

Prescribing rationality and availability of antimalarial drugs in Hajjah, Yemen

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الوصف الرشيد للأدوية المضادة للملاريا وتوافرها في حجة بالجمهورية اليمنية
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الخلاصة: تمت الدراسة في ثلاث مناطق من محافظة حجة بالجمهورية اليمنية باستخدام المؤشرات الأساسية لمنظمة الصحة العالمية لاستقصاء الوصف غير الرشيد للأدوية المضادة للملاريا في المرافق الصحية في القطاعين العام والخاص. وقد كانت معدلات التشخيص المختبري منخفضة في مرافق القطاع العام (21.2% من المقابلات)، أما الوصفات غير الرسمية فقد أصدرت في ما يزيد على 70% من المقابلات (في القطاعين الخاص والعام). وقد افتقد الكثير من الوصفات معلومات هامة حول المريض وحول الأدوية، وحفل كل من مرافق القطاعين العام والخاص بمعدلات مرتفعة من وصف أدوية متعددة (وسطيا 3.0 و4.0 أدوية على التوالي في المقابلة الواحدة، وبلغ أقصى عدد للأدوية الموصوفة 11)، وبكتابة الأسماء التجارية للأدوية (32.9% و64.2% على التوالي)، وبوصف الحقن (17.2% و33.5% على التوالي). وقد بلغ العدد الكلي للأدوية المضادة للملاريا المسجلة في البلد 98 دواءً، منها 52 دواءً من مستحضرات وقوى مختلفة للكولوروكين. فمن الواجب بذل الجهود لتعزيز الوصف الرشيد للأدوية المضادة للملاريا.

ABSTRACT This study in 3 districts of Hajjah governorate, Yemen, used WHO core indicators to investigate irrational prescribing of antimalarial drugs in public and private health facilities. Laboratory diagnosis rates were low in public facilities (21.2% of encounters). Informal prescriptions were issued in > 70% of encounters (public and private). Important patient and drug information was missing from many prescriptions. Both public and private facilities had high rates of prescribing multiple drugs (mean 3.0 and 4.0 respectively per encounter, maximum 11), brand-name drugs (32.9% and 64.2%) and injections (17.2% and 33.5%). The total number of antimalarial drugs registered in the country was found to be 98, with 52 different formulations and strengths of chloroquine. Efforts should be made to promote rational prescribing of antimalarials.

Rationalité des prescriptions et disponibilité des médicaments antipaludiques à Hajjah (République du Yémen)

RESUME Cette étude dans trois districts du gouvernorat de Hajjah (République du Yémen) a utilisé les indicateurs fondamentaux de l'OMS pour enquêter sur la prescription irrationnelle de médicaments antipaludiques dans les centres de santé privés et publics. Les taux de diagnostic en laboratoire étaient faibles dans les centres publics (21,2 % des consultations). Des ordonnances informelles étaient délivrées dans plus de 70 % des consultations (public et privé). Dans beaucoup d'ordonnances, des renseignements importants sur les patients et les médicaments ne figuraient pas. Dans les centres publics et privés, les taux de prescription de plusieurs médicaments (moyenne 3,0 et 4,0 respectivement par consultation, maximum 11), de médicaments de marque déposée (32,9 % et 64,2 %) et d'injections (17,2 % et 33,5 %) étaient élevés. Au total, 98 médicaments antipaludiques enregistrés dans le pays ont été dénombrés, avec 52 formules et dosages de chloroquine différents. Des efforts devraient être consentis pour promouvoir une prescription rationnelle des antipaludiques.

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Introduction

In Yemen 60% of the 18 million population live with the risk of malaria infection and about 2 million suffer attacks annually. It is estimated that the mortality rate is 1%, mainly among pregnant women and children under 5 years old [1]. The predominant species of malaria parasite in Yemen is *Plasmodium falciparum*, which represents nearly 90% of all reported cases [2]. In Hajjah governorate, which is situated in the northern part of the country, malaria is a major public health problem, accounting for 31.7% of all attendances at health facilities in one study [3].

Every day, throughout the world, millions of doses of antimalarial drugs are prescribed and sold to people seeking care for themselves or their children at public and private health facilities. In many developing countries, including Yemen, inappropriate, ineffective and inefficient use of drugs commonly occurs at health facilities [4-6]. The prescribing behaviour of health workers is influenced by many factors: education, training, their peer group, the workplace environment, the supply system, advertising and drug detailing, control and regulatory measures, drug information and misinformation, and patient demand [7]. The 1985 Nairobi conference on the rational use of drugs organized by WHO marked the start of global efforts to promote rational prescribing [8].

Development of new antimalarial drugs is not keeping pace with demand for malaria treatment [9], and problems related to prescribing of these drugs have compounded the situation. The benefits of the few drugs available for the treatment of malaria are often reduced owing to sub-standard patterns of use [1]. Up to now, no single study has been undertaken to look at prescribing rationality and availability of antimalarial drugs in the Republic of Yemen.

The WHO Action Programme on Essential Drugs (WHO/DAP) and the International Network for Rational Use of Drugs (INRUD) have made serious attempts to examine good practice in drug use and prescribing [10,11]. The core indicators that they have developed to measure prescribing performance and drug availability in health facilities were used in this study.

The objectives of the study were:

- to assess the extent of irrational prescribing of antimalarial drugs in public and private health facilities in Yemen;
- to identify the availability of antimalarial drugs in public and private health facilities;
- to obtain baseline information for future studies, for targeting and evaluating interventions and for raising awareness about irrational prescribing.

Methods

Three malaria-endemic districts in Hajjah governorate, Yemen, were selected for the study: Hajjah, Haradh and Abbs. The study was carried out in public health facilities at different levels in each district: 1 hospital, 2 health centres and 3 health units, except for Abbs, where there is no hospital, so 2 health centres were selected. In many districts, there is only 1 district hospital. The health centres were selected randomly and the health units selected through cluster sampling. For comparison, the study was carried out in different private health facilities. Two private clinics were chosen in each town in the same districts as the public health facilities. The first 25 prescriptions including antimalarial drugs were collected from each clinic (50 prescriptions in total from each town).

The prescribing practices of health workers were measured by collecting samples of patient prescriptions during the peri-

od January–May 2002. In hospitals and private clinics the prescriptions are written by doctors, in health centres by doctors and paramedics while in the health units by paramedics only. The prescriptions were collected retrospectively from public health facilities and prospectively from private facilities. About 120, 60 and 50 prescriptions written for outpatients suffering from malaria or containing antimalarial drugs were collected or recorded from each public hospital, health centre and health unit respectively and 25 from each private health facility.

The information on each prescribing indicator was recorded, calculated and analysed for individual health facilities. Then, the mean for each health facility level and for all public health facilities and private health facilities was calculated. The following prescribing indicators were calculated:

- percentage of encounters where patients had laboratory tests,
- percentage of encounters where formal prescription sheets were written,
- percentage of prescriptions with basic patient information recorded,
- percentage of prescriptions with basic information recorded for antimalarial drugs,
- mean number of drugs per prescription,
- mean number of antimalarial drugs per prescription,
- percentage of antimalarial drugs prescribed by generic (non-proprietary) name,
- percentage of antimalarial drugs prescribed in injectable form,
- percentage of each type of antimalarial drug prescribed.

The availability of antimalarial drugs in the public health facilities was compared with the antimalarial drugs listed in the Yemeni *National essential drugs list*, which is

officially disseminated to the public health facilities according to facility level.

A visit was made to the registration department of the Yemeni Supreme Board of Drugs and Medical Appliances to investigate the antimalarial drugs officially registered by the Board and marketed through the private pharmacies.

Results

Prescribing of antimalarial drugs

There were significant differences between public and private health facilities in most prescribing indicators. Laboratory tests for malaria were given in significantly fewer encounters in public health facilities (mean 21.2%, range 0%–88.0%) than in private health facilities (100.0%) (Table 1). Formal prescription sheets were written in similar proportions of encounters; mean 27.2% in public health facilities and 28.5% in private health facilities (Table 1).

Health workers in public health facilities wrote the necessary patient information (patient's name, sex, age, address and diagnosis) on more prescriptions than did private health facilities (mean 59.6% of prescriptions versus 54.4%). The differences were significant for sex, age and address but not for diagnosis (Table 2). In public health facilities, health workers were significantly less likely to record drug information (strength, dose, frequency and duration of administration) than were private health facilities (20.8% of prescriptions versus 52.8%) (Table 2).

In the public health facilities, the overall mean number of all drugs per prescription written for malaria patients and/or patients treated with antimalarial drugs was 3.0 (range 1.0–5.7; highest number of drugs on one prescription 11) (Table 1). In the studied private health facilities, the overall mean number of drugs per prescription

Table 1 Laboratory tests and pattern of drug prescribing in public and private health facilities in Hajjah governorate

Health facility	Patient encounters				Mean drugs prescribed/ prescription			Anti-malarial drugs prescribed			
	Total	Lab. test given	Formal prescription written	Total No.	Anti- malarial No.	By generic name	As injection	Chloroquine			
	No.	%	%	No.	No.	%	%	%			
<i>Public health facilities</i>											
Hospitals (n = 2)	226	40.3 (17.9–60.0)	47.4 (40.6–53.3)	3.9 (3.5–4.3)	1.2 (1.2)	42.0 (21.4–64.9)	27.2 (15.2–40.5)	72.5 (69.5–75.2)			
(Min.–max.)											
Health centres (n = 6)	345	34.8 (0–88.0)	47.3 (0–100)	3.9 (2.1–5.7)	1.1 (1.0–1.3)	60.2 (32.1–97.1)	27.2 (0–51.7)	63.2 (35.7–83.3)			
(Min.–max.)											
Health units (n = 9)	424	0.0 ^a	0.0 ^b	1.7 (1.0–2.1)	1.0 (0.9–1.0)	90.2 (27.6–100)	1.2 (0–4.6)	94.0 (58.6–100)			
(Min.–max.)											
Total (n = 17)	995	21.2 (0–88.0)	27.2 (0–100)	3.0 (1.0–5.7)	1.1 (0.9–1.3)	67.1 (21.4–100)	17.2 (0–51.7)	77.4 (35.7–100)			
(Min.–max.)											
<i>Private health facilities</i>											
Total (n = 6)	151	100.0	28.5 (9.8–46.0)	4.0 (3.7–4.4)	1.2 (1.1–1.3)	35.8 (14.8–50.9)	33.5 (23.8–50.9)	55.3 (49.2–68.7)			
(Min.–max.)											
P-value		P < 0.001 ^c	P = 0.73 ^c	P = 0.007 ^d	P = 0.11 ^d	P < 0.001 ^c	P < 0.001 ^c	P < 0.001 ^c			

Table shows mean values for level/type of facility with minimum to maximum range.

^aTest facilities not available at health units.

^bFormal prescription sheets not supplied to health units.

^c χ^2 test comparing public and private.

^dt-test comparing public and private.

n = number of facilities.

Table 2 Information recorded on prescription sheets collected from public and private health facilities in Hajjah governorate

Health facility	Prescriptions with patient information ^a					Prescriptions with antimalarial drug information ^b				
	Name %	Sex %	Age %	Address %	Diagnosis %	Strength %	Dose %	Frequency %	Duration %	
Public health facilities										
Hospitals (n = 2)	96.0 (95.3-96.7)	3.1 (1.7-4.7)	38.9 (34.9-42.5)	8.0 (0.9-16.0)	33.6 (18.9-47.7)	1.1 (0.0-2.3)	49.3 (36.6-63.4)	49.3 (36.6-63.4)	49.3 (36.6-63.4)	
Health centres (n = 6)	97.1 (86.0-100)	31.0 (0.0-95.7)	37.1 (0-100)	30.7 (0-95.7)	36.2 (0-100)	0.0 -	41.4 (0-73.3)	41.4 (0-73.3)	41.4 (0-73.3)	
Health units (n = 9)	100.0 -	25.9 (0.0-92.0)	94.6 (58.0-100)	94.1 (56.0-100)	99.8 (98.0-100)	0.2 (0.0-2.0)	0.2 (0-2.0)	0.2 (0-2.0)	0.2 (0-2.0)	
Total (n = 17)	98.1 (86.0-100)	22.5 (0.0-95.7)	62.0 (0-100)	52.6 (0-100)	62.7 (0-100)	0.4 (0.0-2.3)	27.6 (0-73.3)	27.6 (0-73.3)	27.6 (0-73.3)	
Private health facilities^c										
Total (n = 6)	100.0	6.6	90.7	17.2	57.6	0.0	70.4	70.4	70.4	
(Min.-max.)	-	(0-20.0)	(72.0-100)	(0-27.5)	(28.0-94.1)	-	(58.2-81.0)	(58.2-81.0)	(58.2-81.0)	
P-value ^e	NV	P = 0.01	P < 0.001	P < 0.001	P = 0.54	NV	P < 0.001	P < 0.001	P < 0.001	

Table shows mean values for level/type of facility with minimum to maximum range.

^a% of all prescriptions.

^b% of total antimalarials.

^c% test comparing public and private.

NV = not valid.

n = number of facilities.

was 4.0 (range 3.7–4.4; maximum on one prescription was 9).

For antimalarial drugs, the overall mean number of drugs per prescription was similar in public and private health facilities (1.1 versus 1.2) (Table 1). The highest number of antimalarial drugs on one prescription was 3 in both types of facility.

Public health facilities prescribed using generic names significantly more often than private health facilities (mean 67.1% of antimalarial drugs prescribed by generic name versus 35.8%). The lowest value was 21.4% in one of the public health facilities compared with 14.8% in one of the private facilities (Table 1).

Antimalarial drugs were significantly less often prescribed in the form of injections in the studied public health facilities than in private facilities (mean 17.2% versus 33.2% of antimalarial prescriptions). The highest percentage of antimalarial drugs prescribed in injectable form was 51.7% in one of the public health facilities

and 50.9% in the one of the private health facilities (Table 1).

Chloroquine, quinine, sulfadoxine/pyrimethamine, primaquine, artemether and halofantrine were prescribed in different percentages in both public and private health facilities. The most commonly prescribed antimalarial drug was chloroquine (mean 77.4% and 55.3% of antimalarial drugs prescribed in public and private health facilities respectively) (Table 1), followed by sulfadoxine/pyrimethamine.

Availability of antimalarial drugs

There are 4 types of antimalarial drugs in different dosage forms listed in the Yemeni *National essential drugs list*, as shown in Table 3. These drugs are supplied by the government drug fund through Sana'a regional medical stores to Hajjah governorate central medical stores. It was found that some of the essential antimalarial drugs or some dosage forms were not available in all of the studied public health facilities. Some

Table 3 Recommendations for availability of antimalarial drugs, level of use and priority from the Yemeni *National essential drugs list* [13]

Antimalarial drug	Form	Strength	Unit	Level	Priority: vital, essential or necessary
Chloroquine phosphate	Tablet	150 mg base		1	Vital
Chloroquine phosphate	Syrup	10 mg/mL base	Bottle, 60 mL	1	Vital
Chloroquine phosphate	Injection	40 mg/mL base	Ampoule, 5 mL	3	Necessary
Primaquine	Tablet	7.5 mg		1	Vital
Sulfadoxine/pyrimethamine	Tablet	25/500 mg		3	Vital
Quinine	Tablet	300 mg		4	Vital
Quinine	Injection	300 mg/mL	Ampoule, 2 mL	4	Vital

Level 1 = For use by health units and all higher facilities.

Level 2 = For use by health centres and all higher facilities.

Level 3 = For use by district hospitals and all higher facilities.

Level 4 = For use by governorate hospitals and specialists only.

antimalarial drugs or dosages were available at lower levels of health facility than appropriate. Chloroquine tablets were available in all studied public health facilities, whereas primaquine was the drug least found in stock. The overall percentage of essential antimalarial drugs in stock in all studied public health facilities was 50.0% (Table 4).

Many types of antimalarial drugs including the newer ones were officially registered by the Yemeni Supreme Board of Drugs and Medical Appliances and were also available in the private pharmacies. These drugs are produced by different local and foreign manufacturers under generic and many different proprietary names for the same drug. The total number of antimalarial drugs registered was 98. Chloroquine was the most common antimalarial drug, in locally produced and imported forms; 52 products of chloroquine in dif-

ferent forms and strengths were available from a number of different manufacturers. There was also a big difference in the prices of different brands for the same antimalarial drug. All antimalarial drugs could be obtained over-the-counter.

Discussion

Overall, there was a significant difference between the public and private facilities in the average number of drugs per prescription and in the proportions of antimalarial drugs prescribed by generic name, as injections and as chloroquine, with private facilities showing more irrational prescribing patterns. On the other hand, there was no significant difference between them regarding the use of formal prescriptions and the average number of antimalarial drugs prescribed.

Table 4 Availability of antimalarial drugs in public health facilities in Hajjah governorate

Health facility level/district	Chloroquine			Quinine			Sulfadox/pyrimeth ^b	Primaqu ^c
	Tablet	Syrup	Injection	Tablet	Syrup	Injection	Tablet	Tablet
<i>Facility level</i>								
Hospitals	2/2	2/2	1/2	1/2	1/2	0/2	2/2	1/2
Health centres	8/8	7/8	4/8	5/8	4/8	2/8	7/8	2/8
Health units	7/7	4/7	0/7	3/7	1/7	0/7	4/7	0/7
<i>Health district</i>								
Hajjah district	6/6	6/6	2/6	2/6	2/6	1/6	5/6	2/6
Haradh district	6/6	6/6	2/6	4/6	3/6	0/6	6/6	0/6
Abbs district	5/5	1/5	1/5	3/5	1/5	1/5	2/5	1/5
Total (% facilities)	100.0	76.5	29.4	52.9	35.3	11.8	76.5	17.7
P-value	NV	P<0.001	P=0.43	P=0.19	P=0.19	P=0.18	P<0.001	P=0.03

Table shows number of facilities with drug available/total number of facilities.

^a χ^2 test comparing availability of antimalarials in health districts.

NV = not valid.

n = number of facilities.

^bSulfadoxine/pyrimethamine.

^cPrimaquine.

There was also a significant difference between the public and private health facilities in the percentage of encounters where laboratory tests were carried out. In the health units, no patients had laboratory tests because no malaria laboratory diagnostic facilities are available there. The low level of laboratory diagnosis carried out in public health facilities—for only one-fifth of encounters—is probably due to a lack of appropriate diagnostic equipment, particularly microscopes and/or accessories and the absence of laboratory technicians or trained persons in some health facilities. Moreover, there are little or no incentives for the laboratory technicians. In addition, most of the laboratory technicians in the public health facilities own or work in private medical laboratories. In contrast, laboratory tests were done for 100% of patient encounters in the private health facilities. This may be due to the fees and incentives that private facilities get. The danger is that unethical practices and lack of monitoring in the private sector may lead them to carry out unnecessary laboratory tests.

The data in this study revealed that informal prescriptions were often issued, and badly handwritten prescriptions were common, with similar results in both public and private health facilities. Poorly written prescriptions can lead to confusion and mistakes. The *Guide to good prescribing* booklet published by the WHO [12] states that the prescription should be clear and understandable and given in lay language. Health units in Yemen are not officially supplied with formal prescription sheets, only an official registration book. However, in all the health units studied neither formal prescriptions nor official registration books were used, only an exercise book marked up by the health worker.

Concerning the necessary patient and drug information on prescription sheets, there were significant differences between

public and private health facilities. Public facilities performed better at writing the sex and address of the patient, while private facilities performed better at writing the patient's age, dose, frequency and duration of prescribed drugs. On the other hand, there was no significant difference between them in the proportions writing a diagnosis. Some of the basic patient and drug information that should be stated in each prescription was often missed by prescribers in both public and private sectors. The only explanation for missing or ignoring the basic information is that the prescriber may not recognize the importance of this element for patient compliance and care. It would be possible for the dispenser to check if the drug and its formulation and dosage schedules are correct.

The average number of drugs per encounter on prescriptions obtained in the study was 3 drugs in public and 4 drugs in private facilities; more than 2 is considered to be high. The average number of drugs per case for all diagnosis in previous studies conducted in Yemen was 3.0 drugs [4,5]. As the number of drugs a patient is taking increases, treatment becomes complex to monitor. Also an increasing number of drug-related problems are caused by drug interactions and confusion about instructions. Thus prescribing is assumed to be more rational if the number of drugs prescribed is low and is appropriate for the diagnosis. The high number of drugs prescribed may be due to lack of appropriate training and laboratory tests, and also to poor dissemination and use of the Yemeni *Standard treatment guidelines, National essential drugs list* [13] and National Malaria Programme treatment protocol.

According to the concept of essential drugs, it is correct practice to refer to drugs by their generic names. In many countries, there is now a policy to encour-

age generic prescribing. Unfortunately, in this study there was a high incidence of prescribing antimalarial drugs by proprietary names. The generic prescribing of antimalarial drugs was lower in the private health facilities than the public ones, probably due to industry influences such as advertising and drug detailing in the private sector.

In general, overprescribing of injections is common in Yemen. The percentage of antimalarial drugs prescribed in injectable form was higher in the private health facilities than the public ones. Sometimes more than one injection was prescribed for one patient. Injections are an important, powerful and useful form when prescribed and used properly, but potentially harmful and dangerous when prescribed carelessly. The overprescribing of injections is mainly due to lack of appropriate training for health workers, lack of public education and patients' demands and beliefs. Also, health workers can obtain a higher fee, and maybe even more prestige, by prescribing more drugs.

In Yemen, although there is no officially adopted antimalarial policy, chloroquine is regarded as a first-line drug for the treatment of uncomplicated malaria. However, in this study we found many health workers were prescribing non-essential and newer types of antimalarial drug. In the public health facilities, vital antimalarial drugs that should only be prescribed in the higher facility levels were being prescribed in the lower level facilities. Correct selection and use of an effective antimalarial drug will not only shorten the duration of malaria illness but also reduce the incidence of complications and risk of death. In contrast, irrational selection and use of antimalarial drugs leads to a dramatic decline in the efficacy of the most affordable antimalarial drugs [14].

The main aim of the WHO Action Programme on Essential Drugs has been to increase the availability of essential drugs in accordance with health facility level and to promote their rational use. In some of the studied public health facilities antimalarial drugs were out of stock and some antimalarial drugs that are only supplied officially to higher facility levels were available in lower levels. This is probably due to ineffective drug management.

In the private pharmacies and drug stores, antimalarial drugs are imported from a wide range of sources under generic and many different proprietary names, with big differences in the prices for the same antimalarial drug. There were also differences in the strength for the same antimalarial drug supplied by different sources. This is probably due to uncontrolled registration of drugs imported to the country. It is important to limit the importation and use of antimalarial drugs to those recommended by the Yemeni *Standard treatment guidelines* and National Malaria Programme treatment protocols.

Affordability of drugs for consumers is a major public health concern, especially in view of the strong interrelationship between malaria and poverty. It is essential to ensure that all people are able to obtain the antimalarial drugs they need either free of charge or at the lowest possible price. Although malaria patients are exempted from payment for consultation and antimalarial drugs in the Yemeni public health facilities, fees are still applied in many health facilities.

Conclusion

It is clear from the results obtained in this study as well as other results obtained from studies of rational drug prescribing that

have been performed in Yemen and other developing countries, there are inappropriate prescribing practices and consequently inappropriate use of drugs [5,15,16].

The inappropriate prescribing and inadequate stock of essential antimalarial drugs may result in ineffective treatment, health risks such as adverse drug reactions, exacerbation or prolongation of illness, disease relapse and development of resistance as well as needless expenditure.

The deficiencies identified in this study are important for improving the quality of malaria treatment and health care and will serve as a basis for targeting and evaluating future interventions and increasing the awareness of the problem of irrational antimalarial drug use. These could include training materials and a curriculum for continuing training of health workers.

Rational prescribing, adequate availability and accessibility of essential antimalarial drugs as well as neutral drug information are of paramount importance in promoting rational therapy. Essential factors include: appropriate training for health workers; targeted studies of suspected or known antimalarial drug problem areas; a proper antimalarial drug policy; appropriate examinations for diagnosis; availability, afford-

ability and accessibility of antimalarial drugs of a good standard; and an adequate flow of reliable drug information.

The way towards rational prescribing of antimalarial drugs is to prescribe only if necessary, according to the *Standard treatment guidelines* and National Malaria Programme treatment protocols, the correct drug(s), in the correct dose, frequency and duration, by generic name, with a minimum number of drugs per consultation and cautious use of injections, from the Yemeni *National essential drugs list*.

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References

1. *Roll back malaria: in the WHO Eastern Mediterranean Region*. Cairo, World Health Organization Regional Office for the Eastern Mediterranean, 2002. (WHO-EM/MAL/273/E/G/12.01/3000.)
2. *Malaria control programme reports*. Sana'a, Republic of Yemen, Ministry of Public Health, 1996–97.
3. *Hajjah health office annual report*. Hajjah, Republic of Yemen, Ministry of Public Health and Population, 1999.
4. Abdo-Rabbo A. Patients' care regarding consultation and dispensing in some of the public hospitals and private clinics in Sana'a. *INRUD news*, 1995, 2(5):22–3.
5. Abdo-Rabbo A. Baseline prescribing and health facility indicators in Yemen. *Journal of Faculty of Medicine, Baghdad*, 2000, 42(4):824–9.
6. Laing R, Hogerziel H, Ross-Degnan D. Ten recommendations to improve use of medicine in developing countries.

- Health policy and planning*, 2001, 16(1): 13–20.
7. Soumerai SB. Factors influencing prescribing. *Australian journal of hospital pharmacy*, 1988, 18(suppl.):9–16.
 8. Conference of Experts on the Rational Use of Drugs. *The rational use of drugs: the report of a conference of experts, Nairobi, 25–29 November 1985*. Geneva, World Health Organization, 1987.
 9. Winstanley PA, Breckenridge AM. Therapeutic and drug development. *Lancet*, 1997, 349(suppl.1):3–4.
 10. Hogerzeil HV et al. Field tests for rational drug use in twelve developing countries. *Lancet*, 1993, 342:1408–10.
 11. *How to investigate drug use in health facilities (selected drug use indicators)*. Geneva, World Health Organization, 1993 (WHO/DAP/93.1).
 12. De Vries TPGM et al. *Guide to good prescribing: a practical manual*. Geneva, World Health Organization, 1994 (WHO/DAP/94.11).
 13. *Yemen treatment guidelines and essential drugs list*. Sana'a, Yemen, Pharmacy Sector, Ministry of Public Health and Population, 2001.
 14. Marsh K. Malaria disaster in Africa. *Lancet*, 1998, 352:924.
 15. Bimo. Field testing of drug use indicators of INRUD: report of a field trip to Indonesia, Bangladesh, and Nepal, Jun–July 1991. In: *How to investigate drug use in health facilities*. Geneva, WHO, 1993: 74(WHO/DAP/93.1).
 16. Hogerzeil H. Promoting rational prescribing: an international perspective. *British journal of clinical pharmacology*, 1995, 39:1–6.

Improving the affordability and financing of artemisinin-based combination therapies

Malaria management is in a state of transition. Chloroquine resistance has increased around the world, and this single drug treatment has become useless in most malaria-endemic areas. Resistance to sulfadoxine–pyrimethamine (SP) is also widespread. Resistance to other antimalarial drugs, such as amodiaquine, varies but their useful therapeutic life also appears limited. Options for alternative antimalarial drug policies are limited. Although the potential value of drug combinations, particularly artemisinin-based combination therapies (ACTs), is widely accepted, high costs are a major barrier to their effective use. Because of their increasing role as first or second-line treatment of malaria, it is important that their use is secured and that the development of resistance is held back as long as possible. The above-mentioned paper provides a background for further discussion on affordable and sustainable financing policies for ACTs in the short and medium term. It does not prescribe “solutions”, but instead presents a critical overview of the main policy options to improve affordability and financing. It can be accessed at: http://whqlibdoc.who.int/hq/2003/WHO_CD5_MAL_2003.1095.pdf