

Original Research Article

Prescribing practices for uncomplicated malaria in a rural district in Ghana, 2012

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 determine 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 and median were calculated. Unadjusted odds ratios were used to determine associations at 5% significance level. Predictors of conformity were determined by logistic regression model, adjusting for potential confounders.

Results: Four hundred and four records were reviewed of which 247 (61.1%) were females. Median age was 12 years (interquartile range 12-38). Overall, 202 (50%) of prescriptions conformed to guidelines: 132 (65.3%) being Artesunate-Amodiaquine (AA). Temperature of $\geq 37.5^{\circ}\text{C}$ [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, nine workdays were lost by economically active people as a result of malaria 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 resistant 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) 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, ArtesunateAmodiaquine (AA) is the first line drug for uncomplicated malaria with ArtemetherLumefantrine (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. MATERIAL AND METHODS

2.1 Study design

A retrospective review of health facility records with diagnosis of malaria during January 2012 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

72 km from Accra, the capital city of Ghana. The district has a population of 69, 757 with a
 73 predominantly rural population of 50,883. Males constitute 33,094 giving a sex ratio of 1:
 74 1.1[17] Children under five constitute about 28% of the total population. The district is
 75 divided into six sub-districts and served by 17 public health facilities including one district
 76 general hospital. Malaria transmission in this area is endemic with seasonal fluctuations.
 77 Higher malaria transmission occurs during the major rainy season between April and July
 78 annually. Diagnostic and treatment services are provided by health workers at all levels of
 79 the health delivery; that is the district hospital, health centres and the lowest level of care
 80 also known as the Community-based Health and Planning Services (CHPS) compounds.
 81 Prescribers in the district hospital are medical officers and physician assistants whilst at the
 82 health centres and CHPS compounds, physician assistants and nurses of various categories
 83 are the prescribers.

84 **2.3 Sample Size**

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

91 **2.4 Data collection**

92 We randomly selected fifty percent of the sub-districts and all the seven public health
 93 facilities in the selected sub-districts were included in the study. The 404 records were
 94 allotted to all the seven health facilities based on proportion of their malaria caseloads for
 95 preceding year. The records for each health facility were selected by systematic random
 96 sampling using the ratio of the caseload for the preceding year and the allotted number of
 97 records per facility as the sampling interval. We abstracted data on patient demographics,
 98 clinical presentation and prescription patterns. Prescriptions were considered to conform to
 99 recommended guidelines if ACT was prescribed for confirmed uncomplicated malaria and
 100 not prescribed for test negative or presumptive malaria.

101 **2.5 Statistical analysis**

102 Descriptive statistical analysis was performed where categorical variables were expressed
 103 as frequencies and relative frequencies. Continuous variables that were uniformly distributed
 104 were expressed as means (+/- standard deviation) and those non-uniformly distributed
 105 expressed as medians (interquartile ranges). In inferential statistical analysis, Chi square
 106 and Fisher's exact test were used to determine association between outcome and
 107 explanatory variables at 5 % significance level. The outcome variable was compliance with
 108 recommended guidelines (Yes/No). The explanatory variables were age (categorized at 5
 109 and 12 years), sex of the patient, possession of valid national health insurance card, having
 110 fever (either by history or measured axillary temperature of greater than 37.5 °C), having an
 111 additional diagnosis to malaria and being managed at the hospital facility. Unadjusted odds
 112 ratios and their corresponding 95% confidence intervals were calculated in bivariate
 113 analysis. Explanatory variables found to be significantly associated with compliance with
 114 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%) Community Health Planning Services (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).

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

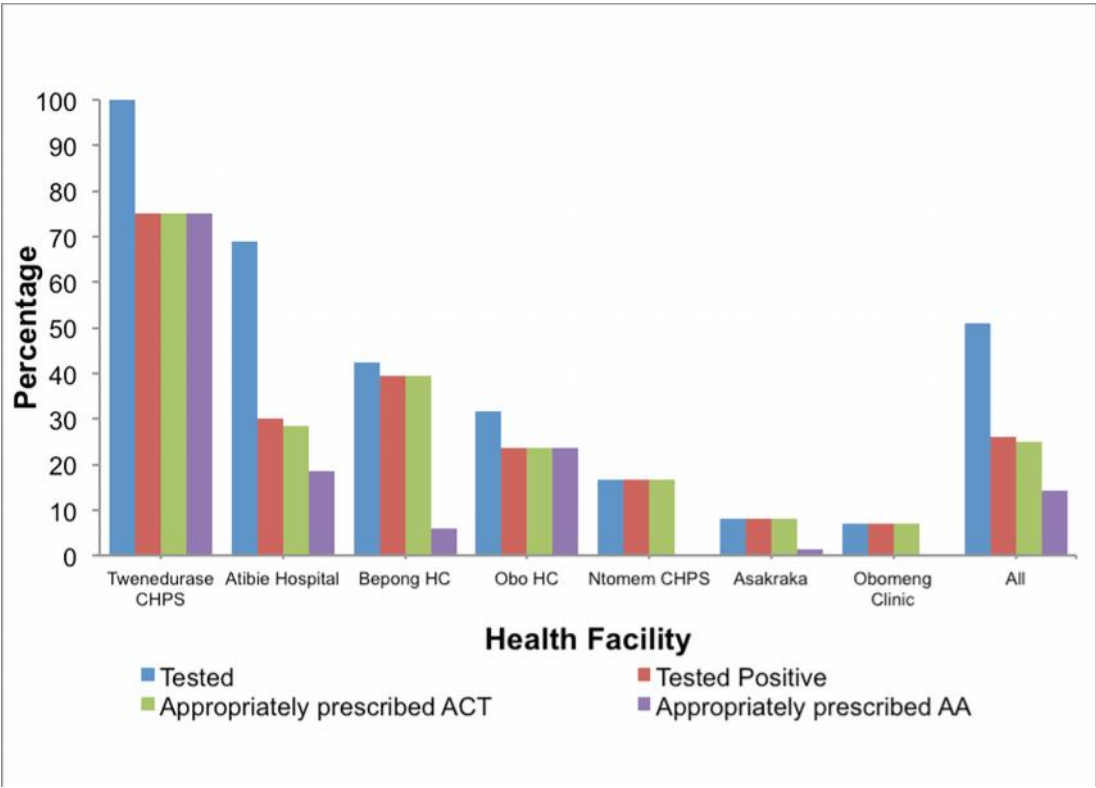
Patient Characteristics		Health Facility Type				Overall
		Hospital	Health Centre	Clinic	CHPS	
		n (%)	n (%)	n (%)	n (%)	n (%)
Sex	Female	156 (61.9)	66 (57.9)	18 (64.3)	7 (70.0)	247 (61.1)
	Male	96 (38.1)	48 (42.1)	10 (35.7)	3 (30.0)	157 (38.9)
Age	0-4 years	21 (8.3)	23 (20.2)	0 (0.0)	0 (0.0)	44 (10.9)
	5-12 years	34 (13.5)	20 (17.5)	10 (35.7)	1 (10.0)	65 (16.1)
	>12 years	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)

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-malarials for 266 (65.8%), AA for 132 (32.7%), quinine for five pregnant women in their first trimester and artesunate monotherapy for one patient. Of the 198 records without any documentary evidence of diagnostic testing, 144 (72.7%) were from health facilities under than the hospital. Ninety five percent of records from the health centre and CHPS compounds combined had poor documentation of written notes on patients' complaints, examination findings as well as laboratory request and findings. Interestingly, none of the 404 records had written note on counseling messages given.

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 (Figure 1). Blood film microscopy was done at the hospital whilst rapid diagnostic testing (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.

145 **Figure 1. Proportion of malaria patients tested (microscopy or RDT) and appropriately**
146 **prescribed ACTs by health facility, Kwahu South District, 2012**
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150 **3.3Factors associated with compliance with recommended guidelines**

151 As shown in (Table 2), the factors significantly associated with appropriate treatment from the
152 bivariate analysis were: presenting complaints of fever [OR = 1.9 (CI: 1.25-3.03)], measured
153 temperature of greater than 37.5°C [OR = 1.8 (CI: 1.11-2.92)] and being managed at the
154 hospital compared to other facilities [OR = 8.7 (CI: 5.41-14.12)]. These factors were positively
155 associated with compliance with recommended guidelines.
156 Bivariate analysis also showed positive association between compliance with guidelines and
157 factors such as patients less than five years [OR = 1.2 (CI: 0.62-2.17)], age greater than 12
158 years [OR = 1.2 (CI: 0.77-1.87)] and possession of active NHIS card [OR = 6.9, (CI: 0.85-
159 56.79)]. On the other hand, the odds of compliance were lower in male patients compared to
160 female patients [OR = 0.7, (CI: 0.47-1.05)] and in patients having additional diagnosis to
161 malaria [OR = 0.8, (CI: 0.55-1.26)]. All these differences, however, were statistically
162 insignificant. After adjusting for the effects of the factors with significant association in the
163 bivariate analysis in the logistic regression model, the independent predictors of compliance
164 with recommended guidelines were: measured temperature of greater than 37.5°C [AOR =
165 2.7, (CI: 1.48-4.85)] and being managed at a hospital [AOR = 9.2, (CI: 5.29-15.95)].
166

167 **Table 2. Factors associated with conformity to recommended malaria case**
 168 **management guidelines, 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					
≥ 37.5°C (n = 92)	58 (63.0)	1.8 (1.11-2.92)	0.02	2.7 (1.48-4.85)	0.001
<37.5°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					
≤ 12years (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)				

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

170 4.0 DISCUSSION

171 The use of ACTs in uncomplicated malaria treatment was almost universal. The only
 172 exceptions to this were one record where a patient was treated with artesunate monotherapy
 173 contrary to guidelines. In spite of high level of compliance with ACT prescription, most of the
 174 prescriptions deviated from the algorithm of appropriate treatment of malaria. Presumptive
 175 diagnosis and treatment, as well as prescribing anti-malarials for patients who tested negative
 176 for malaria were quite common. This observation of inappropriate treatment of test negative
 177 cases was more pronounced in other studies[7,14,20,21] and was most likely due to
 178 prescribers' lack of trust in test results as observed elsewhere[20].
 179 The high proportion of patients prescribed ACT is consistent with findings by Sears et al [22]
 180 but far higher than that found in South East Nigeria where less than half of the prescriptions
 181 from government hospitals and only 16.7% of prescriptions from private hospitals were ACTs,
 182 contrary to recommended guidelines[12]. In terms of the recommended first line treatment of
 183 uncomplicated malaria, only 4.6% consisted of the recommended AL. These differences
 184 could be explained by the fact that the change of policy to ACT use was relatively new in
 185 Nigeria at the time of the study and therefore prescribers had not fully adapted to it.
 186

187 The use of alternative first line drug AL dominated contrary to recommended first line AA.
 188 This corresponds to findings in other studies where health workers used other anti-malarials
 189 other than the recommended first line drug combination[14,15] However, it contrasts with
 190 60%[23] and 97.3%[22] conformity to prevailing first line drug (AL) observed in Uganda. The
 191 non-compliance to AA as first line in our study could be due to reported adverse reactions
 192 that accompanied its use[2] and negative media coverage on its safety[15] during the initial
 193 stages of its introduction. The perception than AL is more desirable than other ACTs
 194 transcends the borders of Ghana. Health workers in Kenya considered AL as more
 195 efficacious and tolerable than Amodiaquine and other ACTs [11].

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

205 In the bivariate analyses, fever (either by history or by measured axillary temperature of $\geq$
 206 37.5°C) was positively associated with conformity to guidelines statistically significant levels.
 207 This means that, compared to those who did not have fever, patients with fever were more
 208 likely to have been treated according to standard guidelines. This association remained
 209 significant for measured axillary temperature $\geq 37.5^{\circ}\text{C}$, but not history of fever, after potential
 210 confounding factors have been taken into account. This underscores the importance of
 211 measuring temperature of patients at the clinics as those whose temperature may not have
 212 been measured may have missed being managed according to guidelines. It seems that
 213 health workers had high index of suspicion for malaria when a patient's temperature was
 214 37.5°C or more. Such patients would therefore be treated more meticulously and in
 215 conformity to guidelines. This contrasts with findings from studies in Kenya[13] and
 216 Uganda[23] where chief complaint of fever was associated with high treatment quality. The
 217 odd of being managed in compliance with guidelines was significantly higher among those
 218 who were treated in the hospital than those treated in the lower health facilities. This finding is
 219 quite alarming as it suggests that lower health facilities, which are expected to be the primary
 220 port of call to most of the malaria cases, are deficient in malaria case management capacity.
 221 This could probably be explained by the fact that the prescribers at the hospital are mostly
 222 medical doctors and physician assistants who are formally trained to manage malaria cases
 223 unlike other cadres of staff at the lower facilities. Some of these personnel perform outpatient
 224 consultations because of shortage of staff and not as a primary function.

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

236 Age less than five years as well as being a paediatric patient (less than or equal to 12 years)
 237 was not associated with appropriate treatment of malaria. This finding contrasted with
 238 findings from elsewhere where age was a predictor of compliance with treatment

239 guidelines[13,15,27] This finding of age not being an independent predictor of compliance
240 with guidelines seems rather disturbing as it suggests that patients are managed in the same
241 way irrespective of their ages. The critical age group of under-five years in whom the effects
242 of malaria are amplified are not being given the extra attention they require in terms of case
243 management. Having an additional diagnosis to malaria was not significantly associated with
244 appropriate treatment malaria. This means that presenting with multiple pathologies was not
245 a barrier to receiving appropriate treatment

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

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256 **5. CONCLUSION**

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

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268 **COMPETING INTERESTS**

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270 The authors declared that no competing interests exist.

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273 **ETHICAL APPROVAL**

274

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

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