

Clinicians' adherence to implementation of test, treat and track strategy for malaria control among children under-five years in Ho Municipality, Volta Region, Ghana

Abstract

Background: The World Health Organization emphasized testing and confirming every suspected malaria case with either Rapid Diagnostic Tests (RDTs) or microscopy before treatment with anti-malarial drugs. Over 80% of cases in endemic countries of Africa are still treated without diagnostic test. This study presents an assessment of the adherence of clinicians to implementation of the Test, Treat and Track (T3) strategy for malaria control among children under-five years in Ho municipality of the Volta region of Ghana.

Methods: A cross-sectional study was carried out in 10 facilities comprising 7 public and 3 private health facilities in 2015. The survey was to determine the number of fever cases that were tested before Artemisinin-based Combination Therapy (ACT) is prescribed, if tracking of patients was done by clinicians and challenges to implementation of the T3 strategy among children under-five years. Data was collected using a structured questionnaire.

Results: Of the 300 children under-five years, 82% reported to the health facilities with fever. Only 58.5% of these fever cases were tested, out of which 52.8% was confirmed malaria positive whilst 43.8% tested negative for malaria. All confirmed and unconfirmed cases were treated with ACT. 21.9% of cases which tested negative and 21.5% of non-tested cases were equally treated with ACT. About 61.5% of the cases treated were not asked to return for a review. Majority (80%) of the clinicians cited frequent RDT stock-out as the major challenge to their adherence to the T3 policy.

Conclusions: Adherence to the test of fever cases by clinicians was poor. Also, a substantial proportion of the untested fever cases were presumptively treated with ACT as malaria. Adherence to the use of ACT for the treatment of all malaria cases was overwhelming. The Ministry of Health/Ghana Health Service should ensure adequate and sustained supply of RDTs and ACTs to both public and private health facilities. Clinicians should be sensitized on the T3 policy.

Key words: Malaria, Treatment guideline, Diagnosis, Implementation, Adherence.

Background

Malaria continues to be a major public health problem; it affects all age groups across the globe. It causes high morbidity and mortality, especially among children under-five years of age. In 2012, the World Health Organization (WHO) reports that, about 207 million cases of malaria and 627 000 deaths occurred globally, with 80% of the cases and 90% of the deaths occurring in Africa. About 77% of these deaths were children under-five years [1]. A report from the national malaria control program indicates that, malaria is responsible for 48.8% of admission among children under-five in Ghana [2]. Also, the proportion of malaria among every five children sampled is 20% (one in five children) in Ghana [3]. Over the years, several interventions have been recommended by WHO for the prevention and control of malaria. These include: vector control through indoor residual spraying (IRS),

Insecticide Treated Bed Nets (ITNs) ownership and usage, and chemoprophylaxis [4]. In April 2012, the WHO Global Malaria Programme launched a highly ambitious new initiative, *T3: Test. Treat. Track* [1,5]. T3 aims to address the widespread problem of poor access to diagnostic testing and antimalarial treatment, and to enhance case-reporting. It sets a target of universal access to diagnostic testing in the public and private health care sector by 2015 [1,5]. Clinicians' adherence to T3 with respect to fever cases varies in different African countries. For example, 94.6% and 38% adherence rates were observed in Zambia [6] and Kenya [7] respectively. In 2013, Ghana subscribed to sub-regional and global initiatives such as the T3 initiative, and the guidelines for malaria case management have been revised to demonstrate a shift from the past when fever was invariably equated with malaria, to testing of every suspected case of malaria before treatment [8]. During the Ghana Health Service 2015 half year bulletin by the National Malaria Control Programme, the number of malaria cases tested, cases tested positive and cases treated with ACT were 555,712, 304,827 and 645,086 respectively in the month of June 2016 [9].

The incidence of malaria in Ho municipality is on the ascendancy. According to the Ho Municipal Health Directorate (MHD) 2013 annual report, malaria is number one among the top ten Out-Patient Department (OPD) cases, accounting for 72,118 (30.9%) cases in 2011, 80,289 (25.8%) in 2012 and 81,846 (26.2%) cases in 2013 [10]. The report further states that a high proportion in 2011, (94.6%), 2012, (85.8%) and 2013, (84.3%) of malaria cases were not tested before treatment with anti-malaria drugs. Only 3,884 (5.4%) cases were tested and confirmed in 2011, 11,370 (14.2%) in 2012, and 12,865 (15.7%) cases in 2013 [10].

A huge numbers of malaria cases among children under-five years are also not being tested either with RDTs or microscopy before treatment with anti-malaria drugs. According to the MHD report, in 2011, out of 18,760 OPD suspected malaria cases in children, only 3,832 (20.4%) were tested and in 2012, out of 21,817 only 5,065 (23.2%) were tested [10]. This underscores the fact that most cases in the municipality are still treated based on presumptive or clinical diagnoses.

Owing to the high rates of poor adherence to the T3 strategy by clinicians, and the fact that there is limited information on clinicians' adherence to implementation of the strategy in Ghana despite the numerous researches on malaria, we therefore sought to determine the adherence of clinicians to the T3 strategy for malaria control among children less than five years.

Methods

Study site

The study was conducted in the Ho Municipality in the Volta Region of Ghana. The municipality houses the regional capital, Ho. The municipality is divided into five sub municipalities with 117 clear-cut communities and 26 health facilities. The population of Ho Municipality according to the 2010 Population and Housing Census is 177,281, representing 8.4 percent of the region's total population. Females constitute 52.7 percent and males represent 47.3 percent. The Municipality is located between latitudes 6° 20"N and 6° 55"N and longitudes 0° 12'E and 0° 53'E. Its total land area is 2,361 square kilometers, thus representing 11.5 percent of the region's total land area [11]. In the Municipality, malaria declined from 26.2% in 2013 to 22.2 per cent in 2014. Although OPD attendance increased by 7%, malaria cases reportedly dropped by almost 14% between the two years [12]. The facilities recruited for this study include: (1) Matter Ecclesiaste, (2) Hofedo CHPS compound, (3) Miracle life Hospital, (4) Royal Hospital, (5) Nyive Health Center, (6) Ho

Polyclinic, (7) Akrofu Health Center, (8) Hodzo CHPS compound, (9) Taviefe Health Center and (10) Hope Clinic.

Study population

The study ~~population comprised~~^{involved} Clinicians at the various health facilities and children under five years with their Parents/Guardians who presented at the health facilities with **fever or history of fever** for treatment.

Study design

This was a descriptive cross-sectional study carried out in May 2015. Face-to-face interviews were conducted using semi-structured a questionnaire which was administered to access the number of fever cases seen, whether fever cases seen were tested, and whether fever cases tested were treated and tracked. The questionnaire was used to gather information on demographic characteristics of both children under five years and their Parents/Guardians, fever cases, fever cases tested, tested fever cases with respect to malaria, untested fever cases diagnosed clinically as malaria and treated with ACT, types of antibiotic and other drugs prescribed together with ACT to treat malaria and challenges faced by clinicians in implementing T3.

Sampling

A non-probability (convenience) sampling technique was used to select the study sites. A total of ten (10) facilities comprising of seven (7) public and three (3) private ~~health facilities~~ were included in the survey. A purposive sampling technique was employed to select one clinician ~~from~~ⁱⁿ each of the selected health facility. Study participants (children under five years with their Parents/Guardians) were selected ~~at random~~ using simple random sampling technique. **A child was eligible if a clinician wrote in the folder that there was history of fever or recorded temperature $\geq 37.5^{\circ}\text{C}$.** The participants were ~~selected~~^{chosen using the random selection method} as follows:

A list of all eligible participants who visited the selected health facilities was developed by the interviewer. The interviewer identified and assigned a number to each eligible participant. The interviewer randomly selected even or odd numbers. If the interviewer selected even number then all participants with even numbers were selected one after another without replacement for interview. **Once a child was eligible, a written informed consent was sought from the parent/guardian. Information about the study was provided by the interviewer. Parent/guardian were allowed to ask questions and when satisfied appended signature to the informed consent form.** The random selection was done repeatedly till the required number of eligible participants was selected. **The study recorded 100% response rate.**

Sample size calculation

The sample size was calculated using the formula propounded by Cochran [13].

$$n = \frac{(Z_{\frac{\alpha}{2}})^2 p(1-p)}{(e)^2}$$

n is the expected sample size, **z** is **z** statistics for a confidence level of 95%, **e** is the margin of error **on the proportion** and **p** is the estimated proportion of malaria in children under five years old. Therefore, using a malaria prevalence rate of 24.6% in the Ho Municipality, at a confidence level of 95% ($z = 1.96$), with a margin of error of 0.05 (5%), an expected sample size of 300 was obtained. Thus a total sample size of 300 children under five years who had fever and visited the selected facilities were recruited for the study.

Data collection

Pre-tested semi-structured questionnaire were used to collect the data by Disease control and health information officers who were recruited and trained on the use of questionnaire to collect the required data. The interview was conducted at the OPD and their medical records (folder and road to health card) were used to confirm diagnosed fever cases. The questionnaire was administered to mothers of eligible children below five years immediately after they have completed and were exiting the clinic. The exit interview was conducted in a convenient and conducive place at the OPD, in the local language (Ewe) or English language to respondents.

Statistical analysis

Data from respondents were entered twice into a database using EPI data software. The data was checked and validated using customized validation programmes. The cleaned data was analysed using Statistical Package for Social Sciences (SPSS) version 20. Results were displayed in tables and graphs according to the variables studied. Chi-square test (χ^2) was used to determine association between each demographic categorical variable and dependent variables. Chi square test result with p-value less than 0.05 was considered significant.

Results

The number of respondents per facility ~~was~~ere as follows: forty (40) in Matter Ecclesiaste and Hofedo CHPS compound, thirty-five (35) in Miracle life and Royal Hospitals, thirty (30) in Nyive, Ho Polyclinic and Akrofu health centers, twenty (20) in Hodzo CHPS, Taviefe and Hope clinic. Ten (10) clinicians (one in each of the health facilities) were interviewed on the challenges to implementation of the T3 strategy.

Background characteristics

Out of the 300 respondents sampled, 63.3% attended public health facilities whilst 37.7% attended private facilities. A greater proportion (52.7%) of the children were females. Most (86.3%) of the respondents were married, 11.7% were single and 2.0% divorced. Majority (89.3%) of the respondents were Christians. Up to 11.3% had no formal education, a few (7.7%) had tertiary education, and majority (65.0%) had basic education. Some of them (7.0%) were government workers, 15.7% were farmers and 15.0% were unemployed. There was a statistically significant relationship between respondent's level of education/occupation and the health facility type (public and private), (χ^2 =8.374; p=0.039, χ^2 =23.766; P=0.001, CI = 95%), respectively (Table 1).

Table 1: Background characteristics of study population

Type of facility

Total

	Public	Private		χ^2	P-value
	n =190 (%)	n = 110 (%)	N = 300 (%)		
<u>Children under five years</u>					
Sex of child					
Male	93 (48.9%)	49 (44.5)	142 (47.3)	0.542	0.462
Female	97 (51.1)	61 (55.5)	158 (52.7)		
Age group					
0-11months	41 (21.6)	32 (29.1)	73 (24.3)	4.154	0.386
12-23months	40 (21.1)	27 (24.5)	67 (22.3)		
24-35months	38 (20.0)	21 (19.1)	59 (19.7)		
36-47months	39 (20.5)	16 (14.5)	55 (18.3)		
48-59months	32 (16.8)	14 (12.7)	46 (15.3)		
<u>Caregivers/Guardians/Parents</u>					
Age					
<20	8 (4.8)	3 (2.7)	11 (3.7)	7.229	0.065
20-30	110 (57.9)	48 (43.6)	158 (52.7)		
31-40	57 (30.0)	45 (40.9)	102 (34.0)		
40+	15 (7.9)	14 (12.7)	29 (9.7)		
Marital status					
Single	27 (14.2)	8 (7.3)	35 (11.7)	4.857	0.105
Married	158 (83.2)	101 (91.8)	259 (86.3)		
Divorce	5 (2.6)	1 (0.9)	6 (2.0)		
Level of education					
No formal education	20 (10.5)	14 (12.7)	34 (11.3)	8.374	0.039
Primary./JHS/Middle school	134 (70.5)	61 (55.5)	195 (65.0)		
SHS/O & A Level	26 (13.7)	22 (20.0)	48 (16.0)		
Tertiary	10 (5.3)	13 (11.8)	23 (7.7)		
Occupation					
Seamstress	25 (13.2)	17 (15.5)	42 (14.0)	23.766	0.001
Trading	68 (35.8)	41 (37.3)	109 (36.3)		
Farming	36 (18.9)	11 (10.0)	47 (15.7)		
Govt. worker	4 (2.1)	17 (15.5)	21 (7.0)		

χ^2 = Pearson Chi Square test

Management of fever cases

Assessment of the number of fever cases at health facilities showed that 246 (82.0%) children who reported at the OPD had fever and the rest ~~had~~ other illnesses other than fever (Table 2). The ~~C~~chi-square test showed that the difference between fever/non fever cases and health facility type (public and private) was statistically significant ($\chi^2 = 5.917$; $P = 0.015$; $CI = 95\%$). Out of the 246 fever cases observed, 144 (58.5%) got tested whilst 102 (41.5%) were not tested. Most (73.6%) of 148 fever cases seen in public facilities were tested compared to 35% of cases seen in private facilities tested. The difference between fever cases (tested/untested) and health facilities types (public and private) was statistically significant ($\chi^2 = 1.367$; $p < 0.001$; $CI = 95\%$). Table 2 shows that, of the 102 not tested fever cases, 39 (38.2%) were recorded in public health facilities ~~of which~~ and 7.7% were presumptively treated with ACT, and 63 (61.8%) ~~were recorded~~ in private health facilities of which 79.4% were also treated with ACT. A total of 52.0% of not tested fever cases were presumptively treated with ACT based on clinical judgment, whilst 48.0% were not treated. There was a statistically significant relationship between the number of fever cases (treated and not treated) and the type of health facility (public and private) ($\chi^2 = 49.573$; $p = < 0.001$; $CI = 95\%$) (Table 2).

Table 3 shows that ~~a large proportion~~ majority (22.9%) of the 144 tested fever cases were children age 12-23 months, whereas ~~a large proportion~~ majority (30.4%) of the 102 untested fever cases were children 0-11 months. Moreover, 66.7% of the tested fever cases were children of parents/guardians who had basic education (Primary/JHS/Middle school), 9.0% were those with tertiary education whilst 7.6% were those without formal education. Variations in the testing rates between age/education and fever cases (tested and untested) ~~was~~ not statistically significant ($\chi^2 = 6.447$; $p = 0.168$; $\chi^2 = 1.861$; $p = 0.602$; $CI = 95$) respectively. – Most (24%) of the fever cases were children 0-11 months followed by children 12-23 months. Fever cases were high, 52.4% among females than 47.6% among males. However, the difference was not statistically significant ($\chi^2 = 0.028$; $p = 0.866$; $CI = 95\%$). All confirmed malaria cases (100%) were treated with ACT and 21.9% who tested negative for malaria were also treated with ACT. Those with unknown results (2.8%) were not treated (Table 3).

Table 2: Fever case management at the facility level

Type of facility			Total	χ^2	P-value
Fever cases					
Variables	Public	Private	Total		
	n = 190 (%)	n = 110 (%)	N= 300 (%)		

Fever	148 (77.9)	98 (89.1)	246 (82.0)		
No fever	42 (22.1)	12 (10.9)	54 (18.0)		
				5.917	0.015

Fever cases tested

	Public	Private	Total		
	n=148 (%)	n=98 (%)	N=246 (%)		
Tested	109 (73.6)	35 (35.7)	144 (58.5)		
Not tested	39 (26.4)	63 (64.3)	102 (41.5)	1.367	<0.001

Tested Fever cases with respect to malaria

	Public	<u>Private</u>	Public	Total		
	n = 110 (%)	n = 34 (%)	N= 144 (%)			
Malaria positive	61 (55.6)	15 (44.1)	76 (52.8)			
Malaria negative	46 (41.8)	17 (50.0)	63 (43.8)			
Unknown	3 (2.7)	1 (2.9)	4 (2.8)	<u>1.0278</u>	<u>0.598</u>	

Untested fever cases diagnosed clinically as malaria and treated with ACT

	Public	Private	Total		
	n=39 (%)	n=63 (%)	N=102 (%)		
Treated (malaria)	3 (7.7)	50 (79.4)	53 (52.0)		
Not treated (not malaria)	36 (92.3)	13 (20.6)	49 (48.0)	49.573	<0.001

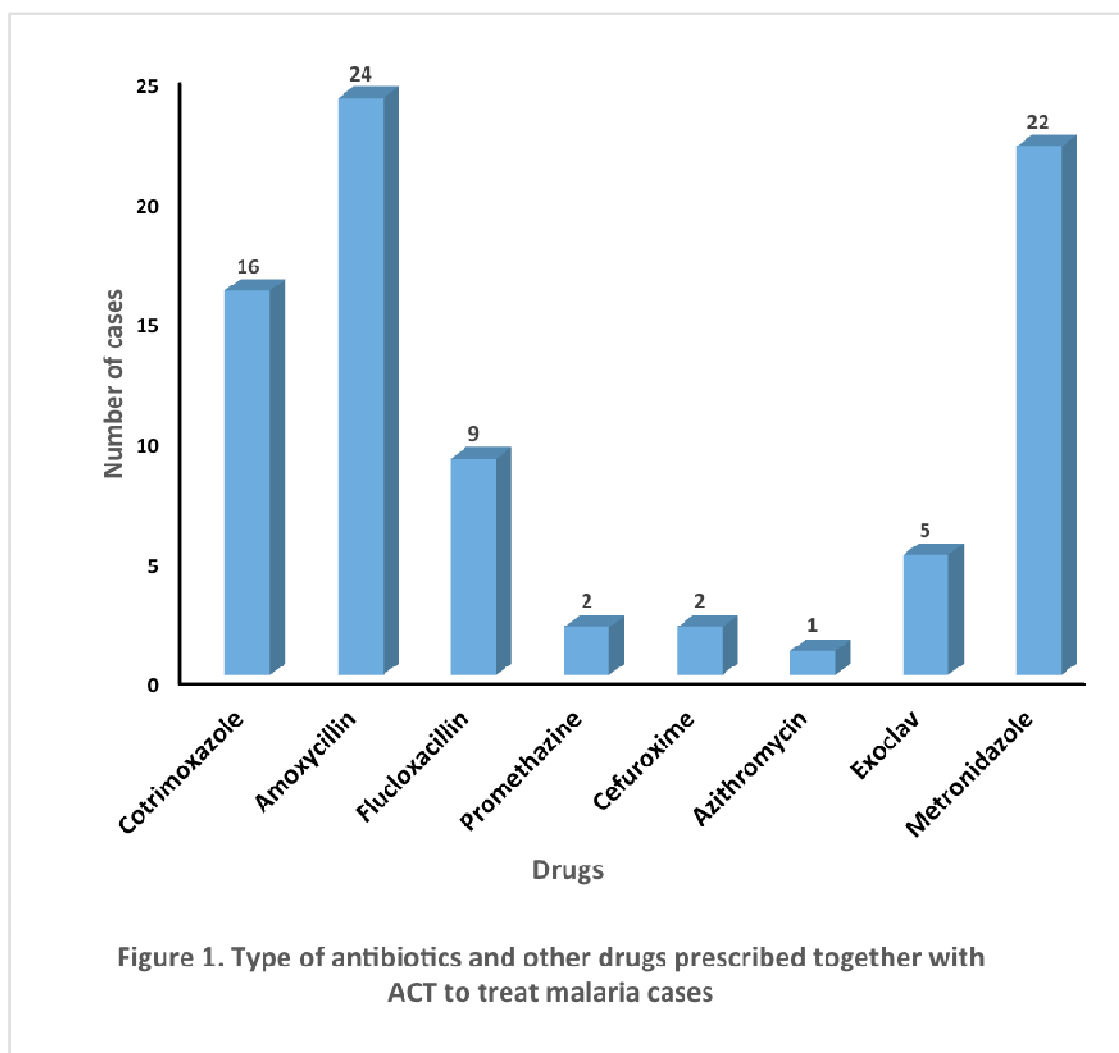
Table 3: Fever case management distribution

	Fever	No fever	Total	χ^2	P-value
	n= 246 (%)	n = 54 (%)	N = 300 (%)		
Age group					
0-11months	59 (24.0)	14 (25.9)	73 (24.3)	2.509	0.643
12-23months	59 (24.0)	8 (14.8)	67 (22.3)		
24-35months	47 (19.1)	12 (22.2)	59 (19.7)		
36-47months	43 (17.5)	12 (22.2)	55 (18.3)		
48-59months	38 15.4)	8 (14.8)	46 (15.3)		
Sex of child					
Male	117 (47.6)	25 (46.3)	142 (47.3)	0.028	0.866
Female	129 (52.4)	29 (53.7)	158 (52.7)		
Fever Testing					
	Tested	Not Tested	Total		
	n=144(%)	n=102 (%)	N=246 (%)		
Age group					
0-11months	28 (19.4)	31 (30.4)	59 (24.0)	6.447	0.168
12-23months	33 (22.9)	26 (25.5)	59 (24.0)		
24-35months	32 (22.2)	15 (14.7)	47 (19.1)		
36-47months	25 (17.4)	18 (17.6)	43 (17.5)		
48-59months	26 (18.1)	12 (11.8)	38 (15.4)		
Level of education for caregivers/parents/guardians					
No formal education	11 (7.6)	12 (11.8)	23 (9.3)	1.861	0.602
Primary/JHS/Middle school	96 (66.7)	67 (65.7)	163 (66.3)		
SHS/O & A Level	24 (16.7)	17 (16.7)	41 (16.7)		
Tertiary	13 (9.0)	6 (5.9)	19 (7.7)		
Test Result					
	Treated	Not treated	Total		
	n = 90 (62.5%)	n = 54 (37.5%)	N = 144 (100%)		
Malaria positive	76 (52.8)	0 (0.0)	76 (52.8)	97.333	<0.0001
Malaria negative	14 (9.7)	50 (34.7)	64 (44.4)		
Unknown (not clear)	0 (0.0)	4 (2.8)	4 (2.8)		

Fever cases treated with ACT					
Fever Cases	Treated with ACT	Not treated with ACT	Total		
	n=143 (58.1%)	n=103 (41.9%)	N=246 (100%)		
Tested	90 (36.6)	54 (22.0)	144 (58.5)		
Not tested	53 (21.5)	49 (19.9)	102 (41.5)	2.723	0.099

Prescribing antibiotics and other drugs

Majority (52.4%) of the 143 malaria cases treated with ACT were prescribed antibiotics in addition whilst 47.6% were not. Amoxicillin was the most prescribed antibiotic, followed by metronidazole, whilst Azithromycin was the least prescribed (Figure 1).



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241 Challenges confronting clinicians

242 The challenges confronting clinicians in the implementation of the T3 strategy were
243 explored. Figure 2 shows that out of the ten clinicians interviewed, eight (80%~~8/10~~)
244 mentioned frequent RDT stock outs as a major challenge to implementation of the T3
245 strategy, seven (70%~~7/10~~) mentioned lack of diagnostic tools for non-malaria febrile cases,
246 six (60%~~6/10~~) believed RDTs do not give accurate results hence they don't adhere to
247 negative RDT results, and four (40%~~4/10~~) cited frequent ACT stock-outs as a challenge.
248 Clinicians did not find lack of diagnostic facilities (RDTs/Microscopy), inadequate training
249 on RDTs use/malaria case management and patients resistance to diagnostic testing as a
250 challenge. Fifty-five (38.5%) of the 143 children under-five who were treated for malaria
251 were asked by clinicians to return to the respective health facilities for review. Among the 55
252 malaria cases returning to the health facilities for follow-up, most (61.8%) were to return
253 only if the child's condition does not improve, whilst 38.2% were to return for follow-up on
254 specific dates given by the clinician.
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Discussion

In order to ensure effective malaria control, the WHO recommends that every suspected fever case must be tested and confirmed before treatment with the appropriate anti-malaria drugs (ACT), following introduction of the T3 strategy in 2012 [1].

Diagnosis of fever cases was associated with the type of health facility. The current study shows that 58.5% of all the fever cases observed were tested for malaria parasites before treatment. However, a sizable proportion (41.5%) of the fever cases were not tested for the presence of malaria parasites before treatment. By this result, clinicians' adherence to test of fever cases can be described as poor among the facilities surveyed. Similar findings were reported by Nyandigisi et al [7] in Kenya in a cross sectional survey, in which only 38% of cases were tested out of 420 febrile children under-five years. It is however lower than the 94.6% test adherence rate observed by Manyando et al [6] in some health facilities' survey among 2,393 febrile children in Zambia.

Of the 143 treated cases of fever, 90 representing 36.6% of all the fever cases were both tested and treated with ACT. This is comparable to findings from Abdelgader et al [14] in the Republic of Sudan where 35% of febrile patients among children under-five surveyed were both tested and treated according to test results. Of the tested fever cases in the current study, 52.8% were confirmed positive for malaria and were all treated with ACT, whilst 44.4% tested negative of malaria of which 21.9% were surprisingly treated with ACT as malaria cases. The 100% adherence to the treatment of test positive malaria cases with ACT by clinicians is however commendable. Nevertheless, the poor adherence to negative test result is undesirable and not commendable.

It however confirms the assertion by Baiden et al [15] that in the absence of appropriate diagnostic tools for non-malarial fevers, clinicians are likely to overlook negative malaria test results and still prescribe anti-malarial drugs to all cases of non-malarial febrile illnesses. This result conforms to a study in Burkina Faso by Bisoffi et al and his colleagues [16]. In their study clinicians' adherence to the negative test result was about 20% in all age groups and that adherence to positive test result, although very high, was below 100%. However, it is lower than results by Manyando et al [6] in Zambia where 68.6% of children with negative test results were treated with anti-malaria drugs despite high adherence to testing of fever cases by clinicians.

It was also observed that 21.5% of all (246) fever cases were not tested but were equally treated with ACT as malaria, based on clinical judgment. It is therefore obvious that, a substantial proportion of febrile cases are still presumptively treated as malaria despite the availability of RDTs and the emphasis on testing and treatment based on test results. This is evidence of the assertion by Bastiaens et al [17] that the availability of reliable easy-to-use tests in theory should result in a switch from presumptive treatment (based on signs and symptoms alone) to parasite-based diagnosis and treatment based on test results, but in practice however, healthcare providers often do not comply with diagnostic processes and treatment. In the present study most of the untested fever cases were recorded and treated in private health facilities than public health facilities. There was a significant relationship between the number of fever cases (treated and not treated) and the type of health facility (public and private). This implies that the presumptive treatment or non-treatment of untested fever cases is dependent on the type of health facility one attends.

Parents/guardians were probed on the duration of treating child's malaria with ACT. This was necessary to determine how well they were informed by clinicians on the adherence to full courses of malaria treatment regimens. Overwhelmingly, 95.0% of the 143 whose children were prescribed ACT, said it should be given to the child for three days to ensure full treatment of malaria, 1.0% believed it should be given for four days whilst 4.0% said

they did not know the number of days it should be given to treat the child's malaria. This is comparable to findings by Zurovac et al [18] on malaria case management under Artemether-lumefantrine (AL) treatment policy in Uganda. They observed that 97% of patients were told how to take AL at home.

The present study revealed that more than half (52.4%) of all the 143 malaria cases treated with ACT were additionally supplied with antibiotics. This is not different from results from a cross sectional survey conducted in Kenya by Nyandigisi et al [7] in which 61.2% ~~out~~ of [the](#) 89.6% malaria positive cases treated with ACT (Artemether-Lumefantrine) were prescribed antibiotics. The reasons for which these antibiotics were prescribed were not known.

On the tracking of malaria cases by clinician, apart from the recording of individual cases, diagnostic test/results and treatments given, at health facilities, a significant proportion (61.5%) of all the cases treated as malaria were not followed (tracked). This is because parents/guardians were not informed by the clinicians² to return to the respective facilities for a review or follow-up to determine their treatment outcomes. Thus, 38.5% of the respondents were asked to return for follow-up/review. Moreover, 61.8% were asked to return only if the child's condition does not improve, whilst 38.2% were given a specific date to return for a follow-up. Tracking of malaria cases and treatment outcomes is very essential in malaria control efforts because it will help in determining and reporting the actual/true malaria cases. But it doesn't seem to be a priority of clinicians as per the findings of this study. As indicated by Thiam et al [19], the ability to track identified malaria cases and the impact of anti-malarial interventions through the T3 strategy will enable malaria elimination to be seriously contemplated.

Frequent RDT stock-outs, lack of diagnostic tools for non-malaria febrile illnesses, RDT not giving accurate results and frequent ACT stock-outs were the major challenges hindering the smooth implementation of the T3 strategy. Moreover, the adherence of clinicians to the T3 policy is highly dependent on the constant supply of RDTs, other diagnostic facilities and ACTs. As reported in Uganda, the basic determinant of effective malaria case-management is the availability of "Test and Treat" commodities [18]. In Ghana, it was reported that lack of diagnostic tools for non-malaria febrile cases was the results of the many years of over-diagnosis and over-emphasis on malaria at the expense of attention to non-malaria febrile illnesses, hence, the capacity for their diagnosis and management remain poorly developed [15]. Therefore, to ensure strict adherence to the T3 Policy by clinicians, testing facilities, malaria drugs and other supplies should be constantly available. Training and sensitization of clinicians' on the T3 policy by the relevant stakeholders is indispensable.

Conclusions

It was encouraging to observe that ACT was used for the treatment of all malaria cases against non-recommended therapies. Nevertheless, the level of adherence to the test of fever cases, negative test results, and tracking of malaria cases were major problems that need attention. General adherence to the T3 strategy was not encouraging. We recommend that the MOH/GHS should ensure adequate and sustained supply of RDTs and ACTs to both public and private health facilities. The WHO in collaboration with other agencies should develop diagnostic tools and guidelines for non-malarial fevers and incorporate them into malaria case-management. The GHS and the Ho MHD should sensitize clinicians on the relevance of the T3 strategy, especially; mandatory testing and adherence to negative test results, tracking of malaria cases and the use of antibiotics in malaria treatment. More research should be conducted to determine the sensitivity and specificity of RDTs especially after it has been stored for some time at the health facilities.

Limitations of the study

1. The information given by respondents could not be compared to that of the consulting room registers ([medical records](#)) of the various health facilities.
2. The study did capture information on the availability of RDTs at the time of the survey.
3. The study could not also explore from clinicians the reasons for the prescription of antibiotic in addition to ACTs for some of the malaria cases.

List of abbreviations

MOH, Ministry of Health; RDT, ACT, Artemisinin-based Combination Therapy; Rapid Diagnostic Test; T3, Test Treat and Track; WHO, World Health Organization; ITN, Insecticide Treated Bed Net; IRS, Indoor Residual Spraying; NMCP, National Malaria Control Programme; OPD, Out Patient Department; MHD, Municipal Health Directorate; SPSS, Statistical Package for Social Sciences; Hb, Haemoglobin; GHS, Ghana Health Service; GHS-ERC, Ghana Health Service Ethical Review Committee.

Declarations

Ethical approval and consent to participate

Ethical clearance was obtained from the Ghana Health Service Ethical Review Committee (GHS-ERC) with the approval identity (GHS-ERC; 06/04/15). Permission was also sought from the municipal health directorate and the heads of the health facilities. Moreover, the parents/guardians of the children consented to be part of the study.

Consent for publication

Written informed consent was obtained from the study participants for publication of this research work. A copy of this form is available for review by the Editor of this journal.

Competing interests

The authors declare that they have no competing interests

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