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Prescription pattern of anti-malarial drugs in a tertiary care hospital

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ABSTRACT

Objective: To evaluate the prescribing pattern of anti malarial drugs in a tertiary care hospital. **Methods:** A prospective cross-sectional study was conducted for 6 months of patients visiting in Basaveshwar Teaching and General Hospital, Gulbarga. Data were analyzed for various drug use indicators. **Results:** A total of 212 prescriptions were collected, with 136 (64.15%) male and 76(35.85%) female. There were 128 (60.37%) *Plasmodium vivax* cases and 84 (39.63%) *Plasmodium falciparum* cases. All *Plasmodium vivax* cases were treated with chloroquine alone and among these 16 (12.5%) recieved radical treatment with primaquine along with chloroquine. Among 84 patients with *Pasmodium falciparum*, 40 patients received single drug such as quinine/ mefloquinine/artesunate/arteether. Another 44 patients received multidrug regime like, quinine+artesunate (54.54%), quinine+mefloquine (27.27%) and quinine+arteether (18.18%). Chloroquine was not administered to any of the patients with *Plasmodium falciparum* malaria. The most common adverse effects with chloroquine were anorexia, nausea, vomiting and tinnitus in 9.37% of the cases. With quinine it was nausea and vomiting in 17.64%, tinnitus in 11.76% and hypoglycemia in 2.1% of cases. **Conclusions:** Our study found the perennial favorites like chloroquine for *Plasmodium vivax* and quinine for *Plasmodium falciparum* were the most effective drug. In the severe *Plasmodium falciparum* cases the artesunate derivatives and combination of artesunate with quinine/mefloquine were most effective with fewer incidences of side effects.

1. Introduction

Malaria is a protozoal disease caused by infection with parasite of the genus plasmodium and transmitted to man by the bite of infected female Anopheline mosquito. Malaria afflicts nearly 500 million people and causes some 2 million deaths each year[1,2]. In India about 27% of population live in malaria high transmission (≥1 case/1 000 population) areas and 58% in low transmission (0-1 cases/1 000 population) areas[3].

Malaria continues to pose a major public health threat in India, particularly due to *Plasmodium falciparum* which is prone to complications[4]. The emergence of drug resistant virulent form of *Plasmodium falciparum* malaria is due to progressive development of biological resistance to the Anopheline vector against insecticides. The artemisinin derivatives are potent and fast acting antimalarials with no clinical evidence of resistance. They are particularly suited for the treatment of severe *Plasmodium falciparum* malaria and now play a key role in the combination therapy of drug resistant infection[5,6]. The artemisinin is derived from the weed Qinghao (Artemisia annua) also called as sweet wormwood or annual wormwood. The Chinese have described medicinal value of this plant more than 2 000 years ago[7]. As early as 340AD, Ge Hong prescribed tea made from Qinghao as a remedy for fever.

Drug utilization studies are powerful tools to ascertain the role of drugs in the society. They provide a sound sociomedical and health economic basis for health care decision making. WHO specifies drug use indicators for adaption in the drug utilization studies. There is a paucity of such studies at the international level and these are nonexistent at our national and regional level in India. The purpose of the study calls for a constant need to upgrade the treatment of malaria and compare older antimalarial drugs with newer artemisinin based combination therapy (ACT) to treat drug resistant *Plasmodium falciparum* malaria[8] .

2. Materials and methods

This is a prospective cross-sectional study conducted in the Department of Pharmacology in collaboration with

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Department of Medicine at Basaveshwar Teaching and General Hospital (BTGH), attached to M.R Medical College, Gulbarga, Karnataka State, India, during the period of January 2002 to July 2002. Patients were recruited after informed consent was obtained. The study protocol was approved by the Institutional Ethical Committee of M.R Medical College, Gulbarga. 212 prescriptions from the newly registered patients were included in the study with a written proforma of patients attending BTGH.

The patients were diagnosed by peripheral blood smear for malarial parasite, Falcichek and Rapid optimal test (ROT). The clinical symptoms, such as fever, chills, leg cramps, headache, vomiting and signs of severe malaria found among these patients were documented and based on the signs and symptoms, these patients were classified into mild and severe *Plasmodium falciparum* malaria.

In this drug utilization study, demographic characteristics such as age, sex and diagnosis were recorded[9]. Once the consultation by the physician was over, the prescriptions were copied and the patients were interviewed as per the WHO guidelines[10] and the following indicators were determined.

2.1. Core indicators

2.1.1. Prescribing indicators

a)Average number of drugs per encounter was calculated by dividing the total number of different drug products prescribed by the number of encounters surveyed.

b)Percentage of drugs prescribed by the generic name was determined by dividing number of drugs prescribed by generic name by the total number of drugs prescribed, multiplied by 100.

c)Percentage of encounters with an antibiotic prescribed.

d)Percentage of encounters with an injection prescribed were calculated by dividing the number of patients encounters during which an antibiotic or an injection was prescribed by the total number of encounters surveyed, multiplied by 100.

e)Percentage of drugs prescribed from essential drug list was determined by dividing the number of products from essential drug list of the hospital by the total number of drugs prescribed, multiplied by 100.

2.1.2. Patient care indicators

a)Average consultation time was determined by dividing the total time for a series of consultations, by the actual number of consultations;

b)Average dispensing time was calculated by dividing the total time for dispensing drugs to a series of patients, by the number of encounters;

c)Percentage of drugs actually dispensed was worked out by dividing the number of drugs actually dispensed at the health facility by the total number of drugs prescribed, multiplied by 100;

d)Patients knowledge of correct dosage was found by dividing the number patients, who can adequately report the dosage schedule for all drugs, by the total number of patients interviewed, multiplied by 100.

2.1.3. Facility indicators

a)Availability of copy of essential drug list: By stating yes (or) no.

b)Availability of key drugs was calculated by dividing the number of specified products actually in stock by the total number of drugs on the check list of essential drugs multiplied by 100.

2.1.4. Complimentary indicators

a)Percentage of patients treated without drugs was calculated by dividing the number of consultations in which no drug is prescribed by the number of consultations surveyed.

b)Average drug cost per encounter was determined by dividing the total cost of all drugs prescribed by the number of encounters surveyed.

c)Percentage of drug costs spent on injection was determined by dividing the cost of injections prescribed by the total drug cost.

2.2 Statistical analysis

Statistical Package for Social Sciences (SPSS) 11.0 (Inc.USA, 2005) was used for data analysis. Comparison of different variables in various groups was done using student *t* test. For all tests a probability (*P*) less then 0.05 was considered significant.

3. Results

A total of 212 prescriptions were collected with 136 (64.15%) males and 76(35.85%) females. There were 96 (45.23%) patients aged 18–30 yrs, 64(30.18%) aged 31–49 yrs, 44 (20.75%) aged 50–69 yrs. The essential drug list was available, and 94.00% key drugs were available.And the other drug use indicators were shown in Table 1.

128 (60.37%) patients with *Plasmodium vivax* positive were treated with chloroquine alone, of which 12.5% patients received radical treatment with primaquine [11] along with chloroquine. Another group of 84(39.63%) patients with *Plasmodium falciparum* malaria were put on single drug regime and multidrug regime. 40 patients of this group received single drug like, quinine (80%)/ mefloquinine(10%)/ artesunate (5%) and arteether (5%). Another 44 patients with severe *Plasmodium falciparum* malaria were put on multidrug regime[12] like quinine+ artesunate (Falcigo) in 24 (54.54%) patients, quinine+ mefloquine in 12 (27.27%) patients and quinine+arteether (E-mal) in 8(18.18%) patients. Chloroquine was not administered to any of the patients with *Plasmodium falciparum* malaria.

The most common adverse effects with chloroquine were anorexia, nausea; vomiting and tinnitus in 9.37% of cases, and with quinine were nausea and vomiting in 17.64%, tinnitus in 11.76% and hypoglycemia[13] in 2.1% of cases.

4. Discussion

Average number of drugs per prescription is an important index of prescription audit. In the present study, average number of drugs per prescription was 3, compared to the previous records of 3.03[14] and 4.07[15] from various specialty clinics in India and 2.9[16] from Hong Kong. The low prescription probably reflects the fact that 60.37% of patients were of *Plasmodium vivax* malaria and therefore the range of drugs prescribed and the number would be low. The percentage of generics used was low and drug use from

Table 1
Details on drug use indicators.

Indicators		Data		Indicators	Data
Prescribing indicators	Average drugs prescribed	3	Patient care indicators	Average consulting time (min)	9.54
	Generic drugs	8.50%		Average dispensing time (sec)	13.50
	Antibiotics	9.45%		Drug dispensed	95.00%
	Antacids	15.09%		Adequate knowledge	50.45%
	IV fluids	28.05%	Complementary indicators	Without drugs	0.00%
	Injections	36.50%		Average drugs cost (Rs) / Prescription	Rs.79.80(1.5 US $)
	On essential drug list	92.56%		Drug cost on injection	87.50 %

essential drug list was higher when compared to those from two specialty hospitals in Delhi[15]. There was no significant difference in antimalarial prescriptions between males and females.

The improvement is needed in patient education and knowledge as 49.55% of patients lacked adequate knowledge of dosage schedule, possibly due to communication error. Pharmacists can be asked to spend more time while dispensing at the moment as only 13.50 seconds are spent for each encounter. This simple measure would probably help the patients to understand their dosage schedule better. All the *Plasmodium vivax* malaria (100%) cases were treated with conventional antimalarial drugs like chloroquine, but radical cure with primaquine[17] was attained in 12.5% of cases only. However, it should be 100% as we know that *Plasmodium vivax* malaria is known to produce replase because it has latent hepatic phase.

40 mild cases of *Plasmodium falciparum* (39.63%) were treated with single drug like quinine followed by mefloquine, artesunate or arteether. Remaining 44 patients (52.38%) of severe *Plasmodium falciparum* malaria[18] were treated with newer artesunate derivatives in combination[19] with quinine / mefloquine. Another interesting observation was chloroquine was not prescribed to any of the patients with *Plasmodium falciparum* malaria. A wide publicity generated that chloroquine was resistant to *Plasmodium falciparum* malaria, probably accounted for the above pattern.

Not only the quantity but also the quality and cost of antimalarial prescribing are important components of drug utilization studies. With new drugs introduced in the market, artemisinin derivatives are much more expensive than conventional antimalarial drugs. Use of injection in 36.50% of cases with quinine and artesunate derivatives will increase the cost of the treatment. The incidence of polypharmacy is very low and that the use of generic names is also low and prescriptions from essential drug list is high, therefore drug use in this setup is quite rational.

To conclude, we found that the perennial favorites are chloroquine for *Plasmodium vivax* and quinine for *Plasmodium falciparum* malaria. But in severe *Plasmodium falciparum* malaria cases artesunate derivatives and combination of artesunate with quinine/mefloquine were more effective and rapidly cured malaria with fewer incidence of side effects.

Conflict of interest statement

We declare that we have no conflict of interest.

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