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Prescribing Practices for Uncomplicated Malaria in a Rural District in Ghana, 2012

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Authors' contributions

This work was carried out in collaboration between all authors. Author DKA designed and conducted the study under the supervision of author EAA. Author DKA also drafted the first manuscript. Authors EAA, FW, KLM and SS critically reviewed the protocol, the final work and the manuscript. Author KMN helped in the design of the study and also critically reviewed the draft manuscript. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

Background: The use of Artemisinin-based Combination Therapies (ACTs) for laboratory confirmed malaria, in conformity to recommended guidelines, remains critical to halting the emergence of drug resistance. We reviewed prescribing practices for malaria in Kwahu South District (KSD) and determined factors influencing conformity to guidelines.

Methods: We conducted a cross-sectional survey in seven health facilities from three randomly selected sub-districts in KSD. We reviewed patients' records with a diagnosis of malaria from January to December 2012. Patients' records were selected by systematic random sampling. Variables reviewed were demographics, clinical presentation and prescription patterns. Prescriptions were considered to conform to recommended guidelines if ACT was prescribed for confirmed uncomplicated malaria and not prescribed for test negative or presumptive malaria. Frequencies, relative frequencies, mean and median were calculated. Unadjusted odds ratios were used to determine associations at 5% significance level. Predictors of conformity were determined by logistic regression

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model, adjusting for potential confounders.

Results: Four hundred and four records were reviewed of which 247(61.1%) were females. Median age was 23 years (interquartile range 12-38). Overall, 202(50%) of prescriptions conformed to guidelines: 132 (65.3%) being Artesunate-Amodiaquine (AA). Temperature of $\geq 37.5^{\circ}\text{C}$ [adjusted odds ratio (AOR)=1.8, (CI:1.11-2.92)] and being managed at the district hospital [AOR=8.7, (CI:5.41-14.12)] were independent predictors of conformity.

Conclusion: Conformity of prescribing practices to recommended guidelines was suboptimal. Determinants of conformity were fever and being managed at the hospital. We recommended targeted interventions to improve conformity of case management practices to guidelines.

Keywords: Malaria; prescription practices; conformity; Ghana.

1. INTRODUCTION

Malaria remains a major public health problem threatening the lives of individuals in the world's most under developed countries [1]. Approximately, half of the world's population is at risk of the disease [1]. Though preventable and curable, it causes high morbidity and mortality. Majority of this mortality burden is borne by children living in sub-Saharan Africa where a child dies every minute from malaria [1]. In Ghana, malaria is hyper endemic [2] with a crude parasite rate ranging from 10-70% and *Plasmodium falciparum* being the dominant malaria parasite [3,4]. It is the number one cause of outpatient attendance accounting for 38% of out-patient illnesses in 2010 [5]. It is the leading cause of workdays lost as a result of illness and therefore contributing the most to potential income loss compared to other diseases. Asante and Asenso-Okyere revealed that, about nine work days were lost per malaria episode by economically active patients while more than five workdays were lost by their caretakers [6].

Effective and prompt case management has been recognized as the cornerstone in malaria control [7–9]. It reduces morbidity, prevents mortality and contributes to reduction in the transmission of the disease [1]. Artemisinin-based Combination Therapy (ACT) is currently the best available treatment for uncomplicated malaria. However, in recent years, parasite resistance to artemisinin is emerging with non-compliance with ACT being recognized as the main driver [1]. With no clear alternative in sight to ACT, targeted treatment of laboratory confirmed malaria offers a means of delaying the emergence of resistant parasites. The World Health Organization (WHO) recommends universal parasitological diagnosis (either by microscopy or by rapid diagnostic test (RDT)) and targeted treatment of uncomplicated malaria with ACT, reserving presumptive diagnosis for consideration when parasitological diagnosis is impossible [1].

Consistent with WHO recommendations and in response to widespread parasite resistance to chloroquine, Ghana adopted the use of highly effective ACTs in 2004 for treatment of uncomplicated malaria [3]. Accordingly, malaria case management guidelines were developed and have subsequently been revised to reflect current trends in case-management. Training and supervision of health workers in malaria case management are also being done regularly [5]. According to Ghana's current antimalarial policy, Artesunate-Amodiaquine (AA) is the first line drug for uncomplicated malaria with Artemether-Lumefantrine (AL) and Dihydroartemisinin-Pyeperaquine as alternatives for those who cannot tolerate AA [2].

Compliance of health workers to diagnostic and treatment guidelines is critical to effective implementation of malaria case management policies [10] and hence an improvement in malaria morbidity and mortality indicators. However, inappropriate patterns of antimalarial prescriptions have been documented following changes in national treatment policies and availability of evidence-based guidelines [11–15]. Non-compliance of health workers to recommended guidelines had also been recorded in Ghana prior to implementation of the new ACT treatment policy [16]. Almost a decade after the adoption of ACT for treatment of uncomplicated malaria, health workers' conformity to recommended guidelines still remains suboptimal. Presumptive diagnosis and inappropriate prescription of anti-malarials have been implicated in the high reported malaria caseloads [4,5]. Limited data however, exists on health workers' prescription practices. Data on prescription patterns will therefore be essential in developing interventions or strategies for malaria case management. We therefore evaluated health worker prescribing practices and associated factors for uncomplicated malaria in the Kwahu South District.

2. MATERIALS AND METHODS

2.1 Study Design

A retrospective review of health facility records with diagnosis of malaria during January to December 2012 was conducted in the Kwahu South District from 18th April to 19th May 2013.

2.2 Study Area

Kwahu South District is one of the 26 districts in the Eastern Region of Ghana and about 200 km from Accra, the capital city of Ghana. The district has a population of 69, 757 with a predominantly rural population of 50,883. Males constitute 33,094 giving a sex ratio of 1: 1.1 [17]. Children under five years constitute about 28% of the total population. The district is divided into six sub-districts and served by 17 public health facilities including one district general hospital. Malaria transmission in this area is endemic with seasonal fluctuations. Higher malaria transmission occurs during the major rainy season between April and July annually. Diagnostic and treatment services are provided by health workers at all levels of the health delivery; that is the district hospital, health centres and the lowest level of care also known as the Community-based Health Planning and Services (CHPS) compounds. Prescribers in the district hospital are medical officers and physician assistants whilst at the health centres and CHPS compounds, physician assistants and nurses of various categories are the prescribers.

2.3 Sample Size

A total of 404 records were selected for the study. The sample size was estimated based on sampling formula for single proportions [18] assuming the prevalence of compliance to anti-malarial treatment guidelines of 88.1% [19], standard score of 1.96 for 95% confidence interval, a precision of 5%, a design effect of 2 to cater for intra-cluster variability and adjusting for 20% of the records with no documentation on key variables of interest such as age and major presenting complaint.

2.4 Data Collection

We randomly selected fifty percent of the sub-districts and all the seven public health facilities in the selected sub-districts were included in the study. The 404 records were

allotted to all the seven health facilities based on proportion of their malaria caseloads for the preceding year. The records for each health facility were selected by systematic random sampling using the ratio of the caseload for the preceding year and the allotted number of records per facility as the sampling interval. We abstracted data on patient demographics, clinical presentation and prescription patterns. Prescriptions were considered to conform to recommended guidelines if ACT was prescribed for confirmed uncomplicated malaria and not prescribed for test negative or presumptive malaria.

2.5 Statistical Analysis

Descriptive statistical analysis was performed where categorical variables were expressed as frequencies and relative frequencies. Continuous variables that were uniformly distributed were expressed as means (+/-standard deviation) and those non-uniformly distributed expressed as medians (interquartile ranges). In inferential statistical analysis, Chi square and Fisher's exact tests were used to determine association between outcome and explanatory variables at 5% significance level. The outcome variable was compliance with recommended guidelines (Yes/No). The explanatory variables were age (categorized at 5 and 12 years), sex of the patient, possession of valid national health insurance card, having fever (either by history or measured axillary temperature $\geq 37.5^{\circ}\text{C}$), having an additional diagnosis to malaria and being managed at the hospital facility. Unadjusted odds ratios and their corresponding 95% confidence intervals were calculated in bivariate analysis. Explanatory variables found to be significantly associated with compliance with recommended guidelines were put in a logistic regression model, to determine factors independently associated with compliance at statistically significant levels. Epi info Version 3.5.4 was used for data entry, cleaning and analysis.

3. RESULTS

3.1 Health Facility and Patient Characteristics

Overall, seven health facilities were included in the study. Of these, one (14.3%) was a hospital, three (42.9%) health centres, one (14.3%) clinic and three (42.9%) CHPS compounds. Majority, 287 (71.0%) of the records were for people 12 years and above and 44 (10.9%) belonged to children under five years old. The median age of patients was 23 years (interquartile range; 12-38). There were 247 (61.1%) females. The age and sex distribution of the patients are shown in (Table 1).

3.2 Prescription Practices

Overall, 206 (51.0%) of the 404 were tested for malaria and 105 (51.0%) were confirmed positive. In four of the records of those tested, there was no written record of the test results. All except six of the patients were given ACTs including all the 97 test negative patients. AL was the most prescribed anti-malarial for 266 (65.8%), AA for 132 (32.7%), quinine for five pregnant women in their first trimester and artesunate monotherapy for one patient. The mean number of drugs per patient was 4.1 (+/-0.9). Of the 198 records without any documentary evidence of diagnostic testing, 144 (72.7%) were from health facilities other than the hospital. Ninety five percent of records from the health centres and CHPS compounds combined had poor documentation of written notes on patients' complaints, examination findings as well as laboratory requests and findings. Interestingly, none of the 404 records had written notes on counseling messages given.

Table 1. Age and sex of patients by type of health facility in Kwahu South District, 2012

Patient characteristics	Health facility type				Overall	
	Hospital	Health centre	Clinic	CHPS		
	N (%)	N (%)	N (%)	N (%)		
Sex	Female	156(61.9)	66(57.9)	18(64.3)	7(70.0)	247(61.1)
	Male	96(38.1)	48(42.1)	10(35.7)	3(30.0)	157(38.9)
Age	0-4years	21(8.3)	23(20.2)	0(0.0)	0(0.0)	44(10.9)
	5-12years	34(13.5)	20(17.5)	10(35.7)	1(10.0)	65(16.1)
	>12years	197(78.2)	64(56.1)	17(60.7)	9(90.0)	287(71.0)
	Missing	0(0.0)	7(6.1)	1(3.6)	0(0.0)	8(2.0)
Total		252(100.0)	114(100.0)	28(100.0)	10(100.0)	404(100.0)

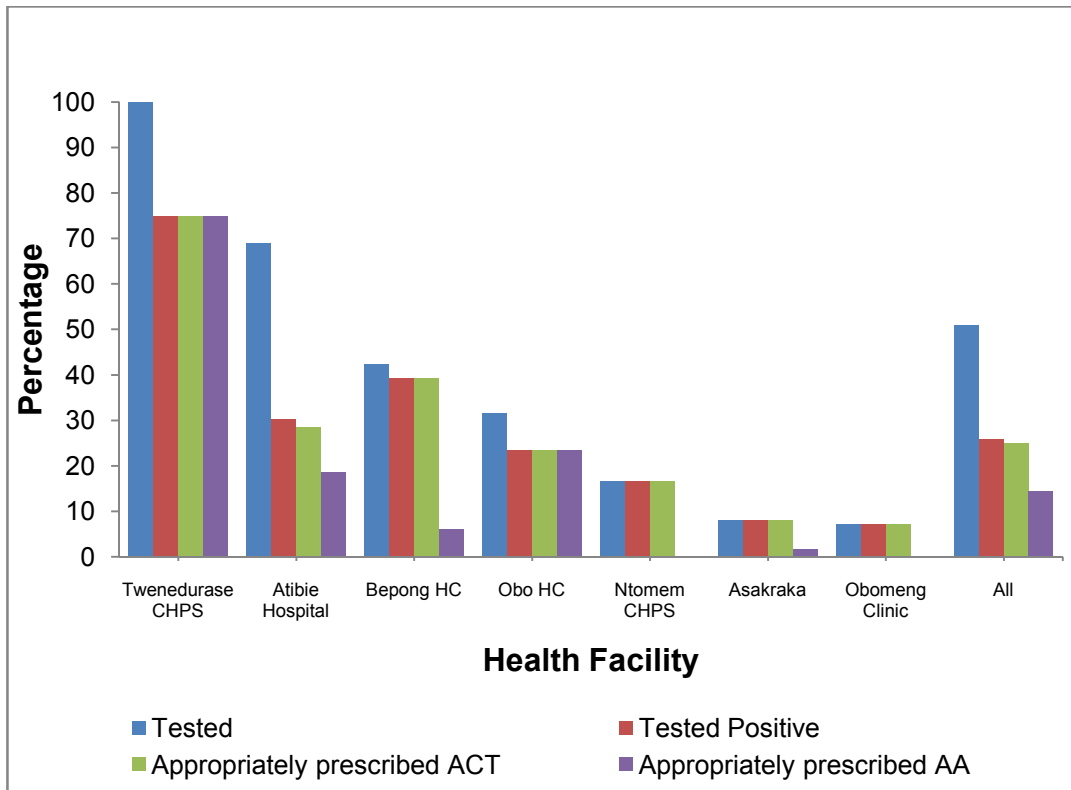


Fig. 1. Proportion of malaria patients tested (microscopy or RDT) and appropriately prescribed ACTs by health facility, Kwahu South District, 2012

The proportion of malaria patients who had diagnostic testing done and the proportion of test positive cases given ACT prescription as evident by documentation are shown in (Fig. 1 above). Blood film microscopy was done at the hospital whilst RDT was the only means of diagnosing malaria at the lower health facilities. None of the facilities recorded stock out of diagnostics, AA or AL within the period under study.

3.3 Factors Associated with Compliance with Recommended Guidelines

As shown in (Table 2), the factors significantly associated with appropriate treatment from the bivariate analysis were: presenting complaints of fever [OR=1.9 (CI:1.25-3.03)], measured temperature $\geq 37.5^{\circ}\text{C}$ [OR=1.8 (CI:1.11-2.92)] and being managed at the hospital compared to other facilities [OR=8.7 (CI:5.41-14.12)]. These factors were positively associated with compliance with recommended guidelines.

Table 2. Factors associated with conformity to recommended malaria case management guidelines in Kwahu South District, 2012

Factor	N (%) conforming	Unadjusted OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value
Facility type hospital					
Yes (n=252)	172(68.3)	8.7(5.41-14.12)	<0.001	9.2(5.29-15.95)	<0.001
No (n=152)	30(19.7)				
Measured fever					
$\geq 37.5^{\circ}\text{C}$ (n=92)	58(63.0)	1.8(1.11-2.92)	0.02	2.7(1.48-4.85)	0.001
<37.5 $^{\circ}\text{C}$ (n=271)	132(48.7)				
History of fever					
Yes (n=298)	158(54.7)	1.9(1.25-3.03)	0.003	1.4(0.84-2.42)	0.19
No (n=115)	44(38.3)				
Sex					
Males (n=157)	70(44.6)	0.7(0.47-1.05)	0.08		
Females (n=247)	132(53.4)				
Age					
≤ 12 years (n=109)	59(54.1)	1.2(0.77-1.87)	0.41		
>12 years (n=287)	142(49.5)				
<5 years (n=44)	23(52.3)	1.1(0.57-2.01)	0.83		
≥ 5 years (n=352)	178(50.6)				
Malaria diagnosis					
Malaria+additional diagnosis (n=143)	67 (46.9)	0.8(0.55-1.26)	0.39		
Malaria diagnosis alone (n=259)	133 (51.4)				
Possession of NHIS card					
Yes (n=392)	199(50.8)	7.2(0.88-59.22)	0.07*		
No (n=8)	1(12.5)				

* P-value was determined by Fisher's exact test, as one of the expected cells was less than 5

Bivariate analysis also showed positive association between compliance with guidelines and factors such as patient's age less than five years [OR=1.2 (CI: 0.62-2.17)], age greater than 12 years [OR=1.2 (CI:0.77-1.87)] and possession of active National Health Insurance Scheme (NHIS) card [OR=6.9, (CI:0.85-56.79)]. On the other hand, the odds of compliance were lower in male patients compared to female patients [OR=0.7, (CI:0.47-1.05)] and in patients having additional diagnosis to malaria [OR=0.8, (CI:0.55-1.26)]. All these differences, however, were statistically insignificant. Age was categorized into two groups namely less than five years and five years or more as well as 12 years or less and above 12 years. This is because children less than five years bear the brunt of malaria and are important benchmark in public health importance of the disease whilst the age of 12 years is usually used as cut-off for paediatric and adult patients.

After adjusting for the effects of the factors with significant association in the bivariate analysis in the logistic regression model, the independent predictors of compliance with recommended guidelines were: measured temperature of 37.5°C or more [AOR=2.7, (CI:1.48-4.85)] and being managed at a hospital [AOR=9.2, (CI:5.29-15.95)].

4. DISCUSSION

Our study provides an assessment of the conformity of antimalarial prescriptions to recommended guidelines. The use of ACTs in uncomplicated malaria treatment was almost universal. The only exception to this was one record where a patient was treated with artesunate monotherapy contrary to guidelines. In spite of high level of compliance with ACT prescription, most of the prescriptions deviated from the algorithm of appropriate treatment of malaria. Presumptive diagnosis and treatment, as well as prescribing anti-malarials for patients who tested negative for malaria were quite common. This observation of inappropriate treatment of test negative cases was more pronounced in other studies [7,14,20,21] and was most likely due to prescribers' lack of trust in test results as observed elsewhere [21].

The high proportion of patients prescribed ACT is consistent with findings by Sears et al. [22] but far higher than that found in South East Nigeria where less than half of the prescriptions from government hospitals and only 16.7% of prescriptions from private hospitals were ACTs, contrary to recommended guidelines [12]. In the latter study, only 4.6% of the recommended first line treatment of uncomplicated malaria consisted of AL. These differences could be explained by the fact that the change of policy to ACT use was relatively new in Nigeria at the time of the study and therefore prescribers had not fully adapted to it.

The use of alternative first line drug AL dominated contrary to recommended first line AA. This corresponds to findings in other studies where health workers used other anti-malarials other than the recommended first line drug combination [14,15]. However, it contrasts with 60% [23] and 97.3% [22] conformity to prevailing first line drug (AL) observed in Uganda. The non-compliance to AA as first line in our study could be due to reported adverse reactions that accompanied its use [2] and negative media coverage on its safety [15] during the initial stages of its introduction. The perception that AL is more desirable than other ACTs transcends the borders of Ghana. Health workers in Kenya considered AL as more efficacious and tolerable than Amodiaquine and other ACTs [11].

Diagnostic testing in the form of RDT or blood film microscopy for malaria parasites was done for 51% of the patients contrary to the recommended testing of all suspected cases. This could be as a result of lack of proper documentation of tasks by the health workers particularly at the lower level facilities where diagnostic testing rate was observed to be low. Other studies however, found lower rates of testing of suspected cases [12,21,24,25]. Testing is very critical to minimizing over diagnosis, over treatment and missing of other potentially serious diseases with their resultant consequences. The level of disregard of negative test results was 47.1%. This is lower than the 82% and 79.3% observed in Papua New Guinea and Kenya respectively [20,25].

In the bivariate analyses, fever (either by history or by measured axillary temperature of $\geq 37.5^{\circ}\text{C}$) was positively associated with conformity to guidelines at statistically significant levels. This means that, compared to those who did not have fever, patients with fever were more likely to have been treated according to standard guidelines. This association

remained significant for measured axillary temperature $\geq 37.5^{\circ}\text{C}$, but not history of fever, after potential confounding factors have been taken into account. This underscores the importance of measuring temperature of patients at the clinics as those whose temperature may not have been measured may have missed being managed according to guidelines. It seems that health workers had high index of suspicion for malaria when a patient's temperature was 37.5°C or more. Such patients would therefore be treated more meticulously and in conformity to guidelines. This contrasts with findings from studies in Kenya [13] and Uganda [23] where chief complaint of fever was associated with high treatment quality. The odds of being managed in compliance with guidelines was significantly higher among those who were treated in the hospital than those treated in the lower health facilities. This finding is quite alarming as it suggests that lower health facilities, which are expected to be the primary port of call to most of the malaria cases, are deficient in malaria case management capacity. This could probably be explained by the fact that the prescribers at the hospital are mostly medical doctors and physician assistants who are formally trained to manage malaria cases unlike other cadres of staff at the lower facilities. Some of these personnel perform outpatient consultations because of shortage of staff and not as a primary function.

Using the facility type as a proxy for cadre of health staff, higher health worker cadres are more likely to manage appropriately than lower health worker cadres. The exact explanation for this is unclear but may be attributed to the differences in the level of training and experience between the higher and lower cadres of health workers. Poor documentation of tasks at the lower health facilities observed in this study may also be a contributing factor. Since these results were based on the documented tasks in the records, facilities that are averse to documentation may be reflected in poor light with regards to malaria case management practices. This finding however, is in agreement with other studies [16,19,23,26] but contrast with findings from studies in Kenya, Ghana and Benin where lower staff like nursing aides adhered much more closely to treatment guidelines than nurses and clinical officers [13,16,27].

Age less than five years as well as being a paediatric patient (less than or equal to 12 years) was not associated with appropriate treatment of malaria. This finding contrasted with findings from elsewhere where age was a predictor of compliance with treatment guidelines [13,15,27]. This finding of age not being an independent predictor of compliance with guidelines seems rather disturbing as it suggests that patients are managed in the same way irrespective of their ages. The critical age group of under-five years in whom the effects of malaria are amplified are not being given the extra attention they require in terms of case management. Having an additional diagnosis to malaria was not significantly associated with appropriate treatment of malaria. This means that presenting with multiple pathologies was not a barrier to receiving appropriate treatment.

This study is limited by the fact that it is based on review of documented assessment tasks performed by health workers. Therefore failure of health workers to document the tasks performed will therefore be misinterpreted as non-performance leading to underestimation of some case-management indicators. Nevertheless, the results highlight practices as it pertain to the district and the lack of documentation may be recognized as a major setback in the practice of the health workers. Given the various methods used to explore this subject matter under different settings, comparison of the results of this study with other studies must be done with caution.

5. CONCLUSION

Prescribing practices for malaria by health workers in the Kwahu South District are less than optimal. Non-compliance with universal utilization of diagnostic testing and inappropriate decision to prescribe anti-malarials featured prominently as gaps. Use of ACTs was the norm, though not all patients were tested before treatment in accordance with national treatment guidelines. The use of AA as recommended first line drug was low in favour of alternative first line AL. Significant predictors of compliance with guidelines were measured fever and being managed at the hospital. The National Malaria Control Programme should intensify training and supervision particularly of health workers at the lower health facilities to improve their compliance to standard guidelines.

CONSENT

Not applicable.

ETHICAL APPROVAL

Ethical approval was obtained from the Ghana Health Service Ethical Review Committee and permission was sought from the Kwahu South District Health Directorate and the management of the selected health facilities prior to commencement of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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