

A Study of Sensitivity of *P. falciparum* to Chloroquine in a Rural Area of Bharuch District, Gujarat

SEWA-RURAL RESEARCH TEAM*

A study was undertaken to determine the level of chloroquine sensitivity in *P. falciparum* strains prevalent in a rural, tribal-belt of Bharuch district, Gujarat during 1992-93. Of the 32 cases for which the 7-day follow-up was completed, only in one RII level of resistance was noted, with the mean parasite clearance time in the remaining cases being 1.87 days. Thus, chloroquine continues to be effective in treatment on falciparum malaria in this area.

Keywords: Chloroquine-sensitivity, Gujarat, Malaria, *P. falciparum*

INTRODUCTION

After initiating a countrywide malaria eradication campaign under NMEP, encouraging results were achieved in the control of disease. Thereafter, in the late sixties and seventies, outbreaks appeared in many parts of the country including Gujarat. Bharuch district also showed an increase in the inci-

dence, especially of *P. falciparum* infection. Resistance of *P. falciparum* to drugs has been one of the causes attributed to such alarming increase in this type of infection. The paper describes a study that attempted to measure the level of sensitivity to chloroquine among *P. falciparum* strains in a rural, tribal area of Bharuch district.

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In India, drug resistant strains of *P. falciparum* were first reported from north eastern states^{1,2}. The *P. falciparum* monitoring teams are observing drug resistance in falciparum malaria throughout the country. In Gujarat, the proportion of *P. falciparum* cases has increased from less than 5% in 1980 to more than 34% of total malaria cases in 1988³. Results of studies in Gujarat have shown increasing trends in resistance, both, in its level and proportion since 1984 and RI and RII resistance have been reported in some districts of Gujarat including Bharuch district³.

The study was set in the project area of SEWA-Rural, a voluntary service organisation working in Bharuch district, Gujarat. The project area constitutes a Primary Health Centre fully managed by the organisation, where all activities of national health programmes are carried out, including malaria control, through a cadre of workers similar to that of a typical PHC. A study of the incidence in Bharuch district and SEWA-Rural pro-

ject area over the last few years (Table 1) indicated that the incidence of falciparum malaria was much higher in the project area as compared to remaining areas of the district. There are two possible reasons, topographically the project area is better irrigated than other areas, and there is a sizeable number of people going to nearby industrial areas which attract a large number of migrant labourers from distant places. The likelihood of importing resistant strains is thus obvious.

Hence, a study was undertaken to determine the level of drug resistance in *P. falciparum* strain prevalent in SEWA-Rural project area and to suggest any change in the drugs used, if need be. The study was conducted over a period of 14 months during 1992-93.

MATERIALS AND METHODS

The study was conducted along with other routine work of the field staff of the PHC project area. Blood smears were

Table 1. Comparison of malaria indices for the SEWA-Rural project area with the remaining rural areas of Bharuch district for 1989-91

Indices	1989		1990		1991	
	SR	District	SR	District	SR	District
ABER	19.6	122.2	15.1	24.6	23.9	21.4
API	13.1	25.0	9.3	28.3	15.6	21.7
SPR	6.9	11.4	6.2	11.5	6.5	10.1
SfR	3.8	2.2	3.8	2.3	4.5	2.1

SR — SEWA-Rural project area.

collected by special mass survey and intensive surveillance of *P. falciparum*-predominant villages that were selected based on epidemiological situation of the past three years.

The collected blood smears were examined on the very day or the next day, after staining with Giemsa stain. Those *P. falciparum* cases that showed ring forms alone, or both ring and gametocytes, were taken up for the study, and results were conveyed to the respective field staff. A urine test for presence of chloroquine was done initially by the Dill and Glazko method⁴, and patients with a positive test were not included for study. A total dose of 25 mg/kg body weight, in three divided doses was administered to each selected patient as per WHO standard field test procedures (7-days test)⁵. All tablets of chloroquine were administered in presence of field staff. A urine test for the presence of chloroquine was repeated on Day 1 to confirm absorption of chloroquine. Follow-up blood smears in duplicate were collected on Days 1, 2, 3 and 7 and examined for parasite both asexual forms and gametocytes. Parasite count was done on blood smears collected on all the above days. The count per cu mm of blood was calculated on the basis of 8000 WBC per cu mm after counting the number of parasites and WBC in 100 oil immersion fields. Those cases which showed less than 1000 asexual parasites on Day 0 were omitted while analyzing the results.

Pregnant women, infants, seriously ill patients and non cooperative patients were omitted from the study. Duplicate blood smears were sent to the laboratory of the Regional Director, Rural Health and Family Welfare, Ahmedabad, and the results were thus cross-checked and confirmed.

RESULTS

A total of 2416 blood smears were collected from 18 villages during the period of the study. Out of these, 86 (3.4%) malaria positive cases were detected, of which 61 (70.9%) showed asexual forms alone or along with gametocytes while 5 (5.8%) showed only gametocytes of *P. falciparum*. *P. vivax* cases were 20 (23.3%).

Out of a total of 66 *P. falciparum* cases, 61 cases showing asexual forms were taken up for the study. However, only 32 (52.5%) cases could be given full treatment and followed up to 7 days. The remaining 29 (47.5%) were not included in the study as they showed very low parasitaemia (<1000 cu mm) or were non-cooperative or were taking treatment from other sources. Out of 32 cases 9 (28.1%) showed only asexual stages and the remaining 23 (71.9%) both asexual stages and gametocytes on Day 0. Again, 9 (28.1%) showed complete clearance of asexual parasites on Day 1, a further 18 (56.3%) cases on Day 2, three (9.4%) more cases on Day 3, while 1 (3.1%) case did not show clear-

Table 2. Day-wise progress in the clearance of parasites from the blood

Age group (yrs)	n (32)	Day 0		Day 1		Day 2		Day 3		Day 7	
		n	MPC	n	MPC	n	MPC	n	MPC	n	MPC
0 - 15	14	14	4988	9	5032	2	507	2	131	1	677
16 - 30	14	14	4390	11	617	2	32	0		0	
> 30	4	4	4026	3	2830	1	232	0		0	

MPC — Mean parasite count; n — Number of smear positive subjects on that day.

ance of parasites till Day 4 and showed higher parasitaemia on Day 7 (Table 2). The mean parasite clearance time of 31 cases was 1.87 days. The patient showing resistance was treated with an alternative regimen.

DISCUSSION

Out of 32 cases studied, only one case (3.12%) has shown RII resistance and 31 (96.88%) cases showed sensitivity or RI resistance. It was not possible to distinguish between the latter two, since the extended test (28 days follow-up) could not be carried out. The seven day test carried out in a neighboring district, Surat (Gujarat) among 97 cases reported, *P. falciparum* strain was found sensitive to chloroquine⁶. The *P. falciparum* monitoring team of Government of India carried out tests in a neighboring PHC of Bharuch district in 1987 and reported RI level of resistance to chloroquine in 48%, RII in 16% and normal sensitivity in 36%³. The result of repeat tests in same PHC carried out in 1990 showed only 7.1% RII resistance while rest of the infections were sensitive to chloroquine (personal communication).

It can be inferred that chloroquine is still effective against asexual stages of *P. falciparum* strain prevalent in this area as only 5 (19.35%) cases out of 31 cases have shown clearance time more than the mean clearance time of 1.87 days and 31 (96.88%) cases have shown sensitivity to chloroquine in the study. However, it is essential to carry out a 7 day study as well as a 28 day (extended period) study of a sufficient number of cases in the next transmission season to find out any increase in mean parasite clearance time and also presence of RI level of resistance.

Since, the study indicates that chloroquine is still effective against asexual stages of *P. falciparum* strains prevalent at the study area, no change in drug regime is required at present. However, it is essential to liquidate detected RII foci.

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