Assessment Of Provider Training On The Use Of Amfm Acts In Private Drug Outlets In Kumasi Metropolis Of Ghana

Francis M. Djangmah, Reuben K. Esena

Abstract: Malaria cases in the community are treated mainly by accessing anti-malarial drugs from licensed chemical sellers (LCSs). With the introduction of the AMFm ACTs and training of Licensed Chemical Sellers (LCSs) on malaria case management, there is the need to assess their knowledge on malaria diagnosis and prescription of appropriate anti-malarial drugs. This was a cross-sectional descriptive study conducted in Kumasi Metropolis. A total of 125 trained and 68 untrained licensed chemical sellers were randomly sampled from each of the five Sub-Metros using structured questionnaire and stratified sampling. The SPSS programme version 16.0 was used for data entry. Chi Square test was run to determine the effect of the training; and the p-values used to compare trained and untrained respondents on selected variables. The results show that licensed chemical sellers in the study area diagnosed malaria presumptively, without confirming it with rapid diagnostic tests (RDTs). Those trained had better knowledge of diagnosing uncomplicated malaria; thus 106 (84.8%), trained as compared to untrained, 33 (48.5%), with $\chi 2=28.753$ and $p<0.0001$ were able to identify malaria. Similarly, all trained respondents correctly identified the clinical manifestations of complicated malaria; that is 63 (92.6%) of the untrained doing it correctly. On the average more than half of respondents prescribed ACTs for the treatment of uncomplicated malaria; some monotherapies, Sulfadoxine-Pyrimethamine (SP), are still being used to treat clinically suspected malaria. However none of them prescribed chloroquine for their clients/patients. The training has improved the knowledge of the beneficiary licensed chemical sellers, in the diagnosis and management of malaria. There is a steady increase in the use of ACTs, despite the fact that some monotherapies are still available on the Ghanaian pharmaceutical market. Awareness of the AMFm ACTs was high [176 (91.2%)] among the study population; television was the commonest source of information.

Index Terms: Trained licensed chemical sellers, AMFm ACTs, Kumasi metropolis, Malaria.

————————————————◆————————————————

1 INTRODUCTION

Malaria is a major threat to public health globally. WHO estimates indicate that malaria cases increased from 233 million in 2000 to 244 million in 2005. This figure however dropped to 225 million in 2009, while malaria deaths reduced from 985,000 in 2000 to 781,000 in 2009. However, this is unacceptably high (WHO, 2010). International disbursements for malaria control rose steeply during the past eight years and were estimated to be US$ 1.66 billion in 2011 and US$ 1.84 billion in 2012 (WHO, 2012). National government funding for malaria programmes worldwide has also increased in recent years, and stood at an estimated US$ 625 million in 2011. However, the currently available funding for malaria prevention and control is far below the resources required to reach global malaria targets. An estimated US$ 5.1 billion is needed every year between 2011 and 2020 to achieve universal access to malaria interventions. In 2011, only US$ 2.3 billion was available, less than half of what is needed.

Malaria is hyper-endemic throughout Ghana, and it constitutes an important cause of morbidity and mortality, mainly among vulnerable groups like children under five years old, pregnant women and the poor. It accounts for over 3 million outpatient attendances every year. In 2008, malaria was responsible for about a third of all outpatient morbidities, a third of all admissions and a third of all mortalities in children under five years. Malaria in pregnancy accounted for 14% of OPD attendances, 11% admissions and 6% of maternal mortality (NMCP Annual Report, 2008). In Ghana it is estimated that malaria is responsible for the loss of about 10.6% of Disability Adjusted Life Years (DALYs), which economically constitute about 6% of the annual gross domestic product (GDP) (MOH, 2009). The control of malaria is however faced with several challenges such as the growing threat of drug resistance to chloroquine which led to the adoption of artemisinin-based combination therapies (ACTs).

1. 1 Background

The development of drug resistance to monotherapies such as chloroquine has posed major challenges in the control of malaria globally. In Ghana, research has shown that treatment failures using chloroquine ranged from 6% to 25%; whilst parasite clearance rates were also low; in certain areas it is less than 50%. In the light of this, Ghana switched to the use of Artemisinin-based Combination Therapies (ACTs) for treatment of uncomplicated *Plasmodium falciparum* malaria, in 2005 as per WHO recommendations (MOH, 2009). Recent clinical trial conducted in children under five years in Ghana with confirmed uncomplicated malaria, showed that by the third day of treatment with Artesunate-Amodiaquine, 99.8% of them had their parasites cleared; with considerable increase in haemoglobin levels by the 28 days (Koram et. al., 2008). Despite their proven efficacy, ACTs are not widely used because they are more expensive than the less-effective anti-malarial drugs. To bridge this gap, the Affordable Medicine Facility-malaria (AMFm) has been introduced to give universal coverage to ACTs (The Global Fund, AMFm, 2010). The

————————————————————

- *Francis M. Djandmah is currently a medical officer at the Pentecost Hospital, Madina-Accra Ghana PH- +23324944397. E-mail: francismd25 @yahoo.com*
- *Reuben K. Esena [Corresponding Author] is currently a lecturer at the University of Ghana School of Public Health, Legon-Accra, Ghana. PH-+ 233277220276. E-mail: rkesena @hotmail.com*

AMFm is a malaria treatment financing mechanism hosted by the Global Fund to Fight AIDS, Tuberculosis and Malaria. It aims to increase universal accessibility and affordability to quality-assured artemisinin-based combination therapies for malaria in endemic countries through subsidies to public health facilities and private drug outlets. The subsidy is expected to translate into low price of ACTs for the final consumer at the end of the distribution chain. A survey conducted in 2008 on knowledge, attitude and practices (KAP) of licensed chemical sellers in the Ashanti Region of Ghana showed that only 38% of respondents knew that Artesunate–Amodiaquine was the first line anti-malarial drug for the treatment of uncomplicated *Plasmodium falciparum* malaria; and just 35.3% of them educated their patients/clients on their medications (Health Partners Ghana, 2008). Based on the findings of the KAP study, a series of training for licensed chemical sellers on malaria case management was organized by *Mobilize Against Malaria* (MAM) and its partners [Family Health International and Ghana Society for Marketing Foundation] since November 2008.

1.2 Statement of the Problem

Plasmodium falciparum which causes most severe form of malaria is resistant to monotherapies like chloroquine, and currently ACTs are the only effective first line anti-malarial drugs. However, ACTs are much more expensive than the ineffective monotherapies; therefore to delay the parasites resistance to ACTs, it is only prudent to make ACTs readily available, accessible and affordable, as well as ensuring their appropriate use by patients in endemic countries. According to Nkrumah-Mills (2006) about 80% of patients do home treatment as the first step by either using herbal concoctions or buying over the counter (OTC) anti-malarial drugs. Nonetheless, most licensed chemical sellers from whom majority of patients/clients buy these over the counter anti-malarial drugs have no structured training on malaria case management (Nkrumah-Mills, 2006). The large deployment of AMFm ACTs was followed with training of dispensers and owners of the private drug outlets on how to promote and educate clients/patients on the use and adherence to the quality assured artemisinin-based drug with the aim of delaying resistance and improving treatment outcome. This study therefore sought to assess the effect of this training on activities of the licensed chemical sellers on the AMFm ACTs in Kumasi Metropolis.

1.3 Conceptual Framework of provider training in the deployment of AMFm ACTs in private drug outlets.
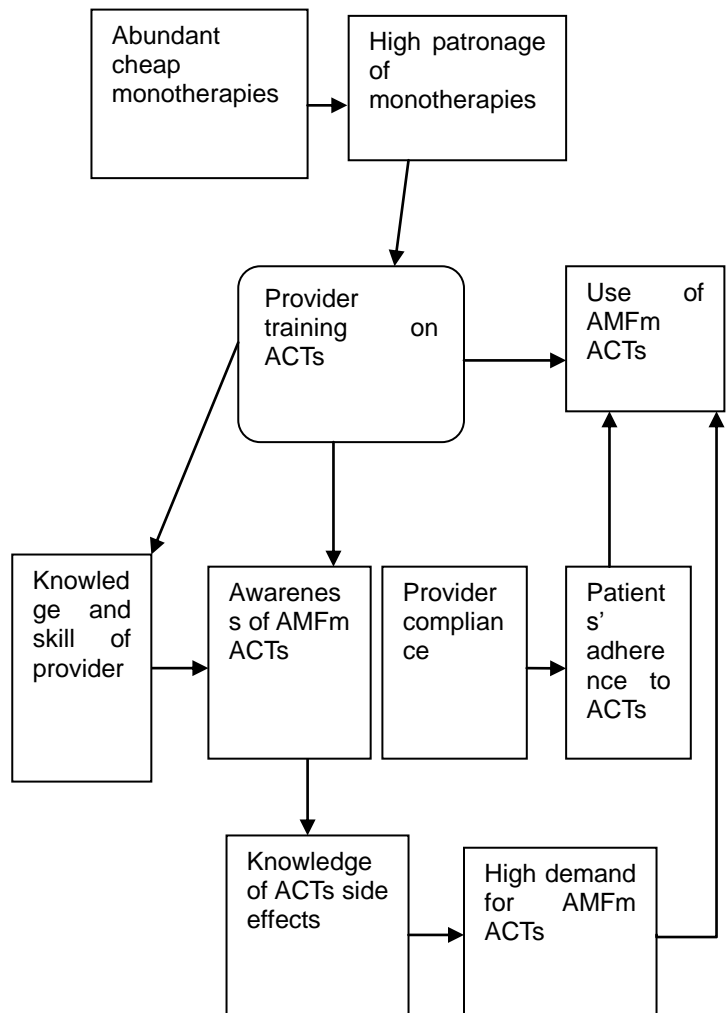

Figure 1: Importance of provider training in the deployment of AMFm ACTs in private drug outlets.

The Conceptual Framework (CF) shows that the lack of provider training on the quality-assured AMFm ACTs, could have led to high patronage of cheap ineffective monotherapies which are easily available and affordable on the market, making the demand and use of AMFm ACTs very low. Providers at private drug outlets would need basic training that enables them to dispense drugs for all diseases. In an environment where over 80% of the population use over the counter (OTC) anti-malarial drugs, there is the need for providers to acquire adequate knowledge and skills in the management of malaria with the appropriate drug and dosage. It would also facilitate recognition of moderate to severe forms of the disease, and to refer the client/patient to a health facility in a timely manner. Training will also enable the dispenser to know the side effects of the drugs, educate and advise the patient accordingly, to encourage appropriate use of the ACT. ACTs are more expensive than monotherapies and hence efforts to slow down parasite resistance to the drug will require providers to comply with dispensing the recommended regimen and patients to complete the full course of treatment. On the other hand if providers are not knowledgeable and

skilled enough in diagnosing, prescribing and educating or counselling the patient/client correctly, this will lead to poor adherence by the patient and subsequent drug resistance.

1.4 Justification

The large deployment of quality assured AMFm ACTs to the private sector is a new experience in Ghana which requires information on how the drug is being dispensed to clients and evaluation of the effectiveness of provider training on dispensing habits of private drug outlet owners/dispensers. It is also necessary to document the knowledge gaps and motivation of dispensers to provide AMFm ACTs which will be useful in future training for private drug sellers. It is therefore hoped that the study will provide information to the National Malaria Control Programme on how the quality assured AMFm Anti-malaria Drug Policy is faring within the private sector.

1.5 Objectives

1.5.1 General objective

The general objective of the study is to assess the effect of the malaria case management training on licensed chemical sellers in Kumasi Metropolis.

1.5.2 Specific Objectives

The specific objectives of the study are to:

1. Establish the criteria for malaria diagnosis by chemical sellers.
2. Ascertain the types of anti-malarial drugs prescribed by chemical sellers.
3. Ascertain chemical sellers' awareness of AMFm ACTs.
4. Compare the knowledge of trained and untrained providers on malaria case management.

3 METHODS

3.1 Study Design

A cross-sectional descriptive study was conducted in Kumasi Metropolis of the Ashanti Region of Ghana among trained and untrained licensed chemical sellers to evaluate their knowledge on diagnosis and management of malaria.

3.2 Study Area

The research was carried out in Kumasi Metropolis (Figure 2). The area is a commercial centre with trade routes linking it to many parts of the country. Geographically, Kumasi is situated in the transitional forest zone. It is about 270 km north of Accra; and located between latitude 6.35^{o} and 6.40^{o} and longitude 1.30^{o} and 1.35^{o}, making it lie between 250 and 300 metres above sea level. Kumasi Metropolitan area is bordered to the north by Kwabre East District, to the south by Bosomtwe, to the east by Ejisu-Juaben Municipal and to the west by Atwima District. On average, it has an area surface of about 150 square kilometres (GHS, 2012).
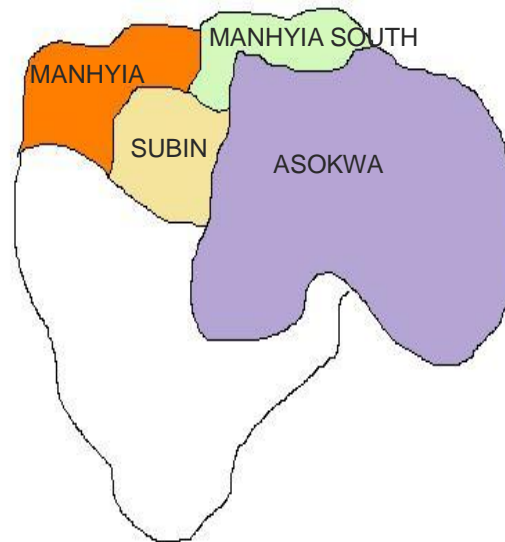

Figure 2 Map of Kumasi Metropolis showing the five sub-metros

Kumasi is known to as the "Garden City of West Africa" due to its layout and green vegetation. Initially, the metro comprised only three communities; namely Adum, Bompata and Krobo. However, it has now grown and expanded, to a total of 209 communities (GHS 2012). Kumasi is the administrative capital of the Ashanti Region, and second to Accra (the national capital) in terms of urbanization. It is also the capital of Ashanti Region. Kumasi is the most populous of the 27 districts in the region, with a population of 1,634,901 projected from the 2010 Population Census, based on a growth rate of 3.4% per annum. It is administratively divided into ten political Sub-Metros; which are further collapsed into five health Sub-Metros with the following: Asokwa (30.3%), Bantama (24.2%), Manhyia South (18.6%), Manhyia North (16.0%) and Subin (10.9%). Each Sub-Metro is has a hospital, with Kumasi South Hospital situated at Asokwa doubling as the regional hospital. These apart, there is good collaboration and partnership with private health service providers as there are a good number of such facilities in the metropolis (GHS 2012). There is also the Komfo Anokye Teaching Hospital, which is the second among the three in the country. Of 1,130,187 outpatient visits in 2012, about 419,143 (excluding pregnant women 6,576) were due to malaria; constituting about 37.1%. Furthermore, 7,204 presented with a severe form of malaria necessitating admission; out of which 44 (0.6%) lost their lives. Children under five were not spared by severe malaria; of the 2,225 who were admitted, 25 (1.1%) died. As many as 57,032 pregnant women were put on Intermittent Preventive Treatment (IPT); however, none of the 6,576 pregnant women diagnosed with malaria lost her life. Being a cosmopolitan city, the main source of employment of the in the community is commerce, with just a few engaged in subsistence agriculture. In terms of religion, Christians are the most predominant, followed by Moslems and other faith-based groupings. There are 2,164 licensed chemical shops in the Ashanti Region, out

of which 540 are located in Kumasi. About 1047 licensed chemical sellers have been trained between 2007 and 2012.

3.3 Study population
The target population included all licensed chemical sellers resident in Kumasi Metropolis. The study units were trained and untrained licensed chemical sellers.

3.4 Sample size
A list of all licensed chemical shops in Kumasi Metropolis (obtained from Pharmacy Council, Regional Office, Kumasi) were 540. From November 2008 till the first week in May 2012, *Mobilize Against Malaria* (MAM) and its partners had trained a total of 1,207 licensed chemical sellers in the Ashanti Region, out of which 174 were in Kumasi Metropolis. Eight were randomly selected for pre-testing the questionnaire. Based on a 38% prevalence of licensed chemical seller's knowledge on the use of ACTs (Artesunate-Amodiaquine) as the first line anti-malarial drug of choice in treating uncomplicated malaria, and using a confidence level of 95%, with a 5% precision and because the sample was from a finite population without replacement (using the finite population correction factor) the sample size calculation is:

$$n=Nz^2pq/[d^2(N-1)+z^2pq]; \text{ where } q=1-p$$

n: the sample size to be calculated,

N: the remaining number of trained LCS in Kumasi Metro (after the pre-test),

z: the confidence level,

p: the prevalence of knowledge of ACTs (among LCS) as the first line anti-malarial drug for treating uncomplicated malaria,

d: the margin of error or precision of the estimate.

This gave sample size of 114.03=115 plus 10% a non-response rate gave 126 which was rounded off to 130. In order to compare the knowledge of trained and untrained LCS in the diagnosis and management malaria, 70 untrained LCS were also randomly selected from the 366 using the same procedure. Therefore, a total sample size of 200 was obtained.

3.5 Sampling procedure
A list of all the 540 licensed chemical sellers in the study area (sampling frame) was obtained from the Ashanti Regional Office of the Pharmacy Council of Ghana. These were stratified into "Trained" (174) and "Untrained" (366). Eight (8) of the trained LCS and five (5) of the untrained were randomly sampled for pre-testing the questionnaire. The selected trained LCS were three (3) from Asokwa, two (2) from Bantama, and one (1) each from the three remaining Sub-Metros; whilst an untrained LCS was randomly chosen from each Sub-Metro, making a total of thirteen (13). Microsoft Office Excel Random Number Generator 2007 was used to aid this process. All those names corresponding to the generated numbers formed part of the sample. Because there were unequal numbers of licensed chemical shops in the various Sub-Metros, to determine the actual sample size, proportional stratified sampling was used to proportionally select the individual sample units (Table 2).

Table 2 Distribution per Sub-Metro of proportionally sampled licensed chemical sellers.

Sub-Metro	No. of LCS trained by MAM (A)	No. of trained LCS selected for pre-test (B)	No. of trained LCS left after pre-test (C)= (A-B) [%]	No. of chemical shops with trained personnel sampled (D)	No. of chemical shops with untrained personnel sampled (E)	Total sample size (F)= (D+E)
Asokwa	67	3	64 [38.6]	50	26	76
Bantama	41	2	39 [23.5]	31	16	47
Manhyia N	27	1	26 [15.7]	20	11	31
Manhyia S	23	1	22 [13.2]	17	9	26
Subin	16	1	15 [9.0]	12	8	20
Total	174	8	166 [100]	130	70	200

Of a total of 130 trained licensed chemical sellers sampled, two (2) from Asokwa Sub-Metro were excluded: one (1) shop was un-operational whilst a questionnaire was incompletely filled because the respondent was unwilling to continue. Two (2) from Bantama Sub-Metro out rightly refused to partake in the survey; and in Manhyia North a shop attendant was never present despite the shop being opened. Therefore, out of the 130 trained licensed chemical sellers expected to be interviewed, 125 that responded (Table 3). In the case of the untrained, one (1) each from Asokwa and Bantama Sub-Metros were disqualified due to out right refusal and incompleteness, respectively. Hence there were 68 valid responses out of 70. The final sample size for the study, therefore, was 193 (Table 3).

Table 3 Respondents interviewed per Sub-Metro.

Sub-Metros	Number of chemical shops with trained personnel interviewed (A)	Number of chemical shops with untrained personnel interviewed (B)	Sample size (C)=(A+B)
Asokwa	48	25	73
Bantama	29	15	44
Manhyia North	19	11	30
Manhyia South	17	9	26
Subin	12	8	20
Total	125	68	193

3.6 Data Collection Techniques/Methods & Tools
A modified structured questionnaire adopted from the Licensed Chemical Sellers Quarterly Monitoring Tool developed by Health Partners Ghana, was employed to collect quantitative data, from 24th May to 4th June, 2012.

48

3.7 Quality Control

The questionnaire was pre-tested with 13 LCS (eight trained and five untrained) randomly selected from the five Sub-Metros. The purpose was to ensure quality data. These 13 LCS did not form part of the final sampling frame. The Researchers communicated on mobile phone with the data collectors while on the field to clarify pertinent problems. The questionnaire was coded, and the data collected was entered using Statistical Package for the Social Sciences (SPSS) version 16.0 of 2007. Double data entry by different individuals was employed to avoid data entry errors.

3.8 Data Processing and Analysis

Statistical Package for the Social Sciences (SPSS) version 16.0 of 2007 was used to enter, edit and analyze quantitative data. Frequencies of all variables were run to ensure that there were no repetitions or missing values. Cross tabulations of some variables were also effected to compare the relationship between them. These results were compared between trained and untrained providers, using the Chi-square test.

3.9 Ehical Considerations

Approval was sought from the Ghana Health Service Ethical Review Committee on Research Involving Human Subjects granted ethical clearance (GHS-ERC: 80/2/11) for the study. Permission was also sought from the Regional Director of Health Services, the Country Director of MAM Project and the Licensed Chemical Sellers Association of Kumasi. The research participants were licensed chemical sellers, who gave their informed consent and voluntarily participated. Privacy, confidentiality and anonymity were assured and ensured. Participants were not compensated for the information provided.

4 RESULTS

This research presents the results of data collected from licensed chemical sellers in Kumasi metropolis. It describes the demographic characteristics of respondents; comparison of knowledge on the diagnosis and treatment/management of uncomplicated and complicated malaria, between trained and untrained licensed chemical sellers.

4.1 Demographic characteristics of respondents

There were 193 respondents. Among them were 132 (68.4%) males, out of whom 125 were trained. None of respondents was below 20 years old. Comparatively, both trained and untrained licensed chemical sellers in the study area were relatively young as 82 (65.6%) and 45 (66.1%) respectively, were below 40 years of age (Table 4). The mean age of respondents was 37.3 (SD±13.8) years, with a median of 33.0 years. This relatively young workforce implies that there is a promising future for the licensed chemical selling industry. In terms of their level of formal education, the least educated respondents (13.0% completed either Middle School or Junior High School. There is no significant difference between the trained and untrained respondents since most of them, 89 (71.2%) and 43 (63.3%) respectively, were either Secondary School or Senior High School leavers (Table 4.1). Table 4 shows the professions or occupations of respondents, most 137 which gives 71.0%, of whom were Medicine Counter Assistants (whilst the retired Health Staff (six Medical Assistants and eight Nurses), who could enrich the chemical selling industry their health background constituted 7.2% and

7.3%, respectively, of the trained and untrained licensed chemical sellers.

Table 4 Demographic characteristics of respondents

Variable	Trained [N_1=125] Frequency (%)	Untrained [N_2=68] Frequency (%)	Total [N=193] Frequency (%)
Sex			
Male	93 (74.4)	39 (57.4)	132 (68.4)
Female	32 (25.6)	29 (42.6)	61 (31.6)
Age groups (years)			
20 – 29	48 (38.4)	27 (39.7)	75 (38.9)
30 – 39	34 (27.2)	18 (26.4)	52 (26.9)
40 – 49	18 (14.4)	11 (16.2)	29 (15.0)
50 – 59	7 (5.6)	7 (10.3)	14 (7.3)
≥60	18 (14.4)	5 (7.4)	23 (11.9)
Formal educational level			
Midd/JHS	13 (10.4)	12 (17.6)	25 (13.0)
Sec./SHS	89 (71.2)	43 (63.3)	132 (68.4)
Tertiary	23 (18.4)	13 (19.1)	36 (18.6)
Occupation/Profession			
Medicine Counter Assistant	89 (71.2)	48 (70.6)	137 (71.0)
Dispensing Technician	27 (21.6)	15 (22.1)	42 (21.8)
Retired Health Staff	9 (7.2)	5 (7.3)	14 (7.2)

4.2 Criteria for the diagnosis of uncomplicated and complicated malaria

All 193 respondents based their diagnosis of malaria only on the clinical manifestations of the clients/patients. None of them used rapid diagnostic test (RDT) to confirm malaria before treatment. The proportions of the clinical manifestations of uncomplicated malaria are illustrated in Figure 3.
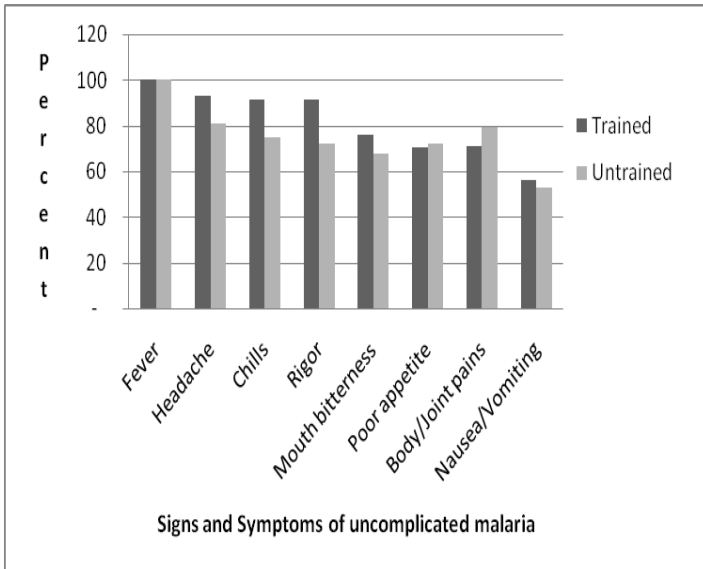
Figure 3 Criteria for diagnosis of uncomplicated malaria by licensed chemical sellers

Note: The sum of the percentages is more than 100% due to multiple responses for other manifestations.

All licensed chemical sellers who took part in the survey mentioned Fever as a common symptom of uncomplicated malaria. Headache was the second highest mentioned, 116 (93%) by trained and 55 (81%) by untrained. However, none of them mentioned Abdominal pains, Irritability and Refusal to feed which are common in younger children and infants with uncomplicated malaria. Overall, a total of 106 (84.8%) of trained licensed chemical sellers correctly diagnosed uncomplicated malaria clinically, as against 33 (48.5%) of the untrained. This implies that the training had improved the knowledge of the beneficiaries (Figure 4).
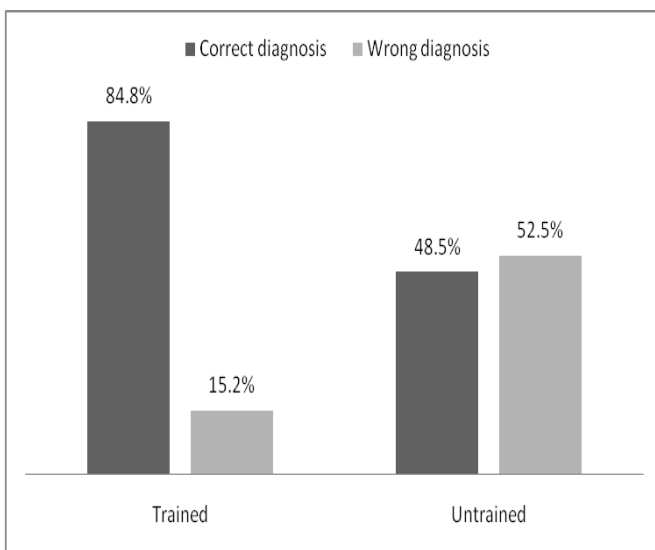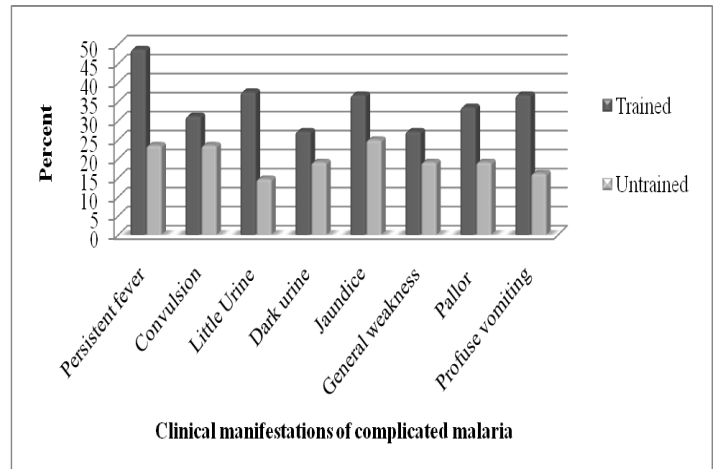

Figure 4 Comparison of diagnosis of uncomplicated malaria between trained and untrained providers.

Note: The sum of the percentages would be more than 100% due to multiple responses.

Figure 5 Criteria for diagnosis of complicated malaria by licensed chemical sellers.

About half of the trained respondents, 61 (49%), mentioned persistent fever as a sign of complicated malaria; whilst the sign mostly mentioned by the untrained respondents was Jaundice, 17 (25%) [Figure 5]. The least signs mentioned were Dark urine and General body pains, 34 (27%) each, by the trained; and Little urine, 10 (15%), by the untrained. In terms of correct diagnosis of complicated malaria, five of the 68 untrained respondents did not mention any of the manifestations, whilst all 125 trained respondents mentioned at least a clinical manifestation. Therefore 100.0% of the trained correctly diagnosed complicated malaria as against 63 (92.6%) of the untrained.

4.3 Awareness of AMFm ACTs

Table 6 Awareness of the AMFm ACTs and the source of information The AMFm ACTs are new on the Ghanaian market. It is therefore important to ascertain the awareness of these anti-malarial drugs among licensed chemical sellers at the forefront in the sales of pharmaceutical products in the country. In this research, a total of 176 (91.2%) respondents heard of the AMFm ACTs from multiple sources (Table 5). Out of this, 118 (94.4%) were trained. Among the untrained, 58 (85.3%) heard about the product. Among those who heard about it, 109 (92.4%) of those trained and 46 (79.3) of those untrained, correctly remembered what it was about or entailed. This implies that awareness of the AMFm ACTs is high among the chemical sellers. The most common source of information was Television, 110 (57.0%). News paper publicity was the least, 4 (2.1%). Not all the trained 125 respondents heard about the AMFm ACTs at a Workshop (Table 5). Despite the awareness only 115 (59.6%) of respondents were sold AMFm ACTs at the time of the study. They comprised of 86 (68.8%) trained and 29 (42.6%) untrained [Table 5].

Table5. Knowledge and Source of Information of AMFm ACT

Variable	Frequency (%)	Frequency (%)	Frequency (%)
Awareness of AMFm ACTs			
Heard about AMFm ACTs	118 (94.4)	58 (85.3)	176 (91.2)
Not heard about AMFm ACTs	7 (5.6)	10 (14.7)	17 (8.8)
Total	125 (100.0)	68 (100.0)	193 (100.0)
What AMFm ACTs are about			
Quality/Affordable/ Accessible/Effective/ Subsidized/ New anti-malaria drugs	109 (92.4)	46 (79.3)	155 (88.1)
Don't remember	9 (7.6)	12 (20.7)	21 (11.9)
Total	118 (100.0)	58 (100.0)	176 (100.0)
Source of information*			
Radio	34 (27.2)	18 (26.5)	52 (26.9)
Television	64 (51.2)	46 (67.6)	110 (57.0)
News papers	3 (2.4)	1 (1.5)	4 (2.1)
Workshop	107 (85.6)	0 (0.0)	107 (55.4)
From colleagues	18 (14.4)	8 (11.8)	26 (13.5)

*The sum of the percentages is more than 100% due to multiple responses.

4.4 Types of anti-malarial drugs prescribed by respondents

Table 6 Types of anti-malarial drugs for the treatment of uncomplicated malaria.

Variable	Trained LCS [N$_1$=125] Freq. (%)	Untrained [N$_2$=68] Freq. (%)	χ^2 (95% CI)	p-value
Correct diagnosis of uncomplicated malaria	106 (84.8)	33 (48.5)	28.753	< 0.0001
Correct diagnosis of complicated malaria	125 (100.0)	63 (92.6)	9.436	0.002
Treat uncomplicated malaria with Artesunate-Amodiaquine	104 (83.2)	30 (44.1)	31.694	<0.0001
Treat uncomplicated malaria with Artemether-Lumefantrine	53 (42.4)	49 (72.1)	15.547	<0.0001
Treat uncomplicated malaria with AMFm ACTs	68 (54.4)	24 (35.3)	6.445	0.011
Refer complicated malaria to health facility	123 (98.4)	66 (97.1)	0.390	0.532

Note: The sum of the percentages is more than 100% due to multiple responses.

The study showed that none of the participants prescribed Chloroquine for their clients/patients. It is encouraging to note that on average more than half of respondents, both trained and untrained, prescribed ACTs [either Artesunate-Amodiaquine, 134 (69.4%), Artemether-Lumefantrine, 102 (52.8%), or any of the Green leaf ACTs, 92 (47.7%)] for their clients. However, it is very surprising to note that about a third of respondents, 57 (29.5%), use Sulfadoxine-Pyrimethamine (SP), [prophylaxis against malaria in pregnant women] to treat clinical uncomplicated malaria. Also, despite the fact that Artesunate and Amodiaquine are Artemisinin-based anti-malarial drugs, and their administration as monotherapies poses a threat for drug resistance they are still used in certain cases. Quinine tablets are supposed to be used to treat complicated malaria; however, five respondents (2.6%) administer them for uncomplicated malaria (Table 7). This

malpractice can also lead to drug resistance, if not corrected.

4.5 Comparison between trained and untrained licensed chemical sellers

Table 7 Comparison of trained and untrained licensed chemical sellers on some selected variables

Variable	Trained [N₁=125]	Untrained [N₂=68]	Total [N=193]
	Frequency (%)	Frequency (%)	Frequency (%)
Combined therapies			
Artesunate-Amodiaquine	104 (83.2)	30 (44.1)	134 (69.4)
Artemether-Lumefantrine	53 (42.4)	49 (72.1)	102 (52.8)
AMFm ACTs	68 (54.4)	24 (35.3)	92 (47.7)
Monotherapies			
Sulfadoxine-Pyrimethamine (SP)	37 (29.6)	20 (29.4)	57 (29.5)
Artesunate alone	6 (4.8)	2 (2.9)	8 (4.1)
Amodiaquine alone	11 (8.8)	5 (7.4)	16 (8.3)
Quinine tablets	1 (0.8)	4 (5.9)	5 (2.6)

The general objective of the study was to assess the effect of the malaria case management training on licensed chemical sellers in the study area. It is therefore necessary to compare the knowledge of respondents who were trained and those not trained. The trained respondents were able to diagnose both uncomplicated and complicated malaria more correctly than those untrained. The chi-squire tests showed statistically very significant p-values (Table 7). This means that the training had an effect on the beneficiaries. However, in the case of treatment or referral of complicated malaria there is no statistically significant difference between the trained and untrained (x^2=0.390; p=0.532). It noted here that since the training was done in batches, some were trained earlier than others. The survey revealed that most of the respondents, 110 (88.0%), had their training a year or more prior to the survey.

5 DISCUSSIONS
This section discusses the findings of the research as they relate to the objectives and presented as follows:

5.1 Demographic characteristics of respondents
The survey showed that there were more males, 132 (68.4%), than females in both trained and untrained respondents. Cumulatively a total of 127 (65.8%), are below 40 years of age (Table 4). This relatively young workforce has the potential to improve malaria case management in their communities. If training is organized for those untrained, they can together make a mark in our quest to reduce morbidity and mortality due to malaria. Contrarily, if they are not well remunerated

they could look for more lucrative jobs elsewhere. An encouraging findings about this research is that all respondents have some level of formal education; the least being Middle School or Junior High School whilst most of them, 132 (68.4%), are Secondary School or Senior High School Certificate holders. This creates the opportunity for them to relatively undrestand the content of any training better organized for them. Again, all of them had some basic formal training on drug dispensing with the least technical personnel among them being Medicine Counter Assistant; however, they are the majority, 137 (71.0%). This technical knowledge would enhance their performance in general drug dispensing.

5.2 Confirming clinically suspected malaria with rapid diagnostic test
The study showed that none of the licensed chemical sellers (trained or untrained) used RDTs to confirm clinically suspected malaria before treatment. This means that they diagnosed clinical malaria and could over prescribe anti-malarial drugs. This notion has been noted in the World Malaria Report that in Africa less than 20% of suspected uncomplicated malaria cases are confirmed; most clients/patients first go to the chemical shops where there are no facilities for confirmation (WHO 2010). However, a survey in two districts in southern Mozambique revealed that using RDTs to make definitive diagnosis of malaria (except in children under five years old) is the standard (Zikusooka et. al., 2008). This is further supported by studies in Tanzania and Dar es Salaam, which demonstrated that after the introduction of policy to confirm malaria with RDTs before treatment, the prescription of anti-malaria drugs reduced whilst that of antibiotics escalated (Bastiaens et. al., 2011; D'Acremont et. al., 2011).

5.3 Awareness of the AMFm ACTs among respondents
The awareness of this novel anti-malarial drug is very high among respondents as 176 (91.2%) of them have heard about it either on radio, television, at workshop or from colleagues. This high awareness among this group of cadres could help to increase the publicity of the drug among the general public; despite the fact that 21 (11.9%) of them did not remember what it is about. The most common source of information is the television, 110 (57.0%).

5.4 Effect of malaria case management training on chemical sellers.
The results of this survey shows that training licensed chemical sellers on malaria case management in their various communities contributes to reducing malaria related morbidity and mortality. Prior to this training only 38% of licensed chemical sellers were able to manage malaria correctly in the Ashanti Region of Ghana (Health Partners, 2008). However, in terms of diagnosis of uncomplicated malaria, the findings this research revealed statistically very significant difference between shows, 106 (84.8%), and untrained, 33 (48.5%) (x^2=28.753; p<0.0001). The difference between trained and the untrained in the diagnosis of complicated malaria also showed statistically significant difference (x^2=9.436; p=0.002). These results compare favourably with a study in rural Kenya where there were increases in percentage of appropriate dose of anti-malarial drugs prescribed after the training (Marsh *et. al.,* 1999). Similarly a study in Ugwuogo-Nike, a rural setting in south-east Nigeria, revealed significant increases in

dispensing correct anti-malarial drugs, taking good history as well as adherence counselling on how clients/patients should take their drugs; with 80% of these clients/patients complying with drug taking (Okeke and Uzochukwu, 2009). An observation here is that more of those trained [104 (83.2%)] correctly prescribed Artesunate-Amodiaquine to Artemether-Lumefantrine [53 (42.4%)] contrarily, to the untrained. This may be explained by the fact that 110 (88.0%) were trained a year or more before the study, during which time the emphasis was more on Artesunate-Amodiaquine as the drug of first choice. Again, those trained counseled clients/patients on the side effects of the drug. On the contrary, the untrained prescribed Artemether-Lumefantrine more [49 (72.1%)] than the trained [30 (44.1%)] probably because they were trying to please the clients/patients by giving them the drug with less side effects. However, the availability of the type of anti-malaria drug in stock could also influence the prescribing pattern. In the case of the AMFm ACTs more of those trained [86 (68.8%)] were selling it, as against 29 (42.6%) of the untrained. This could also explain why the trained prescribed it more. All the above results and discussions confirm the fact that licensed chemical sellers are strong partners and stakeholders in the fight against malaria; and when well equipped with the necessary knowledge and skill, they will contribute their quota in this regard. The average, [more than half] respondents prescribed ACTs (Artesunate-Amodiaquine, Artemether-Lumefantrine or any brand of the AMFm ACTs) to treat uncomplicated malaria [table 6]. This is an indication that licensed chemical sellers are gradually moving away from the use of monotherapies in treating uncomplicated malaria; despite the fact that 86 of them prescribe monotherapies (Sulfadoxine-Pyrimethamine, Artesunate alone or Amodiaquine alone).

6   CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The only criteria for diagnosis of malaria by Licensed Chemical Sellers is "clinical manifestations". The fact that Ghana is a malaria endemic country, requires the use of RDTs for parasitological confirmation of malaria before treatment. There is a steady shift from the use of anti-malarial monotherapies to artemisinin-based combination therapies; some licensed chemical sellers still prescribe Sulfadoxine-Pyrimethamine (SP) to treat presumptively uncomplicated malaria. The awareness of the AMFm ACTs among licensed chemical sellers in the study area is high. It is clear from this study that there is a difference between the trained and untrained licensed chemical sellers in terms of diagnosis of uncomplicated malaria (x^2=28.753; p>0.0001) and complicated malaria (x^2=9.436; p=0.002). The training had impact on malaria diagnosis and treatment.

6.2 Recommendations

6.2.1 To the National Malaria Control Programme (NMCP):

Support should be provided to licensed chemical sellers and those, who treat malaria presumptively, with RDTs for parasitological confirmation before treatment. This will ensure that prescription of ACTs is targeted at those who really need them. It will reduce the over prescription and abuse of anti-malarial drugs that can lead to resistance. Public education should be intensified to raise public awareness to empower the general public to demand for the AMFm ACTs; and to reduce the monotherapies on the market.

6.2.2 To Mobilize Against Malaria (MAM) and its partners:

Because training had positive effect on the way licensed chemical sellers in the study area diagnosed malaria. It should be extended to those not trained. In addition those trained earlier need refresher training to update their knowledge regularly through refresher training.

REFERENCES

[1]. Anti-Malaria Drug Policy for Ghana, Ministry of Health, 2nd Revised Version 2009, pp. 2-6.

[2]. Asante K P, Abokyi L, Zandoh C, Owusu R, Awini E, Sulemana A, Amenga-Etego S, Adda R, Boahen O, Segbaya S, Mahama E, Bart-Plange C, Chandramohan D, Owusu-Agyei S (2010). Community perceptions of malaria and malaria treatment behaviour in a rural district of Ghana: implications for artemisinin combination therapy. *BMC Public Health. 2010; 10: 409.* http://www.biomedcentral.com/1471-2458/10/409. (Accessed on February 1, 2011).

[3]. Bastiaens GJ, Schaftenaar E, Ndaro A, Keuter M, Bousema T, Shekalaghe SA (2011). Malaria diagnostic testing and treatment practices in three different Plasmodium falciparum transmissions setting in Tanzania: before and after government policy change. (Accessed on July 12, 2011)

[4]. Bate R, Coticelli P, Tren R, Attaran A (2008). Antimalarial Drug Quality in the Most Severely Malarious Parts of Africa – A Six Country Study. *PLoS ONE* 3(5): e2132.doi:10.1371/journal.pone.0002132. (Accessed on February 3, 2011)

[5]. Brieger W, Unwin A, Greer G, Meek S (2004). Interventions to Improve the Role of Medicine Sellers in Malaria Case Management for Children in Africa. (Accessed on January 20, 2011 through Pubmed)

[6]. Burnham G M, Pariyo G, Galiwango E, Wabwire-Mangen F (2004). Discontinuation of cost sharing in Uganda. *Bulletin of World Health Organization* 2004, **82**:187-195.

[7]. Chuma J, Abuya T, Memusi D, Juma E, Akhwale W, Ntwiga J, Nyandigisi A, Tetteh G, Shretta R, Amin A (2009). Reviewing the literature on access to prompt and effective malaria treatment in Kenya: implications for meeting the Abuja targets. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2773788/pdf/1475-2875-8-243.pdf?tool=pmcentrez (Accessed on February 3, 2011).

[8]. D'Acremont V, Kahama-Maro, J, Swai N, Mtasiwa D, Genton B, Lengeler C (2011). Reduction of anti-malarial consumption after rapid diagnostic tests implementation in Dar es Salaam: a before-after and cluster randomized controlled study. (Accessed on January 14, 2011 through Pubmed Central).

[9]. Dhingra N, Jha P, Sharma V P, Cohen A A, Jotkar R M, Rodriguez P S, Bassani D G, Suraweera W, Laxminaryan R, Peto R (2010). Adult and child malaria mortality in India

[10]. *Lancet*. 2010 November 20; 376(9754): 1768–1774. (Accessed on January 14, 2011 through Pubmed Central)

[11]. Faye B, Ndiaye J L, Ndiaye D, Dieng Y, Faye O, Gaye O (2007). Efficacy and tolerability of four antimalarial combinations in the treatment of uncomplicated Plasmodium falciparum malaria in Senegal. *Malaria Journal* 2007, 6:80 http://www.malariajournal.com/content/6/1/80. (Accessed on January 20, 2011 through Pubmed Central).

[12]. Ghana Health Service (2012). Kumasi Metropolitan Health Directorate 2012 Annual Report.

[13]. Goodman C, Brieger W, Unwin A, Mills A, Meek S, Greer G (2007). Medicine sellers and malaria treatment in sub-Saharan Africa: What do they do and how can their practice be improved? *American Journal of Tropical Medicine and Hygiene 2007 December*; 77:203-218. Available in PMC 2009 March 19. (Accessed on February 1, 2011).

[14]. Grandesso F, Bachy C, Donam I, Ntambi J, Habimana J, D'Alessandro U, Maikere J, Vanlerberghe V, Kerah C H, Guthmann J P (2006). Efficacy of chloroquine, sulfadoxine-pyrimethamine and amodiaquine for treatment of uncomplicated Plasmodium falciparum malaria among children under five in Bongor and Koumra, Chad. *Transactions of the Royal Society of Tropical Medicine and Hygiene* (2006) **100**: 419-426.

[15]. Griffin J T, Hollingsworth T D, Okell L C, Churcher T S, White M, Hinsley W, Bousema T, Drakeley C J, Ferguson N M, Basanez M G, Ghani A C (2010). Reducing *Plasmodium falciparum* Malaria Transmission in Africa: A Model-Based Evaluation of Intervention Strategies. PLoS Med 7(8): e1000324. doi:10.1371/journal.pmed.1000324

[16]. Guidelines for the treatment of malaria, Second Edition 2010. World Health Organization (WHO/HTM/MAL/2009). http://www.who.int/malaria/publications/atoz/9789241547925/en/index.html. (Accessed on March 5, 2011)

[17]. Health Partners Ghana (2008). Management of malaria by care givers and licensed chemical sellers in the Ashanti Region, Ghana. A baseline survey of the MAM Project October 2008.

[18]. Hetzel M W, Dillip A, Lengeler C, Obrist B, Msechu J J, Makemba A M, Mshana C, Schulze A, and Mshinda H (2008). Malaria treatment in the retail sector: Knowledge and practices of drug sellers in rural Tanzania. *BMC Public Health* 2008, 8:157 http://www.biomedcentral.com/1471-2458/8/157.

(Accessed on January 10, 2011).

[19]. Koram K A, Quaye L, Abuaku B, (2008). Efficacy of Amodiaquine/Artesunate combination therapy for uncomplicated malaria in children under five years in Ghana. *Ghana Medical Journal* **42**(2): 55-60. June 2008. (Accessed on January 10, 2011).

[20]. Kumasi Metropolitan Area profile. http://www.ghanadistricts.com/districts/?news&r=2&_=6. (Accessed on June 25, 2011).

[21]. Marsh VM, Mutemi WM, Muturi J, Haaland A, Watkins WM, Otieno G, Marsh K (1999). Changing home treatment of childhood fevers by training shop keepers in rural Kenya. Trop Med Int Health. May1999; 4(5):383-9. (Accessed on April 12, 2011 through Pubmed Central).

[22]. Meyrowitsch DW, Pedersen EM, Alifrangis M, Scheike TH, Malecela MN, Magesa SM, Derua YA, Rwegoshora RT, Michael E, Simonsen PE (2011). Is the current decline in malaria burden in sub-Saharan Africa due to a decrease in vector population? Malar J. 2011 Jul 13;10(1):188. (Accessed July 15, 2011 through Pubmed Central).

[23]. Nkrumah-Mills G (2006). Behavioural and Social factors influencing malaria control in Kpone-on-sea, Ghana (unpublished).

[24]. Okeke TA, Uzochukwu BS (2009). Improving childhood malaria treatment and referral practices by training patent medicine vendors in rural south-east Nigeria. Malaria Journal. 2009 Nov 20;8:260.

[25]. Piola P, Fogg C, Bajunirwe F, Biraro S, Grandesso F, Ruzagira E, Babigumira J, Kigozi I, Kiguli J, Kyomuhendo J, Ferradini L, Taylor W, Checchi F, Guthmann J P (2005). Supervised versus unsupervised intake of six-dose artemether-lumefantrine for treatment of acute, uncomplicated Plasmodium falciparum malaria in Mbarara, Uganda: a randomised trial. *Lancet* 2005; **365**: 1467-73.

[26]. Radigues X, Diallo K I, Diallo M, Ngwakum P A, Maigac H, Djimde A, Sacko M, Doumbo O, Guthmann J P (2006). Efficacy of chloroquine and sulfadoxine-pyrimethamine for the treatment of uncomplicated falciparum malaria in Koumantou, Mali. *Transactions of the Royal Society of Tropical Medicine and Hygiene* (2006) **100**: 1013-1018.

[27]. Rutebemberwa E, Pariyo G, Peterson S, Tomson G, Kallander K (2009). Utilization of public or private health care providers by febrile children after user fee removal in Uganda. http://www.malariajournal.com/content/8/1/45. (Accessed on January 10, 2011).

[28]. The Global Fund, Affordable Medicines Facility for malaria, Frequently Asked Questions, Updated 22nd July, 2010, page 4.

[29]. World Health Organization; World Malaria Report 2010. Malaria vector control and personal protection: report of a WHO study group. ISBN: 9241209364. (Accessed on April 4, 2011).

[30]. World Health Organization. WHO Media Centre,(2010). http://www.who.int/mediacentre/factsheets/fs094/en/ (Accessed on February 12, 2011).

[31]. World Health Organization, (2012). Factsheet on the World Malaria Report, 2012

[32]. Zikusooka C M, McIntyre D, Barnes K I (2008). Should countries implementing an artemisinin-based combination malaria treatment policy also introduce rapid diagnostic tests? http://www.malariajournal.com/content/7/1/176. (Accessed on January 20, 2011).