Chapter 5.

MATERIAL AND METHODS
5. MATERIAL AND METHODS

This study pertains to burden of malaria during pregnancy, infants and children up-to 14 years of age, measured by conventional parasitological indices and DALY as summary measure in a malaria endemic population under natural conditions. During the first year, in addition, maternal and foetal complications due to malaria, severity and complications of malaria and major co-morbid conditions in children were studied. The effect of one-year presumptive single dose chloroquine chemotherapy to all fever cases through village volunteers was assessed in children in comparison with a control area where regular anti-malaria measures continued to operate.

The kind of epidemiological investigation planned in this study was based on parasitological examination of peripheral blood smears for malaria parasites in different population groups. Therefore, the technique of collection, staining and examination for malaria parasite was simple, sensitive and reproducible which measured not only prevalence but also density and species of the parasite. A review was made and the easiest but sensitive technique of thick and thin smear method technique was adopted. The slides were stained with Giemsa's stain and examined using NIKON (Japan) binocular microscope with 7X100 oil immersion magnification. Independent re-examination of randomly selected 10% slides was carried out to check quality control.
5.1. DESCRIPTION OF STUDY AREA

5.1.1. The land and its people:

The Koraput district (17°50’ and 20°30’N and 81°27’ and 84°10’E) is one of the largest districts in India before the re-organization and division of the district into four districts in 1993. Before 1936, it was in the erstwhile agency area of Madras Presidency as a subdivision of Vishakapatnam district (Senior White, 1937). It forms a part of Jeypore hill tract in the eastern ghat hill ranges in Orissa state and is dreaded for its malarious since early parts of 20th century (Perry, 1911; Senior White, 1937). Koraput, the district headquarters 'a camp near Jeypore' was built by the British in the middle of 19th century. For the inhabitants of the district, which include many aborigine tribes, malaria remains the major cause of morbidity and mortality even today (Das et al., 1988, Rajagopalan et al., 1989, 1990)

5.1.2. Location and boundaries:

The present Koraput district is one of the southern districts of Orissa state. It has Kalahandi, Nabarangapur and Rayagada districts of Orissa in the north, Vishakapatnam and Vizianagram districts of Andhra Pradesh in the east, Bastar district of Chattisgarh state in the west and Malkangiri district of Orissa state in the south. This district forms a nodal point for inter district and interstate population and goods movements. When the study was conducted, the four
districts of Koraput, Malkangiri, Nabarangapur and Rayagada were under one district (Koraput).

5.1.3. Area and population:

The district covers an area of 8,537 sq. Kilometers. with a population of 6,10,777 of which 3,50,287 (55%) are from different tribes and 75,288 (14%) belong to scheduled castes (1991 census). The male to female ratio is 1:0.99. A majority (78.7%) of the population lives in rural areas. There are 1766 villages and average population of these villages is 224 per village.

5.1.4. Physiography:

The state of Orissa has been divided into four physiographic areas (Dash et al., 1984).

5.1.4.1. Northern plateau: an extension of Chotnagpur plateau from Bihar and comprises of Mayurbhanja, Keonjhar and Sundergarh districts.

5.1.4.2. Central tableland: districts of undivided Dhenkanal, Sambalpur and Bolangir districts.
Figure 5.1: India, Orissa state with districts, Koraput district and Borigumma CHC
BORIGUMMA EXPERIEMNTALCHC WITH STUDY AREA (SHADED)
5.1.4.3. Coastal tract: The districts of undivided Balasore, Cuttack, Puri and Ganjam districts.

5.1.4.4. Eastern ghat region: The districts of undivided Koraput, Phulbani and Kalahandi districts.

While the northern plateau and the eastern ghat regions have always been malarious, in the coastal plains malaria is relatively recent (Venkat Rao, 1949). The hills of eastern ghats lie to the north west of Rajmudry and Vishakhapatnam and rise abruptly to heights of about 900 to 1200 metres above the sea level. The famous Jeypore hills of Koraput district forms the northern most part of these hill ranges. The district itself is highly undulating one with numerous perennial and seasonal streams and rivulets, which are highly conducive for breeding of malaria vectors. The district is divided into 2 zones on the basis of altitude, separated by natural barriers (Rajagopalan, 1990). They are: eastern Koraput zone (900 metres plateau): The eastern part of the district is a plateau starting from near the peaks of Jeypore hills (Pottangi) to Koraput town at altitude of about 900 metres above MSL. It extends from the southern most part of Kalahandi and Nabarangapur districts of Orissa to Vizianagram and Srikakulam districts of Andhra Pradesh. The plateau is tilted to the west and a range of hills marks the eastern limit. The area of this plateau consists of undulating tableland with numerous small to large hills. The tribals inhabiting this area have long denuded these hills of their forest cover have been reduced due to practice of slash and burn cultivation. The hills, which form the state boundary, however,
contain thick and valuable forest growth. Kolab is the main river of the area. Koraput (the district headquarters) and Sunabeda are two the important town of this zone. Jeypore zone (600 metres plateau): This plateau starts at the foothills of western part of the Koraput zone. This plateau consists of mostly flat land except on the eastern side, where there are a few hills with forest cover. Some of these hills rise to about 900 metres above MSL. In the south it descends into Malkangiri district as a steep ghat of about 450 metres above MSL and in the west it slope into Kalahandi district with about 300 metres below. The greater parts of the plateau drain westward the rivers Kolab and Indravati and their tributaries of river, Godavari in Andhra Pradesh. There are some intervening hill tracts within the main plain land; Ranaspur hill in Boriguma and Boipariguda hills are prominent. There are numerous villages with wide tracts of paddy cultivation forming the principal granary of the district and that to southern Orissa. Throughout this plateau, there is a fine growth of ‘sal’ and other timbers. Jeypore is the important town in this zone.

5.1.5. Tribes:

Though tribals constitute only 6.94% of India’s total population, 54.3% of population of this district is tribals. Out of a total of 62 tribes inhabiting the Orissa state, 51 are found in the undivided Koraput district. The tribals have been classified into three major groups according to their origin, (i) Dravidian race represented by Kondhas, Parajas, Gond and Koya forming major part of the population, (ii) Kolarian race includes Savara and Gadaba, and (iii) Austro-Asian
race, the Bondas, the most primitive tribe of the area and the country. Apart from these three, there are many others like Omanathio and Bhumia, whose origin is not clearly known (Rajagopalan, 1989).

Kondhas, Parajas and Gadavas are the three major tribal groups inhabiting the present (reorganized) Koraput district almost in equal proportions. The Kondhas (meaning hills) inhabit in both the zones and are migratory in nature. They practice ‘slash and burn’ type of cultivation and shift with their entire establishment when the surrounding becomes unfavorable. The Parajas are a heterogeneous group settled mostly in the Jeypore zone. They are good in goat breeding, agriculture work and collection of forest products. The Godavas inhabit mainly in the Koraput zone are professionally ‘the palanquin bearers’ and are now settled farmers.

5.1.6. Socio economic condition:

The socio-economic condition of the people of the district, which is rich in natural resources, is very poor. The rural daily wages, for unskilled labourerres, according to Government circulars are Rs. 30/day for men and Rs.25/day for women but are never followed. Sometimes the entire wage is paid in kinds. The main mode of trade is through the weekly markets (sandies) or petty shops in the villages.

5.1.7. Health care

The district has 2 hospitals with specialists’ care and 12 primary health centres.

5.1.8. Education:

The literacy rate in the population of the district is 36.2 as against 61.19% in the state and 61.72 in India (1991 census, India). The low literacy contributes to the lack of awareness about health problems prevailing in the population.
Terrain and typical villages of the study area
5.1.9. Meteorology:

The meteorological data presented in chapter are obtained from district meteorological office, Similiguda for Koraput zone and from rice research unit of Orissa University of agriculture and technology, Jeypore for Jeypore zone. Koraput, the district headquarters is considered as a summer resort, since it is the coolest area in whole of Orissa state during summer. However, earlier, the climate of the area was described as 'unhealthy' (Senior White, 1937). Nearly 80% of the rainfall received by the district is from the southwest monsoon. The rainy season starts from the month of June (sometimes late May) and ends by September. The eastern ghat hill ranges influence the rainfall. Regions on the western side (windward side) of the hills receive more rainfall. Therefore, Jeypore zone receives more rainfall than the Koraput zone. The average annual rainfall in the district was 1521.8 mms. between 1901-1950, 1652.2mms between 1951-1960, 1430.6mm between 1975-1980. There is a declining trend in the amount of rainfall from the middle of the century, probably due to deforestation (Chandrasekaran, 1983). However, the average annual rainfall between 190-1995 was 1539.06 mm. The seasonal pattern of rainfall in the two physiographic zones of the district is given in figure 5.1. The number of rainy days was higher in Jeypore zone than in Koraput zone of the district. The seasonal variation in temperature in the district is given in figure 5.2. The climate is hot between March to May (highest temperature in May). The temperature falls at the onset of monsoon in the month of September and falls to a considerably low level during November to February (winter season). The lowest temperature recorded was
6.5°C in December and highest 35.4°C in May in Koraput zone of the district. The data on relative humidity showed that the climate in the Koraput zone is pleasant throughout the year compared to Jeypore zone. The wind speed in the district ranged from a minimum of 2.9KMH in November to a maximum of 8.2KMH in the month of August. The wind speed in the district is high between June and August, coinciding with the monsoon season.
Figure 5.1: Month wise rainfall in the study area

Figure 5.2. Month wise relative humidity in the study area
5.2. STUDY VILLAGES

The Borigumma Community Health Centre (CHC), in southern part of Koraput district (17° 50' and 20° 30'N and 81° 27' and 84° 10'E) in the state of Orissa, India formed the study area. The CHC consists of 378 villages and hamlets in 33 sub-centres. It is situated 22 kilometres from the nearest township of Jeypore and 45 kilometres from the district headquarters, Koraput. This CHC is the largest in the state of Orissa catering the basic health care needs of 1,25,439 population. The topography and dynamics of malaria transmission in the study area have already been described (Rajagopalan et al., 1990). Villages situated on hilltops and at the foot of the hills are hyperendemic for malaria and experience perennial transmission. Villages situated on plain lands and riverbanks are hypo-endemic for malaria and experience seasonal transmission in rainy season only (Rajagopalan et al., 1990). The houses in the villages are with thatched roofing and mud plastered compound walls and are usually in-groups to form a village. Apart from the main cluster of houses, some areas have a few scattered holdings close by (hamlets). Majority of the population is of tribal aborigines. The tribals in the hilltop and foothill villages are economically poor. The men folk go for cultivation; mainly paddy and women go for collection of forest products, usually sal leaves and firewoods. The health care facilities are poor in these remote hilly villages and the first "medical" assistance is from quacks and Disaris (traditional healers) (Rajagopalan and Das, 1988).
5.3. BURDEN OF MALARIA IN INFANTS and CHILDREN

5.3.1. Mass blood survey for malaria prevalence:

The study area comprised of 112 villages with a population of 27,332, located on hilltop, foothill or fringe areas. A village was taken as one sampling unit. Therefore, it was aimed at sampling the whole population of the selected villages. A total of 32 villages were selected for sampling following random number sampling design so as to cover 10 % of the total population.

Table-5.1. Number of villages, population and number sampled for malaria in the experimental area.

<table>
<thead>
<tr>
<th>Total Population (Number of villages (112))</th>
<th>Target Population for sampling (villages=32)</th>
<th>Population sampled (Blood smears collected and examined)</th>
<th>%Coverage (% of total population)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 year</td>
<td>392</td>
<td>180</td>
<td>123</td>
</tr>
<tr>
<td>1-4 yrs</td>
<td>2985</td>
<td>462</td>
<td>298</td>
</tr>
<tr>
<td>5-9 yrs</td>
<td>3563</td>
<td>707</td>
<td>356</td>
</tr>
<tr>
<td>10-14 yrs</td>
<td>2324</td>
<td>423</td>
<td>202</td>
</tr>
<tr>
<td>&gt;14 yrs</td>
<td>18068</td>
<td>3474</td>
<td>1694</td>
</tr>
<tr>
<td>Total</td>
<td>27332</td>
<td>5246</td>
<td>2673</td>
</tr>
</tbody>
</table>

5.3.2. Active fever surveillance:

Fever survey was carried out at fortnightly interval from randomly selected fixed sentinel villages. All fever or with a history of fever within the previous fortnight
were treated with chloroquine presumptive treatment (10mg/kg of body weight, single dose) and parasite positive cases with chloroquine (25mg/kg of body weight in 3 dosage) and primaquine (45mg single dose in \textit{P.falciparum} and 75mg in 5 dosage in \textit{P.vivax}.) as prescribed by national government anti-malaria programmes. The seriously sick infants and children were referred to the local dispensaries or tertiary care hospitals for further treatment.

5.3. 3. Complications of malaria:

The different complications of malaria (cerebral involvement, repeated generalized convulsion, malaria anaemia, hyper-pyrexia, hyper-parasitaemia, hypoglycaemia, renal failure, hepatic dysfunction, fluid/electrolyte/acid-base imbalance, pulmonary oedema, algid malaria, black water fever etc.,) in parasite positive cases were studied in the district headquarters hospital for one year. The cases either admitted or those referred from peripheral dispensaries and therefore, clinical management and outcome could be poor.

5.3.4. Co-morbid conditions

The co-morbid conditions were examined during the door-to-door fortnightly fever survey. The results were based on clinical diagnosis by doctors.

5.3.5. Dynamics of malaria infection and anti malaria IgG antibodies:

A cohort of infants was followed every month from month one for incidence of malaria parasite and IgG antibodies. Sera of the infants were analyzed at International Centre for Genetic Engineering and Biotechnology (ICGEB), New
Delhi. Whole lysate of *P. falciparum* (early and late ring stages) from a continuous culture maintained at ICGEB was used as antigen. The second antibody used was anti human rabbit antibody with HRPO conjugate. The optical density (OD) values were taken as the quantity of antibodies (IgG titre).

5.3.6. Estimation of transition rates in children:

Transition frequencies (incidence of and recovery) from patent parasitaemia for *P. falciparum* between consecutive surveys were determined, i.e., the numbers **N++**, **N+-**, **N--**, **N-+**, where **N++** is the number of persons positive at both surveys, **N+-** the number positive at first survey but negative at second survey etc. From these transition frequencies, daily rates of transition between negatives and positives were derived as shown by Bekessy *et al.*, 1976.

\[
\begin{align*}
h &= \text{daily conversion rate} = \alpha \Lambda (\alpha + \beta) \log 1/1-(\alpha + \beta). \\
r &= \text{daily recovery rate} = \beta \Lambda (\alpha + \beta) \log 1/1-(\alpha + \beta). \\
\alpha &= \frac{N-+/(N-++N- -)}{N-+/(N-++N- -)}, \beta = \frac{N+-/(N+-+N- -)}{N+-/(N+-+N- -)}. \\
t &= \text{time interval between the surveys} = 365 \text{ days}
\end{align*}
\]

5.4. ESTIMATION OF DISABILITY ADJUSTED LIFE YEARS (DALY) LOST DUE TO MALARIA

The general principle of estimation of DALYs lost was used as per Murray and Lopez, 1996. However, minor modifications have been made according to the local situation. We have used malaria episodes (parasite confirmed) and neurological sequelae for estimation of years of life lost due to disability (YLD) and as usual malaria mortality (parasite confirmed) was used for estimation of years of life lost (YLL). The life expectancy for the state of Orissa (1998) was
used for YLL. The disability weight of global burden of disease (GBD) by Murray and Lopez (1996) was used for estimation of YLD.

Table-5.2: Disability weight used for estimating YLD (after Murray and Lopez, 1996)

<table>
<thead>
<tr>
<th></th>
<th>Untreated</th>
<th>Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sequale</strong></td>
<td>0-4</td>
<td>5-14</td>
</tr>
<tr>
<td></td>
<td>15-44</td>
<td>45-59</td>
</tr>
<tr>
<td>Epilepsies</td>
<td>0.211</td>
<td>0.195</td>
</tr>
<tr>
<td></td>
<td>0.172</td>
<td>0.172</td>
</tr>
<tr>
<td></td>
<td>0.172</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.211</td>
<td>0.195</td>
</tr>
<tr>
<td></td>
<td>0.172</td>
<td>0.172</td>
</tr>
<tr>
<td>Anaemia</td>
<td>0.012</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>0.012</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>0.012</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>0.012</td>
<td>0.013</td>
</tr>
<tr>
<td>Neurological</td>
<td>0.473</td>
<td>0.473</td>
</tr>
<tr>
<td>sequelae</td>
<td>0.473</td>
<td>0.473</td>
</tr>
<tr>
<td></td>
<td>0.473</td>
<td>0.473</td>
</tr>
<tr>
<td></td>
<td>0.436</td>
<td>0.435</td>
</tr>
</tbody>
</table>

5.4.1. Estimation of YLL and YLD

\[ \text{DALY} = \text{YLL} + \text{YLD} \]

YLL is estimated as the number years of lost due to premature death due to malaria. The life expectancy is taken from census data for the concerned state. YLD is estimated either from incidence (IYLD) or from prevalence (PYLD) data using the following formula:

\[ \text{YLD} = \text{incidence} \times \text{duration of each sequelae} \times \text{disability weight for that sequelae} \]

or

\[ \text{YLD} = \text{prevalence} \times \text{disability weight} \]

The DALYs lost are estimated per each year per 1000 population to maintain the uniformity.
5.5. BURDEN OF MALARIA DURING PREGNANCY

5.5.1. Enumeration of pregnant women:

All the pregnant women in the CHC area were enumerated with the help of the Anganawadi workers of Integrated Child Development Scheme (ICDS). This gave us idea about the average number women with pregnancy at any point of time in the villages.

5.5.2. Selection of study subjects:

Out of a total 112 villages in the study area, 32 villages were chosen randomly for this study. All the women in these 32 villages with a pregnancy of 12 weeks of gestational age were recruited for the study. Pregnant women with chronic diseases like diabetes, hypertension, tuberculosis, STD, mental disorders or declared unfit by physician for any other cause were excluded. Diagnosis of pregnancy was done on the basis of the history of last missed menstrual period. The gravidity and parity status were determined by interrogating the women regarding the past obstetrical history and number of living children. The expected date of delivery was determined following simple obstetrical calculation.

5.5.3. Ethical consideration:

All subjects were informed with the help of ICDS workers about the study. Either written consent or left thumb impression in case of illiterates in presence of witness was obtained only after explaining the study in detail and were told that they were free to leave the study at any point of time without assigning any reason.
5.5.4. Study design:

The recruitment of study subjects following the above criteria and those willing to give written informed consent was carried out for a period of three months. Since the villages are situated in areas with poor communication facilities, follow-up of the study subjects was carried out at an interval of two months from a base camp till the women delivered their babies. Since the women were recruited in three different months, a cohort of pregnant women recruited in the first batch was followed concurrently to know the changes in malaria parasite rates and blood haemoglobin (Hb. gm/dl.) concentrations in different trimesters of pregnancy. All malaria positive cases detected during the surveys were treated with conventional dosage schedule of chloroquine (25mg/kg of body weight). However, primaquine was not given as it is contra indicated during pregnancy (as per NAMP). Blood Hb. concentration was measured by colorimetric procedure by Sahali's haemoglobinometer. Progress in pregnancy, abortion, perinatal and neonatal mortality, if any was ascertained through verbal interrogations from the women/mother/relatives. Outcome of the pregnancy was compared between women with/without malaria parasite in their peripheral blood at any point of time. Causes of foetal deaths were ascertained on the basis of clinical judgement and history elicited from her mother/relatives. Data analysis was carried out to know the malaria parasite rates (proportion of women positive for malaria parasite) in pregnant women according to their parity and trimester status. The difference was tested for significance by using chi-square test.
5.5.5. Estimation of disability adjusted life years (DALY) lost due to malaria in pregnant women:

The general principle of estimation of DALY was used as per Murray and Lopez, 1996 with some minor modifications to estimate DALYs lost due to malaria in women with pregnancy: We have used malaria episodes (parasite confirmed) and anaemia as the sequelae for estimation of years of life lost due to disability (YLD) and as usual malaria mortality (parasite confirmed) was used for estimation of years of life lost (YLL). The life expectancy for the state of Orissa (1998) was used for YLL. The disability weight of global burden of disease (GBD) by Murray and Lopez (1996) was used for estimation of YLD.
5.4. INTERVENTION MEASURES

5.4.1. Study phases:

Flow-chart-1

<table>
<thead>
<tr>
<th>YEAR</th>
<th>MONTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Preparatory

Procurements

Reconnaissance

Recruitment/Training/Placement of field workers

Selection of study villages for sampling

<table>
<thead>
<tr>
<th>1st year</th>
<th>2nd year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Active surveillance (fever survey)

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer Winter</td>
<td>Summer Winter</td>
<td>Winter</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mass blood surveys for parasite prevalence
5.4.2. Operational Organization

Flow chart-2
5.4.1. Selection of village volunteers:

A village level meeting was organized in each village with the help of the village head. One volunteer from each village was selected to work as a Chloroquine (CQ) depot holder. The selection was based on attitude of the individual towards social service, educational background and popularity in the village. Most of the volunteers were selected by the people or by the head of the village. In the absence of literate persons in any village, person with no formal education but had aptitude for social service was selected. The volunteers were imparted basic training on the diagnosis of malaria in relation to its symptoms and chloroquine administration by a group discussion. The dosage of chloroquine followed for different age groups (< 1 year=75mg= 1/2 tablet, 1-4 years=150mg= 1 tablet, 5-9 years=300mg=2 tablets, 10-14 years=450mg=3 tablets and > 14 years=600mg=4 tablets) as prescribed by National Malaria Eradication Programme (NMEP) of India (Sharma et al., 1996b).

5.4.2. Distribution of chloroquine:

The village volunteers were advised to give CQ at the prescribed dosage as above to those fever patients who approach them for treatment. The volunteers with educational background were asked to fill up a data capture form called 'fever treatment sheet' indicating the name, age, sex, number of days suffering from fever and the number of CQ tablets given to each fever case attending the Drug Distribution Centre (DDC). The volunteers without any educational background were supplied with different coloured disposable plastic pouches containing CQ tablets for different age classes as above. By counting the
number and type of pouches containing CQ distributed, the number of fever cases from each age group treated was deduced.

At fortnightly interval, the fever treatment sheets were collected from the volunteers after replenishment of CQ tablets through field workers located at different centres of the study area. Some of the Anganwadi workers of Integrated Child Development Scheme (ICDS) also worked as CQ depot holders in addition to village volunteers to have better accessibility of all sections of people of the village.

5.4.3 Definitions and logistics:

A case as having fever was based on the history given by the patient or the attendant (in cases of children unable to communicate) at the time of approaching the DDCs. Presence of fever was ascertained by the workers from external dermal temperature. Fever days were defined as the number of days suffering from fever or feeling ‘feverish’ prior to approaching DDCs. ‘Fever treatment sheet’ is a printed questionnaire in vernacular designed to collect information relating to name of the village, age, sex, address, number of days suffering from fever and number of CQ tablets given. Classification of the study subjects into five age classes (less than 1 year, 1-4, 5-9, 10-14 and 15 years and more) were based on standard age class classification adopted in NMEP to facilitate CQ treatment.
5.5. EVALUATION

5.5.1. Fever Incidence:

Fever incidence in the experimental area was calculated as the number fever cases per 1000 population from the cases reporting to DDCs or Anganwadi centres. In the control area, the number of fever cases detected by the village health surveillance workers of the CHC was taken.

5.5.2. Malaria incidence:

Malaria incidence in the experimental area was determined from the fever surveillance carried out in 16 randomly selected villages covering 10% of the population. Data on malaria incidence from the villages in the control CHC were obtained from surveillance records available with CHC.

5.5.3. Number of days suffering from fever:

The number of days suffered from fever after which the individuals report for treatment at DDCs was recorded for each case. Since such information was not available from the surveillance data of CHC, the same was collected from a group of villages in the control CHC area by fortnightly fever surveillance.
5.5.4. Non-reporting of fever cases to DDCs:

In order to determine the number of fever cases not reporting for treatment at the DDCs, door to door surveys were carried out in 112 villages selected randomly in the study CHC area. All the household members were interviewed so as to know the actual number of fever cases present in that village on the day of the visit and the number not attended the DDCs. The causes of non-reporting were recorded. Information on the deaths attributed to malaria was collected from the records available at the control and experimental CHCs. In the control villages, routine malaria control programmes by the state NMEP continued during the study period. Data obtained from NMEP were used for comparison.

Sampling design:

Since the proposed intervention of treatment with chloroquine is designed at the individual level covering a large population, randomized sampling at the individual level will be time consuming and expensive. Therefore, a general approach taking a village as a statistical unit has been adopted. For the assessment of the impact on the incidence of fever, the overall annual fever incidence and fever incidences by age classes were compared with the corresponding indices from the control CHC. The overall annual and age class wise fever incidence were calculated per 1000 population of that age class at risk. The impact on average fever days (AFD) was calculated on the basis of the total number of fever days and total number of fever cases in that age class and compared with the control area where a simultaneous survey was carried out.
Similarly, parasite incidence per 1000 population per year, parasite rates (proportion positive for malaria parasite), overall and in different age groups was commuted.

Comparisons
Comparisons of impacts were made between 1st and 2nd year of intervention measure between the study and control areas. Statistical significance in the differences in proportions was calculated by using Chi-square test. Relative changes in the annual fever incidence (AFI), annual parasite incidence (API) and slide positivity rate (SPR) between 1st and 2nd year in experimental area and also in the control area was compared by odds ratio.