

Original Article**Prescribing trend of antimalarial drugs at the Ghana Police Hospital**

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Abstract

Introduction: Malaria ranks among the top three leading causes of morbidity and mortality in developing countries. Appropriate use of recommended antimalarial drugs is vital in the effective management of malaria.

Methodology: This study sought to assess the prescribing trend of antimalarial drugs at the Ghana Police Hospital. Antimalarial drug prescribing trends from 3,127 patient cards were assessed at the pharmacy unit of the hospital between December 2012 and May 2013 using modified World Health Organization rational drug prescribing indicators.

Results: Of the 6,697 drugs assessed from the patient cards, antimalarial drugs prescribed included artemether-lumefantrine, 4,226 (63.1%), artemether injection with artemether-lumefantrine tablets, 1,741 (26%), artesunate injection, 241 (3.6%), artemether injection, 194 (2.9%), and artesunate-amodiaquine tablets, 188 (2.8%). The average number of drugs prescribed per encounter was 2.1. A total of 4,052 (60.5%) drugs were prescribed by their generic names, and 2,645 (39.5%) were prescribed by their brand names. There were 2,250 (33.6%) encounters with injection (33.6%), and 6,001 (89.6%) of the prescribed drugs were from the essential drugs list. Prescriptions conforming to recommended dosage regimen totaled 6,328 (94.5%).

Conclusion: The antimalarial prescribing pattern at the hospital was generally satisfactory. However, the use of injectable antimalarials appeared to be high.

Key words: malaria; antimalarial drug; prescription; essential drug list.

J Infect Dev Ctries 2015; 9(4):409-415. doi:10.3855/jidc.5578

(Received 15 July 2014 – Accepted 19 November 2014)

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Introduction

Worldwide, it is estimated that 300 to 500 million people contract malaria yearly, which results in 1.5 to 2.7 million deaths [1]. According to the World Health Organization (WHO), malaria accounts for over 10,000 maternal and 200,000 neonatal deaths per year [2]. The commonest parasite that causes malaria in humans, *Plasmodium falciparum*, has, like many other pathogens, developed resistance to a number of antimalarial drugs over the last decade. Several factors, such as monotherapy, substandard or fake antimalarials, and inappropriate prescribing of antimalarial drugs, have led to the surge of resistance to antimalarial drugs [2,3].

In 2005, high resistance due to monotherapy necessitated a revision of treatment policy in Ghana as had been done by other malaria-endemic countries [4,5]. Ministry of Health, Ghana, initiated the process of using artemisinin-based combination therapies (ACTs) following WHO recommendations. Artesunate-amodiaquine was initially advocated for

uncomplicated malaria in all countries experiencing resistance to monotherapy [6]. The implementation process was faced with challenges of adverse drug events, which warranted review of the drug policy [7]. Two additional ACTs, namely artemether-lumefantrine and dihydroartemisinin-piperaquine, were selected [8]. Introduction of any policy requires periodic monitoring, and a change in antimalarial treatment policy is advised when a 28- or 42-day follow-up after treatment (depending on the drug or regimen) demonstrates a failure rate exceeding 10% [9].

Irrational drug prescription and use have been issues in healthcare settings, especially in developing countries. This is characterized by polypharmacy, the excessive use of antimicrobials and drugs of doubtful efficacy [7,8]. Meremikwu *et al.* found that antimalarial drugs such as chloroquine and sulphadoxine-pyrimethamine (SP) were still being prescribed in private and government health facilities in Nigeria after the WHO's recommendation of ACTs

[10]. Appropriate drug use contributes to reductions in morbidity and mortality with a consequent socio-economic benefit [7]. Studies assessing prescribing practice are often effective evaluation tools in assessing drug treatment policies and interventions.

The government of Ghana spends a substantial amount of its revenue and resources on combatting malaria [11]. Periodic assessment of the prescribing practice of antimalarials in health facilities can provide insight on whether recommended drug treatment policies are being adhered to, can describe prescribing trends in health facilities, and can possibly identify policy implementation challenges. Recommendations from this study would be made available to policymakers, health managers, and health workers who would design interventions that could improve the prescription of antimalarial drugs. The objective of this study was to describe the prescribing trend of antimalarial drugs by clinicians at the Ghana Police Hospital in Accra.

Methodology

Setting

This descriptive cross-sectional study was conducted at the pharmacy unit of the Ghana Police Hospital from December 2012 to May 2013. The hospital is a 100-bed facility situated at Cantonments, Accra, Ghana, and serves as the headquarters of the Ghana Police Health Service. It provides health services to police personnel, their dependents, and the general public, and also serves as a referral center during national disasters. The outpatient department provides services to over 67,000 patients each year. Malaria ranks among the top 10 diseases at the Ghana Police Hospital, and its diagnosis is made through clinical and laboratory examinations. The pharmacy unit is situated within the premise of the hospital and operates 24 hours every day of the week, providing services to inpatients and outpatients.

Data collection process

The study obtained data on antimalarial drug prescribing trends from 3,127 outpatient cards (of

children and adults) submitted at the pharmacy unit of the hospital. Antimalarial drug prescribing patterns were assessed using modified WHO prescribing indicators for rational drug use in a health facility (WHO/DAP/93.1) [12] to obtain the mean number of antimalarial drugs per encounter, percentage of antimalarial drugs prescribed by their generic name, percentage of antimalarial drugs prescribed by their brand name, percentage of encounters with antimalarial injectables, and percentage of antimalarial drugs prescribed from the national essential drug list. Data on categories of patients (children or adults), type of malaria diagnosed, types of antimalarial formulation used, and accuracy of dosage regimen were also gathered. The study protocol was conducted in line with the requirements and ethical approval of the administration of the Ghana Police Hospital.

Data analysis

Data generated from patient cards were entered into an Excel spreadsheet, after manual verification and cleaning. Descriptive statistics (percentages, frequency table, and histogram) were used to present results.

Results

Demographic data

Of the 3,127 patient cards assessed during this study, 1,579 (50.5%) were from male patients and 1,548 (49.5%) were from female patients. Of the cards assessed, 1,823 (58.3%) were from adult patients, whilst 1,304 (41.7%) were from children (< 35 kg).

Types of malaria diagnosed

Cards reviewed also showed that 2,911 (93.1%) of the patients had uncomplicated malaria, and 216 (6.9%) had complicated malaria. Cases of complicated malaria were higher in children (177, 81.9%) than adults (40, 18.1%) in this study.

Prescribing indicators

A total of 6,697 drugs from the 3,127 cards reviewed showed that the average number of drugs

Table 1. Prescribing indicators at the Ghana Police Hospital from December 2012 to May 2013 (n = 6,697)

Prescribing indicator	Value	WHO value*
Average number of drugs prescribed per encounter	2.1	2
Drugs prescribed by generic name	4,051 (60.5%)	100%
Drugs prescribed by brand name	2,645 (39.5%)	—
Encounter with antimalarial injections	2,250 (33.6%)	< 10% **
Drugs prescribed from essential drugs list (Ghana)	6,001 (89.6%)	100%
Prescribed drugs with correct dosage	6,328 (94.5%)	100%

*WHO, 1993 [12]; ** WHO/INRUD-Mallet *et al.*, 2001 [13]

prescribed per encounter was 2.1. Details of the rest of the prescribing indicators assessed in this study are presented in Table 1.

Types and formulations of antimalarial drugs prescribed

Five different types of antimalarial drugs were identified as having been prescribed at the Ghana Police Hospital: artesunate, artemether-lumefantrine, artemether, artesunate-amodiaquine, and quinine. The majority of the cards reviewed indicated that 3,108 (99.4%) of the patients received an artemisinin-based compound in their treatment regimen. The study also revealed that ACTs were prescribed for 2,904 (92.9%) of patients, and monotherapy for 223 (7.1%) patients. From the 3,127 cards reviewed, the details of the types of antimalarial drugs prescribed are presented in Figure 1.

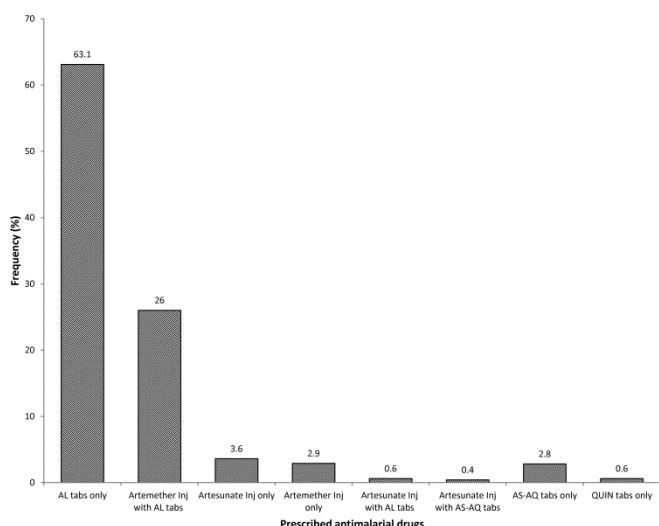
Formulations of antimalarial drugs prescribed included tablet only, tablet with injection, suspension only, injection only, injection with suspension, comprising 4,026 (60.1%), 2,036 (30.4%), 314 (4.7%), 308 (4.6%), and 13 (0.2%), respectively, of reviewed patient cards.

Discussion

Malaria is not known to be associated with any sex preference, but several studies have reported a higher incidence in males [14,15]. Review of patient cards at the Ghana Police Hospital showed 1,579 (50.5%) cases of malaria in males and 1,548 (49.5%) in females. A study in a teaching hospital in Nigeria where the drug prescribing pattern was assessed revealed that a high percentage of recorded malaria cases was reported in patients between 21 and 50 years of age [16]. Furthermore, this study recorded a high percentage of malarial cases in adults as compared to children, whilst cases with complicated malaria were significantly higher in children than in adults. The significantly high number of uncomplicated malaria cases (93.1%) observed in this study was slightly higher than the 89.1% uncomplicated malaria cases seen in a study done in a rural Ugandan hospital [17].

The WHO discourages large numbers of drugs prescribed per encounter and irrational co-prescription of drugs with artemisinin-based combination therapy [18]. WHO guidelines on rational use of drugs recommend the average number of drugs prescribed per encounter as two [12]. It is expected that patients who visit hospitals with co-morbidities such as anemia, malnutrition, and respiratory and other systemic infections often would require a higher

Figure 1. Frequency distribution of prescribed antimalarial drugs



AL: artemether-lumefantrine; AS: artesunate; AQ: amodiaquine; QUIN: quinine

number of drugs. However, as the number of drugs increase, the possibility of drug interactions increases and patient compliance is reduced. In this study, the average number of drugs prescribed per encounter was 2.1, significantly lower than 3.9, 3.0, 2.8, and 3.7 reported in similar studies conducted in Yemen [19], Uganda [20], Nigeria [21], and in the Ghana Police Hospital [22], respectively. Also, drugs prescribed per encounter were significantly lower than those observed in a similar study within two districts in Ghana, Wassa West and Kassena Nankana. Drugs prescribed per encounter in the latter study were 4.3 and 3.0, respectively, in the two districts [23], and it is worth noting that the studies conducted were undertaken before the introduction of the ACT policy. The average number per encounter obtained in this study is comparable to that of a study conducted in Tanzania, where the average number of drugs per encounter was 2.4 [24]. The average number obtained in this study suggests minimal polypharmacy and a specific malaria treatment regimen [23]. However, since this study did not examine whether there was laboratory or rapid diagnostic testing to support treatment with antimalarial drugs, we cannot confirm the latter suggestion. Overdiagnosis of malaria is a major problem in Ghana because symptoms of malaria are shared with a number of fever-causing diseases such as typhoid fever, respiratory tract infections, urinary tract infections, and influenza, among others.

In the current study, 60.5% (4,052) of drugs prescribed were by generic names, although the WHO

recommends that all drugs be prescribed by generic names [12]. Further analysis revealed that about 90% of ACTs prescribed by brand names was Coartem (manufactured by Novartis). The high use of Coartem observed could be due to the fact that it was the first reputable ACT combination marketed after the introduction of the new antimalarial policy. Furthermore, the drug is readily available despite its relatively high cost. According to the concept of essential drugs, it is rational practice to prescribe drugs by their generic names. The relatively high proportion of drugs prescribed by brand names could be a result of pharmaceutical promotion by some drug companies, of prescribers not being quite sure about the efficacy of some generic antimalarial brands of ACTs available, or of increased reports of fake antimalarial drugs in the sub region. Another reason could be that prescribers may want to minimize recrudescence, which occurs when patients purchase cheap, substandard ACTs.

The WHO recommends that parenteral artemisinins be initiated in patients with complicated malaria and changed to oral ACTs once the patients' condition improves to a state that enables oral therapy [25]. Generally, tablets are the most prescribed drug formulation because they are easy to administer. Antimalarials in tablet formulations are almost completely absorbed by the gastrointestinal tract [26]. However, excessive use of injectables has been reported in most developing countries and in Ghana [27-29], due to the belief that injectables are more effective than other formulations. The recommended index for rational injectable use in a health facility, according to the Mallet *et al.*, should be less than 10% [13]. The rate of 33.6% (2,250) obtained in this study indicates a relatively high use of injectables in the management of malaria at the Ghana Police Hospital. The percentage of antimalarial injectables observed in this study also appeared high compared with the proportion of patients with complicated malaria (216, 6.9%) who required injectable antimalarials for treatment. This also suggests that antimalarial injectables in some cases are prescribed instead of oral ACTs for uncomplicated malaria.

Prescribing from the national essential list of medicines is prudent to ensure that the healthcare needs of the majority of the population are satisfied, and to optimize use of scarce financial resources [30]. From the antimalarial treatment cases reviewed in this study, 6,001 (89.6%) of antimalarial drugs prescribed were from the national essential drugs list, which is quite commendable. However, our finding was lower

than the 96% obtained in a similar study by Isah *et al.* [31], which suggests that additional sensitization could further improve the level of adherence.

ACTs offer better efficacy than the traditional monotherapeutic drug regimens to which *Plasmodium falciparum* species have developed near complete global resistance [32,33]. Stakeholders are of the view that prescription practices also influence the emergence of resistance to antimalarial drugs [34]. In this study, the proportion of patients (99.4%) who received artemisinin-based compounds in their treatment was greater than that observed in a similar study by Dodoo *et al.* [35]. Also, the high proportion (92.9%) of patient cards with prescribed ACTs observed in this study was greater than that found in similar studies done in Nigeria in 2008[36], 2011 [37], and 2012 [38], which obtained proportions of 81.4%, 59.7%, and 88.3%, respectively. Findings from this aspect of this study suggest the adoption of the new antimalarial policy by prescribers at the hospital [39]. Studies have revealed that use of non-ACTs and monotherapy in the management of malaria could increase the risk of recrudescence and increase drug resistance, complications, and deaths [40-43].

Antimalarial prescription studies in Ghana [35], Nigeria [37], and Central Africa [44] obtained artemisinin monotherapy rates of 33.1%, 18.9%, and 14.4%, respectively. The rate of artemisinin monotherapy (6.5%) prescribed in this study was lower than the aforementioned findings from similar studies in Africa. On the contrary, the percent obtained in this study was higher than the 3.2% found in a similar study in Nigeria [36]. Furthermore, the proportion of non-artemisinin based therapy (quinine, 0.6%) prescribed in this study was comparable to the 0.7% obtained in a similar study in Nigeria in 2011 [37]. In the latter study, the non-artemisinin based monotherapy drugs prescribed were chloroquine with amodiaquine, quinine with sulphadoxine-pyrimethamine, and amodiaquine with sulphadoxine-pyrimethamine. The results from this study affirm our view of high prescriber adherence to the new antimalarial policy. The prescription of quinine observed in this study was likely due to its use in pregnant women with uncomplicated malaria or in patients with severe malaria. Quinine prescription for patients with severe malaria and pregnant women with malaria has been reported [45]. It is worth noting that in Ghana, quinine is the drug of choice in treating uncomplicated malaria during the first trimester of pregnancy where artesunate is contraindicated, and it

is an alternative drug to artesunate in treating severe malaria [46].

Success of WHO or national antimalarial treatment policy in any country would depend on the adherence of healthcare providers and patients to these treatment recommendations [47,48]. The use of sub-therapeutic doses or non-completion of prescribed antimalarial doses has contributed to the emergence and spread of resistant strains of *Plasmodium falciparum* [49]. However, several studies on antimalarial prescription patterns or use in Ghana, Nigeria, Central African Republic, and Uganda are silent on the percentage of prescriptions adhering to WHO guidelines for artemisinin combination treatment [44,50]. In Ghana, artemether-lumefantrine and artesunate-amodiaquine are used as first-line therapy for uncomplicated malaria, and are to be taken orally twice daily for three days for treatment of uncomplicated malaria [46], though the WHO recommends ACTs be taken once daily for three days. Patients who cannot tolerate oral treatment are to be given parenteral administration for one to two days until they can swallow, and initial parenteral treatment must always be followed by a full three-day course of ACT [45]. In a study at Nipid Health Center in Nigeria, 86.7% of 2010 and 92.1% of 2011 ACT prescription regimens representing 42.6% and 55.0% of all antimalarial prescriptions respectively, complied with WHO treatment regimen recommendations [36,38]. The percentage of encounters with correct antimalarial dosage (94.5%) obtained in this study was higher than those found in similar studies in Ghana (57.8%) [35] and Yemen (54.5%) [51]. The percentage encounter with correct antimalarial dosage regimen is encouraging. It worth mentioning that 66.3% of the dosage regimens accepted as correct in this aspect of the study were written as “full course of artemether-lumefantrine, Coartem or artesunate-amodiaquine”. Prescriptions written in this form could be due to the high patient-doctor ratio at the hospital’s outpatient department, which does not permit medical practitioners to determine the weight of malaria patients. However, the pharmacy section has patient weighing scales, which pharmacists and pharmacy technicians use to weigh patients and determine the appropriate dose based on body weight on receipt of such prescriptions.

This was a descriptive, non-interventional drug utilization study; one of its limitation was the inability to assess whether antimalarial drug regimens prescribed were appropriate for the type of malaria diagnosed at the hospital. Another limitation was that the research team did not assess whether malaria

diagnosis was confirmed with basic laboratory or rapid diagnostic tests. Also, the effect of possible confounders such as drug promotion by pharmaceutical companies, level of training of prescribers in malaria management, and cultural beliefs on the type of antimalarial drug prescribed were not assessed.

Conclusions

Results from this study provide evidence of a satisfactory, rational antimalarial drug prescribing pattern at the Ghana Police Hospital. However, the use of injectable antimalarial medication was appreciably high compared with the low proportion of cases of complicated malaria seen at the outpatient department. Education of prescribers on appropriate use of antimalarial injectables, and prescribing drugs using generic names could further improve rational drug prescribing at the hospital. Further analytical studies to establish the appropriateness of malaria diagnosis with prescribed antimalarial drugs and dosage regimens is recommended.

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Conflict of interests: No conflict of interests is declared.