

## Chloroquine Resistance in Malaria

S. Goyal  
R. Gupta  
B. Bhandari

Malaria continues to pose a challenge in view of its resurgence and problem of drug resistance. The chloroquine resistance in *P. falciparum* was first detected in Thailand in 1962(1) and in India in 1973(2). The extent of problem of chloroquine resistance in *P. falciparum* is increasing every year. Chloroquine resistance in *P. falciparum* has already been found in twelve different states and Union Territories and is likely to be found in other areas also(3). In the present work the problem of chloroquine resistance in malaria in Udaipur region of South Rajasthan was studied.

### Material and Methods

The study was conducted in the Department of Pediatrics, R.N.T. Medical College, Udaipur between April, 1991 to March, 1993. Five hundred confirmed cases of malaria were included in the study.

The WHO *in vivo* test was used for studying the problem of chloroquine resistance in malaria(4). The patients with acute attack of fever were selected for the test. After ascertaining that no chloroquine has been taken during the illness, peripheral smears were made and stained with Giemsa

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*From the Department of Pediatrics, R.N.T. Medical College and Hospital, Udaipur 313001.*

*Reprint requests: Dr. B. Bhandari, 90-L, Bhopalpur, Udaipur 313001.*

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stain(5). Patients whose smears showed rings and early trophozoites were selected for the test.

The WHO extended test was done by giving 25 mg/kg body weight of chloroquine base over 3 days(4). The cases were followed daily for first 7 days (first day of the test was considered as day 0) and weekly for next three weeks to complete a total follow up of 28 days. The interpretation of the test was done as per criteria laid down by WHO(4).

The parasite count was done against total leucocyte count(6). Dill and Glazko test (7) was done in urine to ensure the chloroquine ingestion by the patient. The test was done on day 0 to exclude the presence of chloroquine (no drug has been taken before the study) and on day one and two to ensure that the drug has been ingested, absorbed and excreted by the kidney. If the test was positive on day 0 the patient was not included in the study.

### Results

In the present study, 60% patients had *P. vivax* and 40% had *P. falciparum* malaria. All the patients were followed up for the desired period of 4 weeks. Only 20 patients (10%) of *P. falciparum* infection could not be followed beyond one week hence were labelled as sensitive or resistant at RI level. In *P. falciparum*, chloroquine resistance was detected in 8 (4%) patients, of which RI, RII and RIII resistance was observed in 5 (2.5%), 1 (0.5%) and 2 (1%) patients, respectively. Eighty six per cent were sensitive and another 10% were either sensitive or resistant at RI level and were labelled S/RI (as they could not be followed beyond one week). No resistance was observed in *P. vivax* (Table I).

Drug resistance was observed from

TABLE I—Drug Resistance (Response of Plasmodium to Chloroquine)

Sensitivity/ Resistance	Type of plasmodium			
	<i>P. falciparum</i>		<i>P. vivax</i>	
	No. of patients	%	No. of patients	%
S	172	86.0	300	100.0
S/RI	20	10.0	0	0.0
RI	5	2.5	0	0.0
RII	1	0.5	0	0.0
RIII	2	1.0	0	0.0
Total	200	100.0	300	100.0

TABLE II—Geographical Distribution of Patients and Chloroquine Resistance

S.No.	Name of district	No. of patients of malaria		Chloroquine resistance	
		Total	%	Total	%
1.	Udaipur				
	(a) Udaipur proper and Girwa Tehsil	388	77.6	Nil	—
	(b) Other Tehsils of Udaipur district	86	17.2	8	9.3
2.	Rajsamand	11	2.2	Nil	—
3.	Chittorgarh	6	1.2	Nil	—
4.	Bhilwara	3	0.6	Nil	—
5.	Banswara	2	0.4	Nil	—
6.	Dungarpur	4	0.8	Nil	—
	Total	500	100.0	8	1.6

isolated pockets of Sarada, Kherwada. Dhariwadand Jhahol tehsils of Udaipur district. No resistance was observed from Udaipur city' proper or from patients coming from other districts (Table II).

### Discussion

Chloroquine resistance in *P. falciparum* malaria was observed in 4% children from Udaipur region of South Rajasthan. No resistance was observed in *P. vivax* malaria.

A higher incidence of chloroquine resistance has been reported by Khatri(8) in a study conducted at Rishabdeo PHC (Kherwada tehsil) of Udaipur district of Rajasthan. He reported that out of 29 cases studied RI, RII and RIII resistance was seen in 14, 2 and 2 patients, respectively. Eight were sensitive and 3 were either sensitive or resistant at RI level (SIRI).

In the present study, 77.6% cases belonged to Udaipur city (Girwa tehsil) where

no chloroquine resistance was observed. Rest of the patients came from different parts of Udaipur district and from other districts (Table II). Since the chloroquine resistance is observed from isolated pockets, being present in some areas and absent in others, it may be the reason for lower incidence of resistance observed in this study.

Warhurst(9) described that in many areas where chloroquine resistance has been detected, 70% or more of malaria cases, will still respond to the drug.

In the present study all patients with RI resistance were cured with repeat dose of chloroquine and RII and RHI cases responded to 10 days course of quinine. The other studies also show that patients with RI resistance still respond to chloroquine. Since the level of resistance is not very high, indiscriminate use of pyrimethamine-sulfa combination should be curtailed for routine use.

Nakabayashi *et al.* (10) showed that low resistance cases do not require a change of drug. He recorded 44% recrudescence (RI) with chloroquine. On readministration of chloroquine to these patients, all except 6 cases were cured. Another study(11) showed that low level chloroquine resistance in *P. falciparum* can be held to a sub patent level by giving 300 mg of chloroquine base weekly for 6-8 weeks.

White and Plorde(12) described that if *P. falciparum* malaria has-been contracted in an area of known drug sensitivity, chloroquine or sulphadoxine-pyrimethamine are preferable because they are better tolerated and simpler than quinine and tetracycline. If there is doubt about drug sensitivity, the later combination should be prescribed.

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