Antimalarial drugs: availability and mode of prescribing in Mukalla, Yemen

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الأدوية المضادة للملاريا: توافرها ونمط وصفها في المكلا، اليمن

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الخلاصة: تحتل الملاريا قمة المشكلات الصحية في اليمن. وقد أجريت هذه الدراسة لتقييم مدى توافر أدوية الملاريا ونمط وصفها في مدينة المكلا، استناداً إلى الدلائل الإرشادية العلاجية للبرنامج الوطني لمكافحة الملاريا. وقد وجد الباحثون أن أكثر الأدوية توافراً هي الكلوروكين والكينين وسلفادوكسي/ بيريمثامين، وهي أكثر الأدوية المضادة للملاريا التي توصف في جميع الصيدليات الحكومية والخاصة وعددها 60 صيدلية في المدينة. وحلل الباحثون 42 وصفة ليجدوا أن (54.2٪) منها لا تتوافق مع الدلائل الإرشادية العلاجية للبرنامج الوطني لمكافحة الملاريا من حيث الجرعة الملائمة وفترة العلاج، ولاسيَّما الوصفات التي يعدها الممارسون العامون من الأطباء؛ وأن (16.7٪) من تلك الوصفات تتضمن أكثر من دواء واحد من الأدوية المضادة للملاريا. وتمس الحاجة إلى مزيد من الجهود لتثقيف الأطباء حول الدلائل الإرشادية العلاجية للبرنامج الوطني لمكافحة الملاريا، ولمنع الصيدليات من البيع العشوائي للأدوية المضادة للملاريا.

ABSTRACT Malaria is one of the top health problems in Yemen. This study was done to evaluate the availability and prescribing of antimalarial drugs in Al-Mukalla city, based on the treatment guidelines of the National Malaria Control Programme (NMCP). Chloroquine, quinine and sulfadoxine/pyrimethamine were the most available and prescribed antimalarial drugs in all 60 pharmacies (government and private) in the city. Of 42 prescriptions analysed, 54.2% did not comply with NMCP guidelines on appropriate dose and duration, especially those prescribed by GPs: 16.7% contained more than 1 antimalarial drug. More efforts are needed to educate physicians about the NMCP treatment guidelines and to deter pharmacies from random selling of antimalarial drugs.

Médicaments antipaludiques : disponibilité et mode de prescription à Mukalla, Yémen

RÉSUMÉ Le paludisme est l'un des principaux problèmes de santé au Yémen. Cette étude a été réalisée afin d'évaluer la disponibilité et la prescription de médicaments antipaludiques dans la ville d'Al-Mukalla, sur la base des directives thérapeutiques du Programme national de lutte contre le paludisme. La chloroquine, la quinine et l'association sulfadoxine-pyriméthamine étaient les antipaludiques les plus disponibles et les plus prescrits dans les 60 pharmacies publiques et privées de la ville. Sur 42 prescriptions analysées, 54,2 % n'étaient pas conformes aux directives thérapeutiques du Programme en termes de doses et de durée du traitement. Les prescriptions des médecins généralistes étaient particulièrement concernées par ce manque de conformité : 16,7 % contenaient plus d'un agent antipaludique. Des actions supplémentaires sont nécessaires pour former les médecins sur les directives thérapeutiques du Programme et pour dissuader les pharmacies de vendre des antipaludiques au hasard.

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Introduction

Malaria is one of the top priority health problems in Yemen. Out of a population of 18 million, 60% are estimated to be at risk of contracting malaria. There are about 1.8 million cases per year with 1500–1800 deaths. Malaria in Yemen is the Afro-tropical epidemiological type, with *Plasmodium falciparum* as the predominant species [*1*].

The first strategy for controlling the disease is early diagnosis and treatment to reduce morbidity and to prevent mortality. However, there are several factors that can affect the efficacy of treatment and that are related to local variables in our country [*2*]. There are certain prescribing patterns that might have direct influence on the effectiveness of controlling the disease by chemotherapy. But these patterns sometimes encourage drug resistance. The majority of medical practitioners in Yemen tend to follow their own protocols based on limited personal experience rather than following the treatment guidelines of the National Malaria Control Programme (NMCP) [*2*]. Inadequate, excessive or incorrect use of antimalarial drugs may contribute to the most common causes of drug resistance, mainly for chloroquine, which has partially lost its effectiveness in many countries in the world. This represents the main challenge for treating the disease because chloroquine is the most widely used antimalarial drug [*3*].

To our knowledge there has been no previous study in Al-Mukalla city in Yemen about antimalarial drugs in relation to the treatment guidelines of the NMCP. The objectives of the study were to determine the availability of antimalarial drugs in pharmacies in the city; to evaluate the different patterns of prescribing antimalarial drugs in Al-Mukalla city; and to compare physicians' prescribing of antimalarial drugs with the recommendations in the NMCP guidelines.

Methods

A descriptive case study was performed by a group of 3rd year medical students from Hadhramout University College of Medicine, during the period 20 January–20 April 2004. This period is the peak malaria transmission season in Al-Mukalla, the largest city in Hadramout governorate in Yemen.

Data were collected using 2 standardized questionnaires. The first was given to all 60 pharmacies in Al-Mukalla, 58 private and 2 government-owned (inside the 2 main government hospitals of Al-Mukalla), to study the availability of different pharmacological formulations and strengths of antimalarial drugs. This was done by direct interview with the pharmacists and their assistants.

The second questionnaire was used at the 54 pharmacies where antimalarial drugs were available. All available medical prescriptions for antimalarial drugs were collected ($n = 42$) and the patterns of prescribing were noted: type of physician, drug(s) prescribed, strength and duration of use.

These data were compared with the guidelines of the Yemeni NMCP for appropriate drug treatment of malaria [*4*].

Results

Analysis of pharmacies

In the 60 pharmacies studied, antimalarial drugs were available in 54 (90.0%). The most commonly available antimalarial was chloroquine, found in 86.7% of pharmacies, followed by sulfadoxine/pyrimethamine (Fansidar®) (71.7%) and quinine (45.0%). The next most available were primaquine (30.0%), artemether (18.3%), halofantrine (13.3%) and mefloquine (10.0%). Artesunate and artemether/lumefantrine (Coartem®) were both available in only 1 pharmacy (1.7%), while artemisinin not found at all. The formulations and strengths of the available antimalarial drugs are shown in Table 1. Tablets were the most commonly available formulation.

Of 54 pharmacies where antimalarial drugs were available, 40.7% reported that they were selling the drugs only with medical prescription, while 59.3% were selling them with or without medical prescription, especially chloroquine.

Analysis of prescriptions

Chloroquine was the most commonly prescribed antimalarial (42.9% of prescriptions) on the 42 prescriptions investigated, with quinine the second most prescribed (31.0%) (Table 2). Sulfadoxine/pyrimethamine, halofantrine and artemether were prescribed in 4.8%, 2.4% and 2.4% of prescriptions respectively. The remaining 7 prescriptions had combinations of > 1 antimalarial: chloroquine plus sulfadoxine/pyrimethamine in 5 and quinine plus sulfadoxine/pyrimethamine in 2.

Primaquine, a prophylactic therapy, was found in 7 prescriptions (16.7%).

Just over half the 42 prescriptions (54.8%) were written by general practitioners (GPs) with the remainder written by specialists (45.2%). Chloroquine was the most commonly prescribed antimalarial drug by GPs (56.5% of 23 GP prescriptions), with quinine on 17.4% of prescriptions. A combination of antimalarial drugs was found on 26.1% of prescriptions. Sulfadoxine/pyrimethamine alone was not prescribed by GPs (Table 3). In contrast, quinine was the most common antimalarial drug prescribed by specialists (47.4% of 19 specialists' prescriptions), followed by chloroquine (26.3%).

Compliance

Only around half the prescriptions (54.8%) were compliant with the NMCP treatment guidelines for appropriate dose and duration [*4*]. Of the 19 noncompliant prescriptions, duration of treatment was the most common error in prescribing (63.2%), while incorrect

Table 1 Availability of different preparations and strengths of each antimalarial drug in pharmacies in Al-Mukalla city, Yemen (*n* = 60 pharmacies)

Drug	No. of pharmacies	%
Chloroquine		
Tablets (150 mg)	51	85.0
Syrup (50 mg base/5mL)	26	43.3
Ampoules (40 mg/mL)	22	36.7
Tablets (other strengths)	3	5.0
Ampoules (other strengths)	3	5.0
Sulfadoxine/pyrimethamine		
Tablets	43	71.7
Ampoules	3	5.0
Quinine		
Tablets (300 mg)	26	43.3
Ampoules	14	23.3
Tablets (other strengths)	1	1.7
Primaquine		
Tablets (15 mg)	15	25.0
Tablets (7.5 mg)	5	8.3
Artemether		
Tablets	10	16.7
Ampoules	10	16.7
Halofantrine	8	13.3
Mefloquine	6	10.0
Artesunate		
Tablets	1	1.7
Ampoules	0	0.0
Artemether/lumefantrine	1	1.7
Artemisinin (suppositories)	0	0.0

dose was much rarer (5.3%); errors in both dose and duration was found on 31.6% of prescriptions.

Of 23 prescriptions from GPs, 43.5% were compliant with the guidelines. Of 19 specialists' prescriptions, 68.4% were compliant.

Combinations with other drugs

Only 38.1% of 42 prescriptions were for antimalarial drugs only. Almost half (47.6%) combined antimalarials and analgesics, while 4.8% contained antimalarials and antibiotics and 9.5% contained antimalarials, antibiotics and analgesics. Table 2 shows the combination drugs prescribed. Paracetamol and diclofenac (Voltarine®) were the most prescribed analgesics. Ciprofloxacin (Ciplox®) was the only antibiotic prescribed.

Formulations

Tablets were the most common formulation for antimalarial drugs (73.8% of prescriptions), with injectable formulations the second most common (23.8%), while the syrup was the least recommended dosage form (2.4%).

Discussion

Antimalarial drugs were present in most pharmacies in Al-Mukalla city, which shows that a majority are well-prepared for controlling malaria. Chloroquine was the most available and most prescribed antimalarial drug. This agrees with other studies carried out in different parts of the world, such as Sudan [3]. Chloroquine is the first-line treatment for malaria according to the NMCP guidelines [4], it is the cheapest antimalarial drug and it has fewer side-effects than other antimalarials [5]. In addition, it is sometimes sold without medical prescription. Sulfadoxine/pyrimethamine was the second most available antimalarial drug. However it was the third most commonly prescribed. This means that it is not as preferred for treatment as chloroquine and quinine, which may be due to the need for direct supervision during administration (immediate side-effects, e.g. vomiting) [4]. Quinine was the third most available antimalarial drug and the second most prescribed. This may indicate that there has been an increase in complicated cases where quinine is the most effective treatment [6]. This result was similar to a Sudanese study where quinine was the second most commonly prescribed [2].

Although mefloquine is regarded as the third line of treatment according to the NMCP treatment guidelines, it was not recorded in any medical prescription and this may be due to its serious side-effects (e.g. hallucinations) and contraindications (e.g. in patients with cardiac problems) [7]. The limited use of primaquine, despite its wide availability in pharmacies may reflect its negligible role in treatment because it used for killing of gametocytes to prevent transmission of malaria in the community [4]. Other antimalarial drugs were available in a few pharmacies and prescribed in small percentages or not at all. This might be due to the fact that they are expensive and are not recommended in the NMCP treatment guidelines.

Only around half the prescriptions were compliant with the NMCP treatment guidelines for appropriate dose and duration. More specialists' prescriptions were compliant than GPs' prescriptions, but, even so, 31.6% of

Table 2 Antimalarial drugs and drug combinations prescribed in Al-Mukalla city (*n* = 42 prescriptions)

Drug	No. of prescriptions	%
Antimalarials		
Single antimalarial	35	83.3
Chloroquine	18	42.9
Quinine	13	31.0
Sulfadoxine/pyrimethamine	2	4.8
Halofantrine	1	2.4
Artemeter	1	2.4
Antimalarial combinations	7	16.7
Chloroquine + sulfadoxine/pyrimethamine	5	11.9
Quinine + sulfadoxine/pyrimethamine	2	4.8
Other drug combinations		
Antimalarial(s) only	16	38.1
Antimalarial + analgesic	20	47.6
Paracetamol	14	33.3
Voltarine	4	9.5
Metamizole	1	2.4
Piroxicam	1	2.4
Antimalarial + antibiotic	2	4.8
Ciprofloxacin	2	4.8
Antimalarial + antibiotic + analgesic	4	9.5
Ciprofloxacin + paracetamol	1	2.4
Ampicillin + paracetamol	1	2.4
Amoxicillin + paracetamol	1	2.4
Norfloxacin + diclofenac	1	2.4

hospital physicians' prescriptions were noncompliant. Chloroquine was the most prescribed antimalarial drug by GPs while quinine was the most prescribed by specialists. This may be due to the fact that the specialists mostly treat inpatients and more severe cases.

Inappropriate prescriptions for antimalarial drug combinations were an issue in this study. Sulfadoxine/pyrimethamine combined with other antimalarial drugs as first-line treatment is not recommended in the NMCP. In this study, however, sulfadoxine/pyrimethamine was combined with other antimalarials on 7 prescriptions (16.7%), even those of hospital specialists. Sulfadoxine/pyrimethamine should be reserved as second-line treatment in order to reduce the risk of drug resistance development [*4*]. Antimalarial drugs were also prescribed in combination with other types of drugs. Analgesics (mainly paracetamol) were the drugs most often combined with antimalarial drugs. This may reflect the fact that malarial patients were in need of an analgesic/antipyretic to decrease temperature and for the pain or headache accompanying the infection [*8*]. Prescriptions of antimalarials with antibiotics may reflect physicians' doubts about the presence of other infections.

The oral route was the most prescribed formulation of antimalarials because it is the easiest method of administration; these drugs are completely absorbed by the gastrointestinal tract [*5*]. In contrast, the injectable forms were not preferred because they are painful, expensive and needs skill to administer.

There were some limitations to this study. First, the availability of antimalarials and the prescription pattern was similar in the private and the government hospitals and pharmacies, mainly because most of the doctors, internists and pharmacists were the same, working in the government sector in the morning and in private hospitals, clinics or pharmacies in the afternoon and evenings. All doctors are expected to follow the same programme (NMCP) of treatment.

Secondly, only 42 prescriptions were collected from the 60 pharmacies during the 3 months of data collection. Although January to April is the peak period for malaria, data collection was not done for the whole year. The number of malaria cases in Al-Mukalla city is relatively smal, as there good access to health facilitates in the capital of the governorate. In 2004, for example, there were only 816 confirmed positive cases of malaria throughout the year, most of whom came from areas outside Al-Mukalla looking for treatment in the city.

Table 3 Antimalarial drugs prescribed on prescriptions written by general practitioners (GPs) and specialists in Al-Mukalla city (*n* = 42 prescriptions)

Prescriber/drug	No. of prescriptions	%
***GPs' prescriptions* (n = *23*)**		
Chloroquine	13	56.5
Quinine	4	17.4
Sulfadoxine/pyrimethamine	0	0.0
Combination antimalarial drugs	6	26.1
Other drugs	0	0.0
***Specialists' prescriptions* (n = *19*)**		
Quinine	9	47.4
Chloroquine	5	26.3
Sulfadoxine/pyrimethamine	2	10.5
Other drugs	2	10.5
Combination antimalarial drugs	1	5.4

Other reasons for the small number of prescriptions analysed were difficulties in obtaining them. Patients may obtain a prescription from Al-Mukalla but buy their medications from pharmacies in their own area outside the city and so these prescriptions would not be available for our study. Patients sometimes refuse to hand over their prescriptions to the pharmacies because they believe that they may need them again if they need to return to the doctor in cases of relapse or ineffective treatment. Some of the pharmacy staff were reluctant to hand over prescriptions because they believed it might lead to problems with the prescriber if a mistake were discovered. This difficulty was overcome by assuring those employees or pharmacists that this was a scientific study where names of doctors or patients would not be mentioned.

Recommendations

- The Ministry of Public Health should increase efforts to make available the different preparations of antimalarial drugs in all pharmacies.
- Pharmacists should sell antimalarial drugs only when prescribed by doctors.
- Efforts should be made to update the knowledge of doctors, especially GPs, to follow NMCP guidelines, in particular avoiding prescription of antimalarial drug combinations.
- Further studies are needed regarding antimalarial drugs policy to ensure appropriate prescribing as well as to increase public understanding of the need for strict compliance with prescribing instructions.

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Corrections

Gender inequity in Saudi Arabia and its role in public health. A.E.H. Mobaraki and B. Söderfeldt
***Eastern Mediterranean health journal,** 2010, 16(1):113–8.*
In this article, the first name of the first author, A.E.H. Mobaraki, was printed wrongly in Arabic. It should read عبدإله not عبدالله as published.

Corrected QT dispersion improves diagnostic performance of exercise testing in diagnosing coronary artery disease. H. Hasan-Alia, M.H. Maghraby, D.A. Fouad and A.A. Abd-Elsayed.
***Eastern Mediterranean health journal,** 2010, 16(1):75–83.*
In this article, the name of the first author was printed wrongly. It should read H. Hasan-Ali rather than H. Hasan-Alia.