	34(85.0)	23(76.7)			18(56.2)	22(78.6)		
AA (9-14yrs; 25-34kg)								
Yes	6(15.0)	6(20.0)	0.302	0.583	14(43.8)	5(17.9)	4.627	0.031
No	34(85.0)	24(80.0)			18(56.2)	23(82.1)		
AA (>14yrs; >35kg)								
Yes	7(17.5)	6(20.0)	0.071	0.790	0(0.0)	0(0.0)	0(0.0)	0(0.0)
No	33(82.5)	24(80.0)						
When last Prescribe any ACT								
	12(41.4)	13(44.8)	0.773	0.856	23(76.7)	13(65.0)	4.248	0.236
Always/everyday	6(20.7)	6(20.7)			5(16.7)	3(15.0)		
Within two weeks	4(13.8)	2(6.9)			1(3.3)	0(0.0)		
>1 month ago	7(24.1)	8(27.6)			1(3.3)	4(20.0)		
NR								

Note: AL-ArthemeterLumefantrine AA-ArtesunateAmodiaquine AM-ArtesunateMefloquine AF-ArtesunateFansidar

4.22 Pattern of respondents' preferences for anti-malarial medicines

Table 4.20 presents pattern of respondents' preferences for anti-malarial medicines at post intervention among the experimental and control groups.

At pre and post interventions, the proportions of respondents who mostly preferred prescribing Arthemeter Lumefantrine (AL) were (17.5%) and (10.0%) respectively with significant difference. In the experimental group, there was a significant increase in the proportion of respondents at post intervention (78.1%) compared to pre intervention (42.9%) who had same. There is a significant difference in the groups.

The proportions of respondents at pre and post interventions among the experimental and control who mostly preferred prescribing Arthemeter Amodiaquine (AA) were 42.5% and 73.3% respectively with a significant difference.

Significantly, there was an increase in the proportion of respondents in the experimental group at post intervention (68.8%) compared to pre intervention (39.3%) who mostly preferred to prescribe AA. There is a significant difference in the both groups. See table 4.20 for other details.

Table 4.20: Pattern of respondents' preferences for anti-malarial medicines prescription

Pattern of preference	Pre intervention				Post intervention			
	Expt.	Control	X^2	P value	Expt.	Control	X^2	P value
Prefer SP								
Most	3(7.5)	0(0.0)	20.342	0.001	8(25.0)	6(21.4)	2.119	0.714
Second	5(12.5)	1(3.3)			3(9.4)	3(10.7)		
Third	3(7.5)	1(3.3)			1(3.1)	2(7.1)		
Least	17(42.5)	28(93.3)			19(59.4)	14(50.0)		
Prefer AL								
Most	7(17.5)	3(10.0)	18.950	0.001	25(78.1)	12(42.9)	10.933	0.027*
Second	14(35.0)	4(13.3)			0(0.0)	2(7.1)		
Third	6(15.0)	14(46.7)			0(0.0)	2(7.1)		
Least	3(7.5)	8(26.7)			5(15.6)	11(39.3)		
Prefer quinine								
Most	14(35.0)	2(6.7)	27.528	0.001	16(50.0)	7(25.0)	7.220	0.125
Second	2(5.0)	3(10.0)			3(9.40	2(7.1)		
Third	2(5.0)	7(23.3)			0(0.0)	1(3.6)		
Least	7(17.5)	17(56.7)			7(21.0)	14(50.0)		
Prefer halofantrine								
Most	5(12.5)	0(0.0)	27.984	0.001	10(31.2)	1(3.6)	17.646	0.001*
Second	7(17.5)	6(20.0)			0(0.0)	1(3.6)		
Third	1(2.5)	0(0.0)			6(10.8)	0(0.0)		
Least	10(25.0)	24(80.0)			13(40.6)	24(85.7)		
Prefer AA								
Most	17(42.5)	22(73.3)	10.081	0.039	22(68.8)	11(39.3)	13.125	0.011*
Second	4(10.0)	0(0.0)			0(0.0)	3(10.7)		
Third	2(5.0)	0(0.0)			1(3.1)	1(3.6)		
Least	6(15.0)	5(16.7)			4(12.5)	12(42.9)		
NR								

* = significant at p=0.05

4.23 Availability of ACT at respondents' health facility

Table 4.21 presents availability of ACT related medicines at the respondents' health facilities at post intervention among the experimental and control groups.

At pre and post interventions, the proportions of respondents' health facilities who ever stocked ACT related medicines were 85.0% and 53.3% respectively with significant difference. While at post intervention, the of respondents' health facilities who ever stocked ACT related medicines were 93.8 and 67.9%. There is a significant difference in the groups.

Additionally, at pre intervention, the proportions of respondents' health facilities in the experimental and control who had ACT related medicines in stock were 70.0% and 33.3%. While 71.9% and 71.4% had ACT related medicines in stock at post intervention among the experimental and the control respectively. See table 4.21 for other details.

Table 4.21: Reported availability of ACT related medicines in respondents' health facilities

Pattern of availability	Pre intervention				Post-Intervention			
	Expt.	Ctrl	X^2	P value	Expt.	Ctrl	X^2	P value
Ever stocked ACT in facility	34(85.0)	16(53.3)	8.423	0.004	30(93.8)	19(67.9)	6.687	0.010
Yes	6(15.0)	14(46.7)			2(6.2)	9(32.1)		
No								
Currently have ACT in facility.	28(70.0)	10(33.3)	9.287	0.002	23(71.9)	20(71.4)	0.001	0.969
Yes	12(30.0)	20(66.7)			9(28.1)	8(28.6)		
No								

NOTE: Multiple responses included

CHAPTER FIVE

DISCUSSIONS, CONCLUSION AND RECOMMENDATIONS

5.1 Discussions

This study was a quasi-experimental in design with two study groups – the experimental and control groups respectively. The purpose of the intervention was to document the outcome of training on frontline health workers' knowledge, perception and pattern of prescription of anti-malarial treatment policy in the study LGAs. The study LGAs were grouped into two clusters (cluster A and cluster B) based on proximity in other to avoid diffusion of information. The intervention was therefore implemented only in the experimental group. The intervention group was exposed to training on the current anti-malarial treatment policy while the control group received no such intervention. The pre-intervention, post-intervention and immediate outcome indicators were measured in both the experimental and control groups.

However, the discussions are structured based on the comparisons between the findings of the training intervention on the study groups' knowledge, perception and pattern of prescription of anti-malarial treatment policy and policy stipulations and other similar interventions for similar study groups.

Respondents in this study were over 40 years of age reflecting the age bracket involved in economic productivity and generation activities. There was a preponderance of females at both study periods. This situation is observed across health care facilities were females, who have passion for health care were seen providing routine service delivery and building a career in health care. A previous study carried among frontline health care workers in health care facilities in Ibadan Metropolis (Oyedeji, 2011) showed a similar trend with this study as most of the health care providers at the health facilities in the study areas were females. Majority of respondents at both study periods were Yoruba. This is expected as the study's site was carried out in a Yoruba speaking environment. A higher proportion of respondents had SCHEW qualifications. This finding is comparable to that documented by Isah, et al (2010) where about 48.3% of their respondents had SCHEW qualification. The respondents had over 20 years of professional practice.

At pre-intervention, some of the key messages delivered during training influence respondents' knowledge and prescribing decisions. Incorrect messages were reportedly received, for example that compulsory parasitological testing was required before prescribing coartem which is the recommended first line antimalarial medicine, and that quine was still effective. Around half of the respondents stated these messages as reasons for not prescribing coartem.

The respondents also reported that there was a key emphasis during in-service training on obtaining confirmed parasitic diagnosis using microscopy or rapid diagnostic tests (RDTs) before prescribing coartem. They added that this restriction had prevented many health workers from prescribing coartem because they were waiting for RDTs to be supplied to their health facilities, particularly to those without microscopy. The importance of confirmed diagnosis was particularly emphasized for patients of five years and above. For this age group the respondents reported being told it was compulsory to test before prescribing coartem, regardless of the availability of diagnostics. Only a few health workers said that they could treat presumptively with coartem if diagnostics were not available. They, therefore, often defaulted to using monotherapies for older patients.

Most respondents reported that they were told by training facilitators to treat all childhood fevers presumptively as malaria using coartem, in accordance with algorithms developed in the national guidelines and harmonized with the Integrated Management of Childhood Illness (IMCI) fever algorithms. However, some respondents reported that they had been told by training facilitators to rule out other diagnoses before prescribing coartem in febrile children. They were, therefore, employing some degree of clinical judgement.

This report is similar to a finding in Makueni District by Goodman et al (2007) where health workers were universally told that amodiaquine was still effective and could be used in the treatment of uncomplicated malaria. This statement is incorrect, since Makueni was among the first districts in Kenya reporting increased levels of *Plasmodium falciparum* resistance (22%) to amodiaquine as early as in 1997. Furthermore, such messages clearly contradict the new guidelines, where amodiaquine is not recommended in the treatment of uncomplicated malaria

Greater proportion of respondents at post-intervention compared to pre-intervention had heard about new antimalarial treatment policy. This increase in awareness about the policy can be attributed to other training interventions and enlightenment programmes organized for health care workers by the government. This finding is similar with a study conducted in Tanzania by Mugoyela and Minzi (2011) and Batega (2004) in Uganda where nearly all health workers were aware of the recommended first line malaria management. This increase in the immediate outcome indicator may be attributed to the quality of the training and the key messages delivered to the respondents. However, this conclusion is tempered by the fact that the study had no control arm to detect the effects of other concurrent interventions within the study periods.

The recommended medicine for the management of malaria according to the current national anti-malaria policy is Coartem. Majority of the respondents correctly affirmed this fact about the policy at post intervention than at pre-intervention. Also the respondents strongly disagreed at post intervention than at pre-intervention that chloroquine and SP were the first line medicines for the management of uncomplicated malaria which maybe be due to the clarity of training message (s) and method of message delivery during the training. This is in sharp contrast with findings of Oyedeji (2011) where health workers mention amalar, (a sulphadoxine pyrimethamine) as a first line drug of choice. Also findings by Agbo, et al (2013) were none of the respondents could identify the first line antimalarial medicine according to the current treatment policy contradicts the finding by this study. Further respondents' knowledge of national antimalarial treatment policy was expounded by avoiding conflicting training messages during the training. Majority (74.0%) of respondents at post intervention as against pre-intervention correctly stated that SP is recommended for all pregnant women as Intermittent Preventive Treatment (IPT) for malaria and that pregnant women should receive at least two doses of IPT with SP during the 2nd and 3rd trimesters. This finding is in line with about 90.0% of respondents who had a similar assertion in a study conducted in Tanzania by Nyonyi (2012). This improvement on knowledge of NATP might be attributable to the outcome of the training offered to the respondents and update courses received by respondents while on the job.

Malaria treatment interventions in Nigeria including prompt diagnosis, case ascertainment, use of ITN and IPT were correctly stated by majority of the respondents at post intervention. This finding is comparable to findings by Oyedeji (2011), Aina and Ayeni

(2011); Nyonyi (2012) where prompt diagnosis and treatment topped the list of the correct interventions followed by use of ITNs/ITMs.

On the general signs of malaria, according to this study, a child being unconscious, convulsing and vomiting everything topped the list of the danger signs and symptoms of malaria mentioned by the respondents at pre and post interventions. This observation is similar to a study by Batega (2004) in Uganda were general knowledge of malaria symptoms was relatively high. Also this situation is similar to the findings by Oyedeji (2011), were fewer than half of CHO's were aware that anaemia is one of the signs of severe malaria. In addition, this finding is in contrast to that reported by Batega (2004) in Uganda where health workers' understanding and recognition of severe malaria symptoms was as low as 20%. The limited knowledge of signs of severe malaria, calls for knowledge strengthening through continuous in-service training, health education and communication if appropriate case management of malaria will be achieved. However, at post intervention, a more significant proportion of respondents in the experimental group indicated anaemia, headache and renal failure as general signs of malaria compared with the control with the exception of fever with the control having about 86.0% compared to 45.5% of the experimental group. Reasons for this drop in knowledge of fever as a sign of malaria among the experimental group maybe due to other external factors other than the intervention.

Health workers perception about the provisions of the NATP is vital to their preferred treatment choices which will in the long run determine consumers' health seeking practice as well as preferences. Also, health workers' pereceptions of the current treatment policy would be a key reason for either adherence or non-adherence to its provisions.
According to this study, majority of respondents at post intervention did not recognize Chloroquine as a first line medicine of choice for treatment of uncomplicated malaria. At post intervention, significantly more of the experimental group (96.9% and 89.3% of the control correctly stated that Chloroquine (CQ) is not a first line medicine for treating malaria according to the policy. There was a general acceptance of ACTs which have less side effects for treatment of uncomplicated malaria by the respondents. This is in contrast with that reported by Batega (2004) where health workers still prescribed Chloroquine or Sulfadoxine Pyrimethamine (SP) which have been delisted as first line antimalarial medicines by the Federal Ministry of Health of Nigeria as far back as 2004. Similarly, findings of this study reveal that ACTs are very effective with less side effects and are

available everywhere. However, sustainable efforts should be institutionalized to continue to encourage frontline health workers to prescribe ACTs across the three tiers of health facility in Nigeria. This step if embarked upon would have far-reaching benefits of halting progression of malaria illness to severe malaria and reduction of mortalities among under-fives (FMOH, 2005; WHO, 2006).

Findings from this study reveal that Quinine-based drugs are safe for pregnant women. This is in contrast to findings according to FMOH (2006) were over half (56.0%) of the respondents were unaware that quinine is safe in pregnancy in all trimesters. In high transmission areas like Nigeria, (FMOH, 2006) malaria could be asymptomatic in pregnancy and quinine remains the most effective and can be used in all trimesters of pregnancy including the first trimester. This implies without appropriate information through enlightenment programme by the government, health workers may continue in the practice of not prescribing quinine but subject pregnant women to other antimalarial drugs that are harmful to the developing fetus.

The introduction of efficacious ACTs in the public health sector in Oyo state and other states has major potential public health benefits for Nigeria. However, this may not be realized if health care providers' prescription practices do not conform to the recommended treatment guidelines.

A significant outcome of this study was the marked increase in proportion of health workers who had ever prescribed ACTs related medicines among the experimental group at pre-intervention and post intervention respectively. This finding is similar with that by Oreagbe et al (2006) where only 5.9% prescribed ACTs in spite of the high proportion (59.2%) of health workers who were favourably disposed to the National Antimalarial Policy change from chloroquine to ACTs as first line treatment medicines. Sustaining this step has far-reaching effects in the prevention and reduction of malaria associated morbidities and mortalities.

On the frequency of prescription of ACTs by health workers in this study, majority (74.0%) prescribed ACT everyday with the rationale of its effectiveness whereas this proportion may be marginally compared to about (44.0%) of respondents that prescribed

ACT to the last patient with malaria according to Oreagbe et al (2006). Though encouraging, this effort needs to be sustained considering the fact that there were an estimated 247 million malaria cases (5^{th} – 95^{th} centiles, 189 – 327 million) worldwide in 2006, of which 91.0% or 230 million (175 – 300 million) were due to *P. falciparum* which is sensitive to ACTs.

The main prerequisite of any new drug policy is adequate and continuous availability of the recommended drug at peripheral facilities. In Zambia, one of the earliest countries where ACT was adopted, only 22.0% of patients eligible for ACTs actually received them even where the drugs were readily available and clinic staff knew they were being observed; this illustrates the technical difficulty on how to deploy ACTs to maximize their effectiveness and cost effectiveness (Zurovac, Rowe, Ochola, Noor, Midia, English, Snow 2005). Although AL was the most preferred medicine for management of uncomplicated malaria by health the workers, Chloroquine was seen to be second most preferred option according to this study. This could be attributed to deliberate avoidance of ambiguity or distortion in the training key messages in respect to policy recommendations. Health workers at the training reported that the supply of ACTs had been inconsistent during the initial stages of implementation of the new policy and there were shortages of some dosages, particularly those for adults.

Nearly all the health workers indicated that they were rationing the drug because they were not certain of the next supply based on previous stock-outs periods. This finding is a contrast to a study by Oreagbe et al (2006) were it observed that a large number of the respondents ranked Chloroquine as the first preferred antimalarial drug in a ranking of five antimalarial drugs followed by AL. More so, the reason for this situation, according to Oreagbe et al. (2006), was that introduction of ACT-related drugs was not accompanied by adequate enlightenment.

Continuous availability of Chloroquine since the beginning of ACTs supplies deserves a special attention. There is the need to ensure that the quantity and frequency of ACTs supplies is substantially improved at the front-line health care facilities. On the other hand, the discontinuation of Chloroquine supply without ensuring ACTs availability might have serious public health consequences as health workers may have no choice than to revert to

abandoned and completely ineffective SP treatment policy (which is currently available for IPT in pregnancy) and/or to massive prescribing of quinine risking development of resistance to life-saving therapy for severe malaria.

According to this study, majority of health workers had been trained on the use of ACTs and demonstrated ample knowledge of the provisions of the current NATP. This is in line with findings by Oyedeji (2011) which revealed that 94.2% of respondents who attended recent malaria seminars were more likely to agree with the policy change than those who did not attend seminars indicating that educational interventions could have a pronounced impact on the perception of health workers towards the policy change. It is also not unlikely that health workers may not be adequately trained to address most public health issues according to Oreagba et al (2006) in a study carried out at Lagos State General hospitals where it was reported that prescribers or health workers had no formal training on the use of ACTs.

Introduction of capacity building in enhancing adherence to stipulate health policies cannot be over-emphasized. It has far reaching gains in improvement of case ascertainment, management, adoption of evidenced-based prescription and improvement of health worker-patient communication as documented by a study conducted by the World Health Organization (2004) to assess the effect of Integrated Management of Childhood Illness (IMCI) case management training on the use of antimicrobial drugs among health-care workers treating young children at first-level facilities.

Also a study conducted by Watsierah, et al (2012) on provider knowledge of treatment policy and dosing regimen with artemether-lumefantrine and quinine in malaria-endemic areas of western Kenya revealed that in-service training influenced treatment regimen for uncomplicated malaria ($P = 0.039$ and $P = 0.039$) and severe malaria ($P < 0.0001$ and $P = 0.002$) in children and adults, respectively.

However, the gap observed in health workers' knowledge of the provisions of the treatment policy and prescription patterns can be attributed to lack of quality control measures instituted by the government to eliminate ambiguity or distortion in the training key messages in respect to policy recommendations and non-existence of other measures

such as continuous education, dialogue and clinical supervisory visits coupled with on-job training to augment one-off training efforts by the government and non-governmental agencies.

Conclusion

The introduction of the new NATP with its provisions for efficacious and effective case management of malaria by health care workers has major potential public health benefits for Nigeria. However, this may not be realized if providers' knowledge and prescription practices do not conform to the recommended treatment guidelines. It is essential that high quality training be organized for health care providers to ensure appropriate case management.

The level of awareness and knowledge relating to the provisions of the current NATP, malaria case management for uncomplicated malaria among the experimental group and other workers in the study LGAs prior to the training intervention was low not withstanding series of training programmes organised for the health workers by the government and other non-governmental organizations. Pattern of prescription of the antimalarial medicines was not in line with the treatment guidelines. This also applied to the knowledge of danger signs and symptoms of malaria, safety of quinin as IPT for pregnant women in all trimesters and the categories of the vulnerable groups to malaria. But findings from this study reveal significant increase in the proportion of health workers with the proper knowledge of danger signs and symptoms of malaria, who correctly stated the first line medicine for treating uncomplicated malaria, and safety of quine in all trimesters at post intervention. There was also increase in the respondents' knowledge of the provisions of the NATP and malaria case management.

The training programme was found to be effective not only in upgrading the experimental group's knowledge of the current NATP and its provisions but was also effective in modifying their perceptions and enhancing their pattern of prescription of first line ACTs.

Based on the immediate outcome evaluation involving the comparative analysis within and between groups, it could be stated that it was the implemented training programme that led to the observed changes in the knowledge and perceptions in the experimental group of front-line health workers. However, government and other stakeholders need to

adopt more proactive and sustainable measures such as quality control for trainings in respect to key messages to reduce the chances of mixed or ambiguous messages.

Also, efforts should be made to ensure that one-off in-service training which may introduce ambiguities in policy recommendations should be augmented with some other measures of continuous education, dialogue and clinical supervisory visits coupled with on-the--job training. Furthermore, the importance of a phase-out plan by the government for non-recommended antimalarial medicines during the transition period to prevent mixed prescriptions during the introduction of a new antimalarial treatment policy cannot be overemphasized.

Recommendations

Based on the findings from this study, the following are recommended:

1. In-service training should be regularly organized at state and LGA levels to support introduction of any new antimalarial treatment policies and guidelines.
2. Better quality control should be instituted by the government for training in respect to key messages to reduce the chances of mixed or ambiguous messages.
3. One-off in-service training efforts that may themselves introduce ambiguities in policy recommendations should be augmented with some other measures of continuous education, dialogue and clinical supervisory visits coupled with on-job training.
4. More proactive measures including sustainable, evidence-based enlightenment and prevention of stock-out of ACTs should be instituted to increase health workers efficacy to prescribe ACTs in their health facilities.
5. Periodic assessment and evaluation of health workers knowledge regarding malaria should be instituted to identify and address gaps in management of malarin eases in Nigeria.
6. A phase-out plan should be developed by the government at all levels for non-recommended antimalarial medicines during the transition period to prevent mixed prescriptions during the introduction of a new antimalarial treatment policy.

REFERENCES

Adekunle Oludayo Osuolale, 2010. Mother's knowledge, perception and use of Artcinisinin based combination therapy for treating malaria among under-fives in Ibarapa central Local Govemment Area, Nigeria.

Adjuik, M; Babiker, A; Gamer, P; Olliaro, P; Taylor, W. and White, N. (2004): Artesunate Combinations for treatment of malaria: meta-analysis. International Artemisinin Study Group. *Lancet*; 363:9-17.

Ahmed, A; Cerilli, L.A. and Sanchez, P.J. (1998): Congenital malaria in a preterm nconate: case report and review of liteiature. *American Journal Preinatol.* 15:19-22.

Aina, B.A. (2005): Studies on the rational use of chloroquine in the management of uncomplicated malaria in Lagos State General Hospitals. PhD Thesis, Univeisity of Lagos.

Alnwick, D (2001): Malaria – the malaria challenge. *Africa Health;* 23:6.

Amexo, M; Tolhurst, R; Bamish, G. and Bates I. (2004): Malaria misdiagnosis: effects on the poor and vulnerable. Lancet; 364: 1896-8.

Anabwani, G. (1999): Combination of atovaquone and proguanil hydrochloride vs. halofantrine for the treatment of *plasmodium falciparum* malaria in children. *Paedriatric Infections Diseases Journal.* 18(5):456-461.

Anne, M. (1991): "The economics of malaria control" in *Waiting for Vaccine*, G.A.T Targeted., John Wiley and Sons: Chichester, England.

Bhattarai, A. Ali, A.S; Kachur, S.P; Martensson, A. and Abbas, A.K. (2007): Impact of arteminisin-based combination therapy and insecticide treat nets on malaria burden in Zanzibar. PLoS Med 4(11): e309.

Biddle, B.J. (1979): *Role of Theory: Expectations, Identities and Behaviours*. New York: Academic Press. Inc *2004;* 363:9-17, 2659:813-22.

Billy, N, Maiycelina, M, Marian, W, Max, G.P, Amos, Y, Lars L .G, Goran, T, Zul, P and Anders, B. (2008). Impact of training in clinical and microscopy diagnosis of childhood malaria on antimalarial drug prescription and health outcome at primary health care level in Tanzania: A randomized controlled trial. *Malaria Journal* 2008, 7:199.

Bojang, K.A. (1998): A trial of Fansidar plus chloroquine or Fansidar alone for the treatment of uncomplicated malaria in Gambian children. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 92:73-76.

Boland, P.B and Ettling, M. (1999): Making malaria treatment policy in the face of drug resistance. *Annals of Tropical Medicine and Parasitology*, 93(1): 5-23.

Boland, P.B. (1997): Malarone donation program in Africa. *Lancet*, 350:1624-1625.

Boland, P.B. (1993): Beyond chloroquine: implications of drug resistance for evaluating malaria therapy efficacy and treatment policy in Africa. *Journal of Infectious Diseases*, 167(4):932-937.

Brabin B.J; Wasonic, M; Uddenfeldt-Wort, U; Dellicour, S; Hill, J. and Gies, S. (2008): Monitoring and evaluatioo of malaria in pregnancy – developing a rational basis for control. *Malaria Journal*; 7(suppl 1): S6doi: 10.1186/1475-2875-7-S1-S6.

Brasseur, P. (1999): Amodiaquine remains effective for treatment of uncomplicated malaria in West and central Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 93(6):645-650.25.

Catherine G, William B, Alasdair U, Anne M. Sylvia M and George G (2007). Medicine Sellers and Malaria Treatment in Sub-Saharan Africa: What Do They Do and How Can Their Practice Be Improved? *The American Society of Tropical Medicine, 21 September, 2007.*

Center for Disease Control and Prevention (2004): The Impact of Malaria, a leading cause of death worldwide. Atlanta Georgia, USA.

Center for Disease Control and Prevention (2004): The History of Malaria – An Ancient Disease. Atlanta Georgia, USA.

Clark, D. (2008). Flipping Kirkpatrick. bdld.blogspot.com. Dec. 17, 2008. Retrieved from web April 27, 2009: http://bdld.blogspot.com/2008/12/flipping-kirkpatrick.html

Community Health Registration Board of Nigeria (2006): Comparative advantages UNICEF Malaria Technical Notes 5, February, 2006.

Cross, C. (2004): The Life Cycle of anopheles mosquitoes. A publication of Wellcome Trust, UK.

Darlow, B. (1982): Sulphadoxine-Pyrimethamine for treatement of acute malaria in children in Papua New Guinea. *American Journal of Tropical Medicine and Hygiene, 31:1-9.*

Dinis, D.V and Schapira, A. (1990): Comparative study of the efficacy and side effects of two therapeutic regimens against chloroquine-resistant falciparum malaria in Maputo, Mozambique. *Bulletin de la Societe de Pathologie Exotique*, 83:521-528.

Ekanem, O.J; Ezidinachi, E.N.U; Molta. N.B; Watila I.M, Chukwuani, C.M; Meremikwu, M.M, Akpede, G. and Ojar, E.A. (2000): Treatment of malaria in north-eastern and south-eastern Nigeria: a comparative study of mefloquine, sulphadoxine, pyrimethamine combination (MSP) vs chloroquine. *West African Journal Medicine*, 19:293-297.

Ekue, J.M.K. (1983): A double blind comparative clinical trial of mefloquine and chloroquine in symptomatic falciparum malaria. *Bulletin of the World Health Organisation*, 61:713-71861.

Ezedinachi, E.N.U; Alaribe, A.A; Meremikwu, M. and Ejezie, G.C. (1992): New Trends in chloroquine efficacy in the treatment of malaria. *Central African Journal Medicine*, 38:303-307.

Falade, C.O; Salako, L.A; Sowunmi, A; Oduola, A.M.J. and Larcier, P. (1992): Comparative efficacy of halofantrine, choloroquine and Sulphadoxine-pyrimethamine for treatment of acute uncomplicated malaria in Nigerian children. *Trans R. Soc Tropical Medicine Hygiene*, 91:58-62.

Federal Ministry of Health (2000): African Summit on roll back malaria. Abuja working document. A publication of the Nigerian Ministry of Health, Abuja.

FMOH (2002). Technical Report of anti-malarial drug therapeutic efficacy tests Abuja

FMOH (2000) *Situational analysis of malaria control in Nigeria*. Abuja: Federal Ministry of Health FMOH (2005). *Federal Republic of Nigeria National antimalarial treatment policy*. Abuja: Federal Ministry of Health

FMOH (2005). Training manual for management of malaria in Nigeria, participants' manual

FMOH (2008). National Malarial Control Programme, A Road Map for Malarial Control in Nigeria.

FMOH (2005). *National antimalarial treatment policy*. Federal Ministry of Health, Nigeria.

FMOH (2010). National Guidelines and Strategies for malaria prevention and control during pregnancy.

FMOH (2001). Strategic plan on rolling back malaria in Nigeria. 2001-2005. Abuja, Nigeria.

FMOH (2005). Training Manual on Malaria Control for Primary Health Care Workers in Nigeria. Abuja, Nigeria.

FMOH (2005). National antimalarial treatment policy in Nigeria. Abuja, Nigeria.

Hamer, D.H, Ndhlovu, M, Zurovac, D, Fox, M, Yeboah-Antwi, K, Chanda, P, Sipilinyambe, N, Simon J.L, and Snow R.W, (2007): Improved diagnostic testing and malaria treatment practices in Uganda. JAMA 297:2227–2231. http://www.muucsf.org/publications/Training_materials.asp.

MOH, (2009). Training Manual for the Management of Malaria at Health Facilities in Ghana. *Facilitators Guide.* http//:www.enotes.com/public-encyclopedia/public-health, Encyclopedia of public health, cited 20th January, 2009.

http//:www.malariasite.com. Kakkilaya, 2006. Combinations of antimalarial drugs. Cited 17th April, 2009.

http//:www.malariasite.com. Kakkilaya, 2006. History of malaria treatment. Cited on 5th December, 2008.

http//:www.malariasite.com. Kakkilaya, 2006. Antimalarial drugs. Cited on 5th December, 2008.

http//:www.rollbackmalaria.org.rm Africa Malaria Report, 2003. Cited on 12th July, 2008 http//:www.rollbackmalaria.org.Global Strategic Plan Roll Back Malaria 2005-2015. Cited on 12th July, 2008.

Fischer, P.R. (1997): Congenital Malaria: an African survey. *Clinical Pediatric (Phila).* 36:411-3.

Gilllotin C. (1999): Lack of pharmacokinetic interaction between atovaquone and proguanil. *European Journal of Clinical Pharmacology*, 55 (4): 311-315.

Global Fund, Society for Family Health (2011). *Training Manuals for health care providers on malaria prevention and control*

Greenwood, B.M; Brandley, A.K; Greenwood, A.M; Byass, P; Marsh, K; Kulloch, S,

Guyatt, H.L. and Snow, R.W. (2001): Malaria in pregnancy as an indirect cause of infant morality in Sub – Saharan African. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 95:569-576.

Hien, T.T. (1994): An overview of the clinical use of Artemisinin and Ist derivatives in the treatment of falciparum malaria in Viet Nam. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 88(Suppl.1):S7-S8.

Huang, Q. (1988): Effectiveness of amodiaquine, Sulphadoxine-pyrimethamine, and combinations of these drugs for treating chloroquine-resistant falciparum malaria in Hainan Island, China. *Bulletin of the World Health Organisation*. 66:353-358.

Isah, A.O; Laing, R; Quick, J; Mabadeje, A.F.B; Santoso, B; Hogerzeil, H. and Ross-Degnan, D. (2003): The development of reference values for the WHO health facility core prescribing indicators. West African Journal of pharmacology and Drug Research 18(1-2):6-11.

Jones, C.O.H. and Williams, H.A. (2004): The social burden of malaria: what are we measuring? American. Journal Tropical Medical Hygiene, 71(2 suppl), pp. 156-161.

Juma and Zurovac, (2008): Changes in health workers' malaria diagnosis and treatment practices in Kenya. *Malaria Public Health and Epidemiology Group, KEMRI/Welcome Trust Research Programme*, Nairobi, Kenya.

Kirkpatrick, Donald L. (1998). Evaluating Training Programs: The Four Levels. Berrett-Koehler Publishers.

Kirkpatrick, Donald L. (1998). Another Look at Evaluating Training Programs. American Society for Training & Development.

Kuile F, Terlouv D.J and Phillips-Howard P.A, (1998): Reducing the effects of intermittent SP treatment in pregnancy on parasite clearance and risk of low birth weight in rural Malawi. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 21(2-4):8-10.

Kuileler, F.O. (1995): Mefloquine treatment of acute falciparum malaria: a prospective study of non –serious disease adverse effects in 3673 patients. *Bulletin of the World Health Organisation, 73(5):631-642.*

Kumar, U, Aggarwal, A.K, and Kumar, R. (2009): The effect of interrupted 5-day training on IMNCI on the knowledge and skills of primary health care workers. *School of*

Public Health, Postgraduate Institute of Medical Education and Research, Chandigarh, India. 2009 Mar; 24(2):94-100. Epub 2009 Jan 30.

Le Hesran, J.Y. (2000): The particularities of malaria in the child. *Annals of Tropical Medicine and Parasitology*. 60:92-98.

Mbonye NK, Bygbjerg IC, Magnussen P (2008): *Bulletin of the World Health Organisation*, Volume 86, Number 2, Pp81-160.

Merentikwu M, Alaribe A, Ejemot R, Ekenloku A, Nwachikwu C, Ordu D Ezedinachi E, (2006). Artemeter+Lumefantrine versus Artesunate+Amodiaquine for treating uncomplicated childhood malaria in Nigeria; a randomised controlled trial Malaria journal (5): 43.

Marjolein B, Barend M and Gert V, (2007): Human resource management interventions to improve health workers' perfonnance in low and middle income countries: a Realist Review. *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 12(4):101-103.

Mutabingwa, T.K; Anthony, D; Heller, A; Hallett, R; Ahmed, J. and Drakeley C. (2005). Amodiaquine alone, amodiaquine + Sulphadoxine-Pyrimethamine, amodiaquine + Artesunate, and Artemether-Lumefantrine for outpatient treatment of malaria in Tanzanian children: a four-arm randomized effectiveness trial. Lancet; 365:147-1 – 80.

Oldfield, F.S. and Hayes, R. (1987): Mortality and morbidity from malaria among children in a rural area of the Gambia, West Africa. *Transactions of the Royal Society of Tropical Medicine and Hygiene*.; 81:478 - 486. Doi: 10:1016/0035-9203(87)90170-2.

Onyagba, A.I; Ene, C.C. and Mabadeje A.F.B. (2005). Prescribing pattern of Anti-malarias in the public and private health facilities in Lagos state. *Malaria in African Science Journal (abst)*. 2:17.

Oshiname, F.O., Brieger W., (1990). Primary care training for patent medicine vendors in rural Nigeria. *Social Science and Medical Journal*. 35.12:1477-1484.

Oyedeji, (2011): Awareness, knowledge and perceptions of health workers about the use of the new antimalarial treatment policy in Ibadan metropolis.

Steven Geigle, M.A. (2009): Occupation Safety and Health Training. Developing learning activities, module 4.

Ukwe C.VM and Ekwunife, O.I. (2008). Drug utilization study of antimalarial for the treatment of hospitalized children under five in south eastern Nigeria. *Biomedical Journal Pediatrics* 25:8.

Uzochukwu BSC, Onwujekwe OE, Akpala CO (2002): Effect of the Bamako-Initiative drug revolving fund on availability and rational use of essential drugs in primary health care facilities in Southeast Nigeria. *Health Policy and Planning*, 17(4):378-383.

Wasunna. B, Zurovac, D, Goodman, A and Snow, R. (2008): Why don't health workers prescribe ACT? A qualitative study of factors affecting the prescription of Artemether-lumefantrine. *Malaria Journal BioMed Central Ltd*.

World Health Organization (2001): *WHO guidelines for treatment of malaria*. World Health Organization, Geneva.

White NJ, Olliaro PL (1996): *Strategies for prevention of antimalarial drug resistance: rationale for combination therapy for malaria*. Parasitology Today, 12:399-401.

WHO (2003): *Access to antimalarial medicines: Improving the affordability and financing of artemisinin-based combination therapies*. Geneva: World Health Organization; 2003:1-32.

World Health Organization (1998). *Malaria*. Fact Sheet No. 94. Geneva: WHO, 1998:1-6.

World Health Organization (1993). A Global Strategy for Malaria Control. Geneva: WHO, 1993.

WHO. (2008c). Global Control and Elimination: Report of a meeting on containment of Artemisinin tolerance.

WHO/RBM. (2006a). 2001-20010 United Nations decades to roll back malaria: http//www.rbm.who.int.

WHO. (2006b). Children and Malaria: http//www.rbm.who.int. Cited on 12th July, 2008.

WHO, (2006c) Facts on ACT (Artemisinin based Combination Therapies).:http//www.rbm.who.int. Cited on 12th July, 2008.

WHO, (2006d). Facts on ACT (Economic Costs of malaria): http//www.rbm.who.int. Cited on 12th July, 2008.

WHO, (2004): Improving antimicrobial use among health workers in first-level facilities: results from the Multi-Country Evaluation of the Integrated Management of Childhood Illness strategy WHO vol.82 no.7 Geneva July 2004.

WHO/CDS/RBM, (2003). The Abuja Declaration and Plan of Action,

www.rbm.who.intjadeclaration.pdf.

WHO, (2001a). Procurement of Artemeter-Lumefantrine (Coartem) through WHO website: http//www.who.int/malaria.

WHO/CDS/RBM, (2001b). Assessment and monitoring of antimalarial drug efficacy for the treatment of uncomplicated falciparum. Geneva, WHO.

WHO, (2000a). The African Summit on Roll Back Malaria, Abuja, 25 April 200. Geneva.

WHO, (2000b). Managing complication in pregnancy and childbirth. A guide for midwives and doctors. Geneva. WHO.

WHO, (1993). Implementation of global malaria control strategy. Report of WHO study group on the implementation of global plan of action for malaria control. 1993-2002. WHO Technical Report series number 839.

Zurovac D, Rowe AK, Ochola SA, Noor AM, Midia B, English M, Snow RW (2014): *Predictors of the quality health worker treatment practices for uncomplicated malaria at government health facilities in Kenya. 19(8). 258-261.*

Appendix 1

CONSENT FORM FOR SURVEY RESPONDENTS

Name of Principal Investigator: Nwabueze T. ThankGod

Name of Organization: University of Ibadan

Name of Sponsor: Self

Title of Project: Outcome of Training on Health Workers' Knowledge and Perceptions of Current anti-Malarial Treatment Policy and Prescription Pattern in Ibadan Metropolis in Ibadan Metropolis, Oyo state, Nigeria.

Greetings: My name is.....I am a student from Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan. I am part of a team doing a research study to document the outcome of training on health workers' knowledge and perceptions of current anti-Malarial treatment policy and prescription pattern. Your honest answer to these questions will be useful in future for designing malaria programmes.

Purpose of the research:

We are planning to carry out a study to document the outcome of training on health workers' knowledge and perceptions of current anti-Malarial treatment policy and prescription pattern in Ibadan Metropolis. We would therefore like to find out if you have heard about the current antimalarial treatment policy, what you know about, and your experience in prescribing antimalarial medicines to your clients. Your honest answer to these questions will be useful in future for designing malaria programmes.

Procedures:

To find answers to some of these questions, we invite you to take part in this research project and participate in an interview. You have been randomly selected to participate, if you accept, you will be asked to answer some questions about several aspects of your life. A lot of the questions will relate to your experience on knowledge, perception and pattern of prescription of antimalarial medicines. For example, you will be asked whether you have heard about the current treatment policy, your knowledge about it and how you

prescribe antimalarial medicines to your clients. And if you do, what are your sources of information.

You will be required to provide responses to these questions on this form (questionnaire). Although it is important for the research that you answer all the questions, if you do not wish to answer any of the questions included in the survey, you may ask to move on to the next question. We assure you that we will not tell any other person whatever you disclose to us. Remember also that your name is not required in the interview. Participation in this study is voluntary and you are free to discontinue if you so desire. You are also free to ask questions about the study at any time.

The expected duration of the interview is about 25-30 minutes.

Risk and Discomfort:

There is no known risk (s) associated with your participation in this study. However, you may refuse to answer any of the questions or do not take part in a portion of the survey if you feel the question(s) makes you uncomfortable.

Benefits:

The information obtained from this study will enable the researchers develop an appropriate training intervention programme for health workers about use of antimalarial treatment policy in the management of uncomplicated malaria in Ibadan Metropolis.

Incentives: You will not be provided any incentive to take part in the research.

Confidentiality:

We have taken the following steps to ensure that you are safe and that the information you provide is confidential.

1. The interview will take place in a private place, where no one else hears what you discuss with the interviewer.
2. The information that we collect from this research project will be kept confidential.
3. Information collected from you will be stored in a file that will not have your name on it, but a number assigned to it instead.
4. You may talk to the leader of the research team in case you have any concern or questions.
5. The questionnaires will be destroyed after the research is completed.

Risk to refusing or withdrawing:

You do not have to take part in this research if you do not wish to do so, and refusing to participate will not affect you in any way. Even if do not wish to answer these questions, you are eligible to government's packages of intervention as they implement the recommendations from this research. You may stop participating in the interview at any time that you wish, and there will be no negative consequences for you in any way.

Who to contact: If you have any questions you may ask now or later. If you wish to ask questions later, you may contact any of the following:

(i) Nwabueze ThankGod . Asogwa,

Department of Health Promotion and Education, College of Medicine, University of Ibadan

Telephone: 0803-276-2165

Email: talk2_tg@yahoo.com

(ii) Dr F.O. Oshiname (Supervisor)

Department of Health Promotion and Education, College of Medicine, University of Ibadan

Email: Foshiname@yahoo.com Telephone: 0803-500-1060

Certificate of Consent for Qualitative Study

I have been invited to take part in the research on the outcome of training on health workers' knowledge and perceptions of current anti-malarial treatment policy and prescription pattern in Ibadan metropolis, Nigeria. I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and all the questions I asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study and understand that I have the right to withdraw from the interview at any time without in any way affecting my medical care.

Print Name of Subject
subject

.....

Date and Signature of

Print Name of Interviewer

.....

Date and Signature of Interviewer

Appendix II

OUTCOME OF TRAINING ON HEALTH WORKERS' KNOWLEDGE, PERCEPTIONS OF CURRENT TREATMENT POLICY AND PRESCRIPTION PATTERN OF ANTI-MALARIAL MEDICINES IN IBADAN METROPOLIS

QUESTIONNAIRE

Greetings, my name is ASOGWA, Nwabueze ThankGod, from the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan. This questionnaire is designed to obtain information relating to the current Antimalarial Treatment Policy in Nigeria. The information you give will be used purely for future training programme. Your answers to the questions will not be discussed with others (i.e. whatever you put down in the questionnaire will be kept secret). And part of the steps to ensuring confidentiality is that your name and that of your health facility will not be written on this form or anywhere else. This is to assure you that your responses will not used against your wish. Your personal views or opinion on a number of issues asked in this questionnaire will be greatly appreciated. I appeal to you to provide honest answers to all the questions in the questionnaire.

Thank you for your anticipated cooperation.

SECTION A: Socio-demographic Characteristics.

Please answer the following questions by filling in the blank spaces or by ticking (√) the appropriate options in the boxes provided.

Name of PHC---------- LGA ----------

1. Age (at last birthday)----------

2. Sex: 1. Male ☐ 2. Female ☐

3. Religion:
   1. Christianity ☐ 2. Islam ☐
   3. Traditional African religion others please specify ----------

4. State of origin----------

1. Tribe:
   1. Ibo ☐ 2. Hausa ☐
   3. Yoruba ☐ Others specify ----------

2. Marital status:
   1. Single/never married ☐ 2. Married ☐

3. Cohabiting ☐ 4. Separated ☐

5. Divorced ☐ 6. Widowed ☐

5. What is your professional designation?

1. Nurse/Midwife ☐ 2. CHO ☐

3. SCHEW ☐ 4. JCHEW ☐

5. Pharmacy Technician ☐

7. Others please specify .....

6. How long have you been in practice? (Specify in years or months as the case may be).....

7. Age as at last birthday .....

8. What is the level of this health facility where you are practicing?

1. Primary Health Care Center

2. Health Post ☐

3. Health Center ☐

4. Maternity Center ☐

5. Other specify .....

SECTION B: Awareness of the current Antimalarial Treatment Policy

(Please answer the following questions by ticking (√) the right option in the boxes provided).

9. Have you ever heard of the new Antimalarial Treatment Policy?

1. Yes ☐ 2. No ☐ *(If No go to Q.19)*

10. If yes, what is or are your sources of information about the policy? *(You may tick more than one that applies to you).*

1. Seminar/workshop ☐ 2. TV ☐ 3. Radio ☐

4. Circular from State Ministry of Health ☐ 5. Journals ☐

6. PHC Coordinator ☐ 7. Circular from LGA health department ☐

9. Magazines ☐ 10. Newspapers ☐ 11. Colleague/co-workers ☐

12. Others please specify .....

11. Have you ever seen a copy of the current National Antimalarial Treatment Policy?

Yes ☐ No ☐ *(If No go to Q. 18)*

12. Do you own a copy of the policy?

Yes ☐ No ☐

13. Do you have copies of the policy available here in the health care facility?

Yes ☐ No ☐

14. Has your health facility ever procured a copy of the policy?

Yes ☐ No ☐

15. Have you ever read the new National Antimalarial Treatment Policy?

Yes ☐ No ☐ *(If No go to Q. 16)*

16. If No to Q15, why have you not read it? ----------

17. Have you ever heard about Artemisinin Based Combination Therapy (ACT)?

Yes ☐ No ☐ *(If No go to Q. 18)*

18. If yes to Q17, what is or are your sources of information about ACT? (You may tick more than one) ☐

1. Seminar/workshop 2. Radio ☐ 3. TV ☐

4. Journals ☐ 5. Colleague/coworkers ☐

6. Newspapers ☐ 7. Circular ☐

8. Not applicable ☐ 9. others specify ----------

19. Have you ever attended any training programme on the use of Artemisinin based Combination Therapy (ACT)?

Yes ☐ No ☐ *(If No go to Q22.)*

20. If Yes, what did you learn about use of ACT medicine? ----------

21 Which institution/organization organized the training? ----------

22. If No Q19, will you like to attend one? Yes ☐ No ☐

23. For each of the following list of drugs, indicate by ticking (√) whether you have ever heard about it; also indicate your main source of information for each of the medicine

Medicine	Ever heard Tick (√)		Main source of information (i.e. only one)
	Yes	No	
a) Artemether-Lumefantrine (Coartem®, Lonart®)			
b) Amodiaquine-Artesunate (Larimal®, Dart®)			
c) Artesuante-mefloquine (Artequin®)			
d) Dihydroartemisinin + piperaquine + Trimethoprim (Artecom®, Duocotecxin®)			

SECTION C: Knowledge of National Anti-malarial Treatment Policy (Kindly tick (√)) the appropriate options (s) that best express your option.

24. What is the main feature (*Symptom*) of uncomplicated malaria? (*Tick only one from the following*)

1. Anemia ☐
2. Hypoglycemia ☐
3. Fever ☐
4. Breathing difficulties ☐

25. The table below contains malaria control or management interventions. Indicate whether each statement in the table regarding malaria control/management is **true** or **false** based on the new malaria treatment policy.

Intervention	Tick (√)		
(a) Prompt diagnosis and treatment	True of the policy	Not true of the policy (i.e. False)	I don't know
(b) Appropriate and effective case management			
(c) Use of the Insecticide Treated Nets (ITNs)/Insecticide Treated Materials (ITMs)			
(d) Two doses of Intermittent Preventive Treatment (IPT) with Sulphadoxine-pyrimethamine (SP) during the 2nd and 3rd trimesters of pregnancy			

26. What is the current first line medicine (i.e. *medicine of choice*) for the management of uncomplicated malaria in Nigeria today? _____

27. List Four (4) drugs that are used for the management of uncomplicated malaria (i.e. malaria that has no life threatening conditions) in Nigeria. Please use the in the spaces provided be low.

1. _____
2. _____
3. _____
4. _____
5. _____

28. What is the alternative (*second choice*) drug of choice for the management of uncomplicated malaria in Nigeria today? _____

29. According to the new treatment policy, the purpose of treatment in malaria is to encourage rational drug use to prevent or delay the development of antimalarial medicine resistance
1. True ☐ 2. False ☐

30. According to the new treatment policy, the following group of people are more vulnerable to malaria in Nigeria: Tick (√) True or False in the appropriate box provided

Group	True	False
1. Pregnant women		
2. Children under-five years of age		
3. Persons living with HIV/AIDS		
4. Persons with sickle cell anaemia		
5. Persons with leprosy		
6. Non-immune visitors		

31. The following statements are specific actions with proven potential to reduce illnesses and deaths due to malaria according to the current treatment policy: Tick (√) True or False

1. Use of Insecticide Treated Nets (ITN) ☐
2. Environmental management ☐
3. IPT in pregnancy ☐
4. Use of personal protection and knock-down insecticides/ repellants ☐

32. The current treatment policy aims to achieve all of the following except: Tick (√) True or False in the appropriate box provided

Policy aim	True	False
1. Reduce malaria morbidity and mortality		
2. Halt the progression of uncomplicated disease into severe disease		
3. Reduce the impact of placental malaria infection		

and maternal malaria-associated anaemia			
4. IPT for pregnant women			
5. Minimize the development of antimalarial drug resistance.			
6. All of the above			

Questions 35 to 58 relate to malaria treatment. For each question item, indicate by ticking (√) whether it is **True, False** or **don't know** based on the new Anti-malarial Treatment Policy.

Statement	True	False	Don't know
33. Chloroquine is still the first line medicine for the treatment of uncomplicated malaria			
34. Microscopy remains the gold standard (*best one*) even after the introduction of RDT			
35. The new treatment policy allows syndromic (i.e. *history taking, clinical and bedside examinations*) diagnosis of malaria in children under five years.			
36. The use of single medicine (e.g. Amodiaquine) in the management of malaria is no longer recommended			
37. Sulphadoxine-pyrimethamine (SP) is recommended for all pregnant women as Intermittent Preventive Treatment (IPT) of malaria			
38. The new treatment policy recommends parasitological confirmation (i.e. microscopy and rapid diagnostic test) for children above 5 years and adults			
39. Sulphadoxine-pyrimethamine (SP) must not be used by a pregnant woman in the first trimester of pregnancy.			
40. Pregnant women should receive at least two doses of IPT with SP during the 2nd and 3rd trimesters			
41. Quinine is considered safe in pregnancy and can be used in all Trimesters			
42. Sulphadoxine-pyrimethamine (SP) is recommended for the treatment of malaria			
43. Mothers should be taught to recognize signs of severe malaria for which they must immediately bring a child to the nearest health facility.			
44. Artemisinin based combination therapy (ACT) is to be taken every day for 3 days.			
45. The most effective chemoprophylaxis recommended for sickle cell anemia is proguanil (Paludrine).			

46. Artemisinin based combinations are considered safe in the 2nd and 3rd trimesters of pregnancy.			
47. Patients with malaria should have access to appropriate and adequate treatment within 24 hours of the onset of symptoms			
48. The development of resistance is the ability of a malaria parasite strain (*Plasmodium Falciparum*) to multiply or to survive in the presence of the minimum concentrations of a drug.			
49. Essential antimalarial drugs are those drugs that meet the needs of appropriate antimalarial treatment in the greater percentage of the people.			
50. Severe malarial is a medical emergency and requires parenteral (*injected or implanted*) treatment			
51. Malaria diagnosis is based on symptoms using the Integrated Management of Childhood Illnesses (IMCI) classification.			
52. Rational use of antimalarial drugs refers to adequate use of antimalarials for the right indications and at the correct dosage			
53. Malaria prophylaxis is generally not necessary in persons living in malaria endemic area since it may lower ones resistance to the disease			
54. The health worker should give rectal artesunate or artemisinin (suppository) as pre-referral treatment and promptly refer patients with severe malaria to hospital			
55. Malaria diagnosis is based on symptoms using the IMCI classification.			
56. IMCI classifications are graded into levels of seriousness and are colour-coded.			
57. A full dose of antimalarial should be repeated if a patient vomits within 30 minutes of administration.			
58. If vomiting persists, malaria should be treated as severe and referral should be made immediately.			

59. The table below shows the IMCI classifications which are graded into levels of seriousness and are colour-coded. Tick (√) where appropriate in the boxes provided.

Colour	Classification		
	Requires urgent treatment & referral	Less serious	Requires supportive treatment at home
Yellow			
Red			
Green			

60. For each of the general danger signs listed in the table below, tick (√) whether it is used in the diagnosis of malaria in children under-5 years or not, if in doubt tick not sure.

General danger sign	Tick (√) whether it is used in the diagnosis of malaria in children under-5 years or not		
	Yes	No	Not sure
(a) A child unable to drink or breastfeed			
(b) A child vomits everything taken			
(c) A child convulses			
(d) A child is unconscious			

61. For each of the drugs listed in the table below, tick (√) whether it is Artemisinin based medicine or not, if in doubt tick not sure.

Drug	Tick (√) whether the drugs are Artemisinin Based Combinations Therapy or not		
	Yes	No	Not sure
(a) Amodiaquine-Artesunate (Larimal, Dart)			
(b) Artesunate-mefloquine (Artequin)			
(c) Artesunate-Chloroquine			
(d) Sulphadoxine-pyrimethamine-Chloroquine			

62. Which of the followings are possible signs/symptoms of severe malaria according to the new Anti-malarial treatment Policy? (You may tick more than one which applies to you).

Clinical event	Possible signs/symptoms of malaria	
	Yes	No
(a) Anemia		
(b) Hypoglycemia		
(c) Fever		
(d) Breathing difficulties		
(e) Renal failure		
(f) Headache		
(g) Coma		
(h) Loss of appetite		

63. For each of the medicines in the table below, tick (√) whether it is recommended for the management of severe malaria ornot; if in doubt tick not sure.

Medicine	Is it recommended for the management of severe malaria (tick (√))		
	Yes	No	Not sure
(a) Quinine Injection			
(b) Artemether Injection			
(c) Artesunate Injection			
(d) Artesunate Suppository			
(e) Chloroquine Tablets			
(f) Chloroquine Injection			

64. For each of the medicines listed below, tick (√) whether it is a recommended ACT which people can buy and use for the treatment of malaria at home or not. If in doubt tick (√) not sure

Medicine	Yes	No	Not sure
(a) Artemether-Lumefantrine (Coartem®, Lonart®)			
(b) Artesunate-Amodiaquine (Larimal®, Dart®)			
(c) Chloroquine			
(d) Sulphadoxine-Pyrimethamine			

SECTION D: Perception of health workers towards the use of Artemisinin based Combination Therapy (ACT). Kindly respond to each of the following statements in the table below by ticking (√) the appropriate option (s) that best expresses your feelings.

Statement	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
65. ACT medicines should not be prescribed because they are not in our health facility.					
66. ACTs do not have the ability to delay development of drug resistance by *plasmodium falciparum*					
67. ACT medicines do not prevent progression from uncomplicated malaria to severe malaria					
68. ACTs are more effective than any					

other Anti-malarial drugs					
69. ACT medicines have less side effects compared to Chloroquine					
70. ACTs should only be prescribed after trying chloroquine					
71. ACT is usually not prescribed because patients cannot afford it.					
72. ACTs are not meant for the poor because they are too expensive.					
73. Chloroquine is still more effective as a drug of choice against uncomplicated malaria.					
74. Health workers should only prescribe ACT to patients who demand for it.					
75. Not much is known about the side effects of ACT for pregnant women					
76. ACTs are available everywhere					
77. ACT is cheap and affordable to all patients					
78. Use of ACT is an unnecessary imposition by government					

SECTION E: PRECSRIPTION PATTERN OF HEALTH CARE WORKERS FOR UNCOMPLICATED MALARIA.

Please answer the following questions by filling in the blank spaces or by ticking (√) the right options as the case may be.

79. Have you ever prescribed any of the Artemisinin Based Combination Therapy to your patients?

Yes ☐ No ☐ *(If No go to Q.86)*

80. If Yes (as in Q79 above), which of the Artemisinin based Combination Therapy do you prescribe and at what dosage?

Age	Weight	ACT Medicine/Dosage			
		Artemether/ Lumefantrine (Coartem, Lonart)	Artesunate/ Amodiaquine (Larimal, Dart)	Artesunate/Mefloquine (Artequin)	Artesunate/F ansidar
6month-1yrs	5 – 14kg				
1-8yrs	15-24kg				
9-14yrs	25-34kg				
>14	>35kg				

81. When last did you prescribe Artemisinin based Combination Therapy to a patient with malaria that you managed? ----------

(If you did not prescribe any go to Q. 86)

82. State reason (s) you prescribed Artemisinin based Combination Therapy to a patient with malaria that you managed the last time----------

83. How often do you prescribe Artemisinin based Combination Therapy to your patients?

Always ☐ Occasionally ☐

Rarely ☐ Never ☐

84. Give one important reason for your answer to the question above (Q83) ----------

85. For how long have you been prescribing ACT for your patients? ----------

86. Please rank the following Anti-malarials (1 - 5) based on your preference for prescribing them (1 being the most preferred whenever you see a case of malaria, then 2 being the next preferred up till 5 being the least preferred).

Anti-malarials	Ranking				
	1	2	3	4	5
Chloroquine					
Sulphadoxine-Pyrimethamine (Fansidar®)					
Artemether/Lumefantrine (Coartem,® Lonart®)					
Quinine					
Halofantrine (Halfan®, Haltrine®)					
Artesunate/Amodiaquine					

87. Has your facility ever stocked ACT?

Yes ☐ No ☐

88. Do you have ACT in your store in this facility as of now?

Yes ☐ No ☐

89. If yes, list the type (s) available?

(a) ---------- (b) ----------

(c) ---------- (d) ----------

90. What do you do when you have a patient with malaria but your health facility does not have ACT medicine? ----------

Knowledge Score/knowledge marking Scheme

Question No.	Knowledge Variable	Correct Response	Score in Point
24	The main feature of uncomplicated malaria	Fever	1
25	Whether the statement is true or false based on the new malaria treatment policy	All responses are true (a) Prompt diagnosis and treatment (b) Appropriate and effective case management (c) Use of Insecticide Treated Nets (ITNs)/Insecticide Treated Materials (ITMs) (d) Two doses of Intermittent Preventive Treatment (IPT) with Sulphadoxine-Pyrimethamine (SP) during the 2nd and 3rd trimesters of pregnancy	5
26	The current first line medicine (*medicine of choice*) for the management of uncomplicated malaria in Nigeria today	Artemether-Lumefantrine (Coartem®, Lonart®)	1
27	Four medicines used for the management of uncomplicated malaria in Nigeria	1. Artemether-Lumefantrine (Coartem®, Lonart®) 2. Amodiaquine-Artesunate (Larimal, Dart) 3. Artesunate-Mefloquine (Artequin) 4. Dihydroartemisinin + piperaquine + Trimethoprim (Artecom,	6

		Duocotecxin)	
28	The alternate (*second choice*) medicine for the management of uncomplicated malaria in Nigeria	Amodiaquine-Artesunate (Larimal, Dart)	1
29	The purpose of treatment in malaria is to encourage rational drug use to prevent or delay the development of antimalarial medicine resistance according to the new treatment policy.	True	1
30	The following group of people are more vulnerable to malaria in Nigeria according to the new treatment policy	**True:** ✓ Pregnant women ✓ Children under-five years of age ✓ Persons living with HIV/AIDS ✓ Persons with sickle cell anaemia **False:** ✓ Persons with leprosy	5
31	Specific actions with proven potential to reduce illnesses and deaths due to malaria according to the current treatment policy	**True:** ✓ Use of Insecticide Treated Nets (ITN) ✓ Environmental management ✓ IPT in pregnancy ✓ Use of personal protection and knock-down insecticides repellants	5
32	The current treatment policy aims to achieve all of the following	**True:** All responses are true ✓ Reduce malaria morbidity and mortality	5

		✓ Halt the progression of uncomplicated disease into severe disease ✓ Reduce the impact of placental malaria infection and maternal malaria-associated anaemia ✓ IPT for pregnant women ✓ Minimize the development of antimalarial drug resistance. ✓ All of the above	
33	Chloroquine is still the first line drug for the treatment of uncomplicated malaria	False	1
34	Microscopy remains the gold standard (*best one*) even after the introduction of RDT	True	1
35	The new treatment policy allows syndromic (i.e. *history taking, clinical and bedside examinations*) diagnosis of malaria in children under five years.	True	1
36	The use of single medicine (e.g. Amodiaquine) in the management of malaria is no longer recommended	True	1
37	Sulphadoxine-Pyrimethamine (SP) is recommended for all pregnant women as Intermittent Preventive Treatment (IPT) of malaria	True	1
38	The new treatment policy	True	1

	recommends parasitological confirmation (i.e. microscopy or rapid diagnostic test) for children above 5 years and adults		
39	Sulphadoxine-Pyrimethamine (SP) must not be used by a pregnant woman in the first trimester of pregnancy	True	1
40	Pregnant should receive at least two doses of IPT with SP during the 2nd and 3rd trimesters	True	1
41	Quinine is considered safe in pregnancy and can be used in all trimesters	True	1
42	Sulphadoxine-Pyrimethamine (SP) is recommended for the treatment of malaria	False	1
43	Mothers should be taught to recognize signs of severe malaria for which they must immediately bring a child to the nearest health facility	True	1
44	Artemisinin Based Combination therapy (ACT) are to be taken every day for 3 days	True	1
45	The most effective chemoprophylaxis recommended for sickle cell anemia is proguanil (Paludrine)	True	1

46	Artemisinin based combination therapy are considered safe in the 2nd and 3rd trimesters of pregnancy	True	2
47	Medicines listed in the table which are Artemisinin Based medicine are	Yes 1. Amodiaquine-Artesunate (Larimal, Dart) 2 Artesunate-Mefloquine (Artequin) No 3. Artesunate-Chloroquine 4.Sulphadoxine-pyrimethamine-Chloroquine	5
48	Possible signs/symptoms of severe malaria according to the new Anti-malarial treatment policy	Yes Anemia, Hypoglycemia, Breathing difficulties, Renal failure, Coma. No Fever, Headache. Loss of appetite	6
49	Medicines in the table recommended for the management of severe malaria	Yes Quinine Injection, Artemether Injection, Artesunate Injection, Artesunate Suppository No Chloroquine tablets, Chloroquine Injection	5
50	Medicines listed in the table which people can buy and use for the treatment of malaria at home are	Yes Artemether-Lumefantrine (Coartem, Lonart) Artesunate-Amodiaquine (Larimal, Dart) No Chloroquine, Sulphadoxine-Pyrimethamine (SP)	5
Total			66

Appendix IV

TRAINING CURRICULUM FOR FRONTLINE HEALTH WORKERS IN IBADAN METROPOLIS ON THE CURRENT ANTI-MALARIA TREATMENT POLICY.

Objective	Content	Method	Training Aids	Evaluation
1) To upgrade participants knowledge relating to malaria	(a) What is malaria? Definition, types and causes, Mode of transmission; Burden of malaria, Symptoms/recognition (simple & severe malaria), complications, Vulnerable groups, Myths and misconceptions	Discussions Brief lecture Brainstorming Question & answers Group work	Copy of NATP, training handouts, leaflets	Assignment, recapitulatory questions/evaluation and final post test
	(b) Malaria Prevention: Prevention strategies: • Use of personal protection • environmental management	Brief lecture Brainstorming Question & answers	Training handouts, leaflets.	Recapitulatory questions/evaluation
	(c) Management interventions: Prompt diagnosis: • Types of diagnosis, • Advantages & disadvantages, • Test description • Goal and objectives of treatment • Appropriate & effective case management RDT & microscopy	Brief lecture Brainstorming Question & Answers Group work Demonstration & return demonstration, use of energizers (songs).	Training handouts, RDT kits	Recapitulatory questions/evaluation
2) Improve		Brief lecture		Recapitulatory

participants' knowledge of the new anti-malaria treatment policy	*Anti-malarial Treatment Policy:* • Definition • Summary of the policy contents • Policy aim, goal & objectives	- Group discussion - Demonstration/return demonstration Use of energizers.	Copy of NATP. Training handouts	questions/evaluation
3) To upgrade participants' skills relating to prescription of antimalarial medicines for various groups	*Appropriate prescription of ACTs:* • Prescription of ACTs, • Rationale and use of ACTs (1st line & alternative medicines) • Types & tips on the use of ACTs • Prevention of drug resistance • Medical counseling.	- Discussion - Question & answer - Brainstorming - Group work - Role plays	Training handouts	Recapitulatory questions/evaluation Final post-test

Glossary

Antimalarial Treatment Policy (ATP): a set of recommendations and regulations concerning the availability and rational use of antimalarial drugs in a country. It should be part of the national essential drug policy and the national malaria control policy and in line with the overall national health policy.

Drug Resistance: Drug resistance could be defined as the 'ability of a parasite to multiply or to survive in the presence of concentrations of a drug that would normally destroy the parasites of the same species or prevent their multiplication' (Kakillaya, 2006).

Artemisinin-Based Combination Therapy (ACT): A combination of artemisinin or one of its derivatives with an antimalarial or antimalarials of a different class.

Cerebral malaria: Severe *P. falciparum* malaria with cerebral manifestations, usually including coma (Glasgow coma scale < 11, Blantyre coma scale < 3). Malaria with coma persisting for > 30 min after a seizure is considered to be cerebral malaria.

Drug resistance:

The World Health Organization (WHO) defines resistance to antimalarials as the ability of a parasite strain to survive and/or to multiply despite the administration and absorption of a medicine given in doses equal to or higher than those usually recommended but within the tolerance of the subject, provided drug exposure at the site of action is adequate. Resistance to antimalarials arises because of the selection of parasites with genetic mutations or gene omplifications that confer reduced susceptibility.

Monotherapy: Antimalarial treatment with a single medicine (either a single active compound or a synergistic combination of two compounds with related mechanism of action).

Plasmodium: A genus of protozoan vertebrate blood parasites that includes the causal agents of malaria. *Plasmodium falciparum, P. malariae, P. ovale* and *P. vivax* cause malaria in humans. Human infections with the monkey malaria parasite, *P. knowlesi* have also been reported from forested regions of South-East Asia.

Rapid diagnostic test (RDT): An antigen-based stick, cassette or card test for malaria in which a coloured line indicates that plasmodial antigens have been detected.

Uncomplicated malaria is defined as symptomatic malaria without signs of severity or evidence (clinical or laboratory) of vital organ dysfunction. The signs and symptoms of uncomplicated malaria are nonspecific. Malaria is, therefore, suspected clinically mostly on the basis of fever or a history of fever.

Severe Malaria: Acute malaria with signs of severity and /or evidence of vital organ dysfunction.

Severe Anaemia: Haemoglobin concentration of <5g/100ml (Haematocrit <15%).

Monotherapy: antimalarial treatment with a single medicine (either a single active compound or a synergistic combination of two compounds with related mechanism of action)

Combination Therapy (CT): A combination of two or more different classes of antimalarial with unrelated mechanisms of action.

(Excerpt from the Nigeria current Anti-Malaria Treatment Policy).

1. The main feature of uncomplicated malaria according to the new Anti-malaria Treatment Policy (ATP) is fever.

2. All of the following statements are true based on the new ATP
   (a) Prompt diagnosis and treatment
   (b) Appropriate and effective case management
   (c) Use of Insecticide Treated Nets (ITNs)/Insecticide Treated Materials (ITMs)
   (d) Two doses of Intermittent Preventive Treatment (IPT) with Sulphadoxine-Pyrimethamine (SP) during the 2nd and 3rd trimesters of pregnancy

3. The current first line medicine (*medicine of choice*) for the management of uncomplicated malaria in Nigeria today is Artemether-Lumefantrine (Coartem®, Lonart®).
4. Four medicines used for the management of uncomplicated malaria in Nigeria include the following:
   (a) Artemether-Lumefantrine (Coartem®, Lonart®)
   (b) Amodiaquine-Artesunate (Larimal, Dart)
   (c) Artesunate-Mefloquine (Artequin)
   (d) Dihydroartemisinin + piperaquine + Trimethoprim (Artecom, Duocotecxin)

5. The alternate (*second choice*) medicine for the management of uncomplicated malaria in Nigeria is Amodiaquine-Artesunate (Larimal, Dart)
6. According to the new treatment policy, the purpose of treatment in malaria is to encourage rational drug use to prevent or delay the development of antimalarial medicine resistance

7. The group of people *more vulnerable* to malaria in Nigeria according to the new treatment policy include the following:
   (a) Pregnant women
   (b) Children under-five years of age
   (c) Persons living with HIV/AIDS
   (d) Persons with sickle cell anaemia

8. The following are the specific actions with proven potential to reduce illnesses and deaths due to malaria according to the current treatment policy:
   (a) Use of Insecticide Treated Nets (ITN)

   (b) Environmental management

(c) IPT in pregnancy

(d) Use of personal protection and knock-down insecticides/ repellants

9. The current treatment policy aims to achieve all of the following:
   (a) Reduce malaria morbidity and mortality
   (b) Halt the progression of uncomplicated disease into severe disease
   (c) Reduce the impact of placental malaria infection and maternal malaria-associated anaemia
   (d) Use of IPT among pregnant women
   (e) Minimize the development of antimalarial drug resistance.

10. Chloroquine is no longer the first line drug for the treatment of uncomplicated malaria. The Federal Ministry of Heath has banned use of chloroquine in the treatment of all forms of malaria due to drug resistance.
11. Microscopy (*use of microscope for malaria diagnosis*) remains the gold standard (the *best*) even after the introduction of Rapid Diagnostic Test (RDT).
12. The new treatment policy allows syndromic (i.e. *history taking, clinical and bedside examinations*) diagnosis of malaria in children under five years.
13. The use of single medicine (e.g. Amodiaquine) in the management of malaria is no longer recommended.
14. Sulphadoxine-Pyrimethamine (SP) is recommended for all pregnant women as Intermittent Preventive (*prophylaxis*) Treatment (IPT) of malaria.
15. The new treatment policy recommends parasitological confirmation (i.e. microscopy or rapid diagnostic test) for children above 5 years and adults.
16. Sulphadoxine-Pyrimethamine (SP) must not be used by a pregnant woman in the first trimester of pregnancy.
17. Pregnant should receive at least two doses of IPT with SP during the 2nd and 3rd trimesters.
18. Quinine is considered safe in pregnancy and can be used in all trimesters.
19. Sulphadoxine-Pyrimethamine (SP) is no longer recommended for the treatment of malaria in Nigeria.
20. According to the current treatment policy, mothers should be taught to recognize signs of severe malaria for which they must immediately bring a child to the nearest health facility.

21. It is recommended that Artemisinin Based Combination therapy (ACT) is to be taken every day for 3 days for malaria treatment

22. According to the current treatment policy. The most effective chemoprophylaxis recommended for sickle cell anemia is proguanil (Paludrine)

23. Artemisinin based combination therapy is considered safe in the 2nd and 3rd trimesters of pregnancy according to the current treatment policy.

24. The table below shows examples of Artemisinin Based medicines and non-Artemisinin Based medicines according to the current treatment policy:

Examples of Artemisinin Based medicines	*Not Artemisinin Based medicines*
Amodiaquine-Artesunate (Larimal Dan)	Artesunate-Chloroquine
Artesunate-Mefloquine (Artequin)	Sulphadoxine-pyrimethamine-Chloroquine

25. The table below shows possible signs and symptoms of severe and acute (non-severe) malaria according to the current treatment policy:

Signs and symptoms of severe malaria	*Signs and symptoms of acute malaria*
Anemia, Hypoglycemia, Breathing difficulties, Renal failure, Coma	Fever, Headache, Loss of appetite

26. According to the current malaria treatment policy, the table shows medicines both recommended and not recommended for malaria management:

Medicines recommended for management of severe malaria	*Medicines not recommended for management of severe malaria*
Quinine Injection, Artemether Injection, Artesunate Injection, Artesunate Suppository	Chloroquine tablets, Chloroquine Injection

27. According to the current treatment policy, the following are the medicines which people can buy and use for treatment of malaria at home and the ones

Can be used for treatment of malaria at home	*Cannot be used for treatment of malaria at home*
Artemether-Lumefantrine (Coartem, Lonart) Artesunate-Amodiaquine (Lasimal, Dart), etc.	Chloroquine, Sulphadoxine-Pyrimethamine (SP).

National Guidelines for Diagnosis and Treatment of Malaria in Nigeria

The following are excerpts from the National Guidelines for Diagnosis and Treatment of Malaria in Nigeria.

Artemether-Lumefantrine

It is available as co-formulated. The children packs containing six and twelve tablets come in dispersible tablet form. Each tablet contains 20mg Artemether and 120mg Lumefantrine.

Dosage regimen

Weight	Number of tablets / dose
5 - <15kg	1 tab twice daily x 3days
15 - <25kg	2 tabs twice daily x 3days
25 - <35kg	3 tabs twice daily x 3days
>35kg	4 tabs twice daily x 3days

It is important to emphasize that the 6 doses must be taken by the patient. The first two doses should be taken 8 hours apart. Absorption of the medicine is enhanced by fatty meals.

Artesunate-Amodiaquine

It is available as co-formulated and co-packaged. The co-formulated medicines are however preferred.

Available Strengths of Artesunate and Amodiaquine combination

Medicines	Dosage form	Presentation	Strength
Artesunate - Amodiaquine	Tablet	Co-formulated	Artesunate 50mg and Amodiaquine 135mg
Artesunate + Amodiaquine	Tablet	Co-packaged	Artesunate 50mg and Amodiaquine 153.1mg

Dosage regimen for co-formulated Artesunate-Amodiaquine

Weight / Age	Table strength	Dosage regimen
4.5kg - <9kg 2months - 11 months	25mg/67.5mg	1 tablet once daily for three days
9kg - <18kg 1 year - 5 years	50mg/135mg	1 tablet once daily for three days
18kg - <36kg 6 years - 13 years	100mg/270mg	1 tablet once daily for three days
36kg and above 14 years and above	100mg/270mg	2 tablets once daily for three days

If the patient shows evidence of inadequate response (persistence of fever, parasitemia or deterioration in clinical condition), do the following:

- Evaluate the patient and review diagnosis
- Exclude sub optimal dosing or inadequate intake
- Investigate further

In the absence of clinical improvement and persistence of positive parasitemia despite adequate treatment, quinine should be used. (Please see below for the dosage regimen of quinine).

Immunotherapy with dihydroartemisinin or any other artemisinin derivatives and other antimalarial medicines are not recommended in the treatment of uncomplicated malaria. It should be noted that Sulphadoxine-Pyrimethamine is not a combination therapy and should not be used as such.

Practical Issues in the Management of Uncomplicated Malaria

- *Antipyretic measures*

  If temperature is > 38.5°C, give paracetamol 10 - 15 mg/kg in children or 500 - 1000 mg in adults every 6 – 8 hours or when necessary or advice to tepid sponge (wipe the body with towel soaked in lukewarm water) and avoid over clothing.

- *Persistent Vomiting*

  If a patient vomits the medicine within 30 minutes, repeat the dose. If this is vomited again and the vomiting becomes persistent, the patient should be considered as having severe malaria and managed accordingly.

- *Febrile Seizures*

  If a patient has a seizure and does not recover within 30 minutes from that seizure, it should be considered as severe malaria.

INSTITUTE FOR ADVANCED MEDICAL RESEARCH AND TRAINING (IAMRAT)
College of Medicine, University of Ibadan, Ibadan, Nigeria.

Director: **Prof. Catherine O. Falade**, MBBS (Ib), M.Sc. FMCP, FWACP
Tel: 0803 326 4593, 0802 360 9151
e-mail: cfalade@comui.edu.ng lillyfunke@yahoo.com

UI/UCH EC Registration Number: NHREC/05/01/2008a

NOTICE OF FULL APPROVAL AFTER FULL COMMITTEE REVIEW

Re: Outcome of Training on Health Workers' Knowledge and Perceptions about Current Treatment Policy and Prescription Pattern of Anti-malarial Medicines in three Local Government Areas in Ibadan Metropolis

UI/UCH Ethics Committee assigned number: UIEC/11/0264

Name of Principal Investigator: **Nwabueze T. Asogwa**

Address of Principal Investigator: Department of Health Promotion & Education,
College of Medicine,
University of Ibadan, Ibadan

Date of receipt of valid application: 27/10/2011

Date of meeting when final determination on ethical approval was made: N/A

This is to inform you that the research described in the submitted protocol, the consent forms, and other participant information materials have been reviewed and given *full approval by the UI/UCH Ethics Committee.*

This approval dates from 22/04/2016 to 21/04/2017. If there is delay in starting the research, please inform the UI/UCH Ethics Committee so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the UI/UCH EC assigned number and duration of UI/UCH EC approval of the study.* It is expected that you submit your annual report as well as an annual request for the project renewal to the UI/UCH EC early in order to obtain renewal of your approval to avoid disruption of your research.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the UI/UCH EC. No changes are permitted in the research without prior approval by the UI/UCH EC except in circumstances outlined in the Code. The UI/UCH EC reserves the right to conduct compliance visit to your research site without previous notification.

UI/UCH EC
22/4/16
APPROVED
COLLEGE OF MEDICINE, U.I.

Professor Catherine O. Falade
Director, IAMRAT
Chairperson, UI/UCH Ethics Committee
E-mail: uiuchec@gmail.com