2 VECTOR BORNE DISEASES

2.1 Transmission dynamics of malaria in tribal areas

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Status: On going (May 2004-October 2007)
Funding Agency: ICMR (Under tribal sub plan)

Rationale

Tribal constitutes only 8% of country's population but contributes 30% of total malaria cases, more than 60% of *P. falciparum* cases and about 50% deaths associated with malaria. Control of malaria in this section of the society has defied all attempts as the information on dynamics of transmission at various sites as well as in villages itself and on other aspects like knowledge, attitude and practices among tribals towards health care and its facilities are lacking. Therefore the present study is being carried out to generate data on entomological and parasitological aspects as well as socioeconomic aspect of malaria, which will be useful in planning and execution of control programme.

Objectives

1. To study the Dynamics of transmission of malaria in villages as well as at places of their occupational activities.
2. To understand the Bionomics of vector species to develop appropriate control strategies.
3. To study Parasitological parameters in relation to transmission and treatment.
4. To study population movement in relation to forest based economy.
5. To study socio-cultural aspects, knowledge, attitude, practices and behavior towards disease and health.

Methodology

The study is being carried out in Baiga Chak (Dindori district) and Kanha (Mandla district). These two districts are the highly malarious areas in the state of M.P. Fortnightly active fever survey are being carried out in selected villages and spleen of children between the age of 2-10 year was examined by Hackets method. Man hour density was monitored once in a month using hand catch method. Blood elutes of vectors were examined by gel diffusion method to estimate feeding preference and sibling species identification was done by polytene chromosome preparation & PCR methods at NIMR Delhi.

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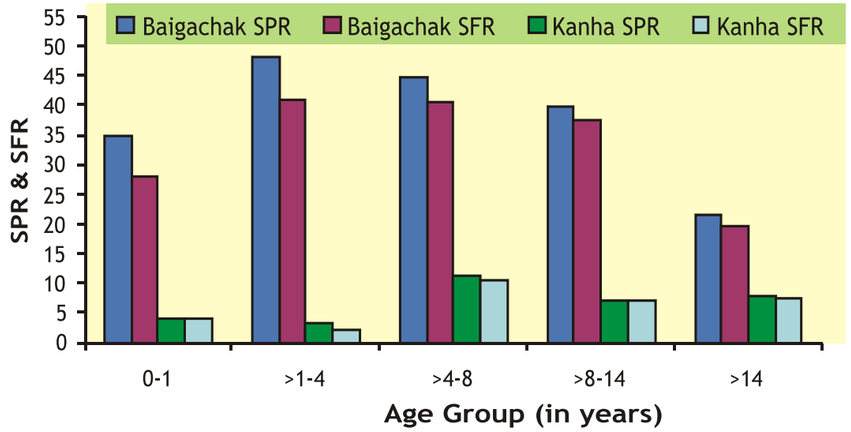
Results

Analysis of age specific data on malaria prevalence (Fig. 2.1.1) in Baiga chak revealed that the SPR was highest in children between 1-8 yrs. (>45%) then declined to 40% in children aged >8 yrs. and further declined to 21% in adults (χ^2 =187.25 df4, p<0.00001). While in Kanha SPR rose from 3.3% in children aged >1-4 yrs. to 11.3% in children aged >4-8 yrs. and declined sharply to 7% in children >8 yrs. and above (χ^2=6.05 df4, p<0.05). Logistic regression analysis revealed significantly more malaria at Baiga chak when compared to Kanha (Exp β = 1.67, p < 0.0001).

Fig. 2.1.1: Age group wise malaria prevalence in Baigachak and Kanha



In-vivo test was carried out for the determination of therapeutic efficacy studies in Baigachak following standard protocol. Four hundred sixty three cases were screened for malaria parasite of which 153 (33%) found positive for *Plasmodium falciparum*. Out of these 80 cases (17, <5-year, 49, 5-15 years and 14, >15 years) were enrolled in the study. Seventy-three cases were followed for 28 days.

Data revealed early treatment failure (ETF) in 26% cases. Further analysis showed significantly more ETF in <5 years as compared to ≥ 5 years (χ^2 = 6.29, p=0.01). Late clinical failure (LCF) and late parasitological failure (LPF) was recorded in 6% and 20% cases respectively. However, there was no significant difference in LPF and LCF between the age groups.

An. culicifacies was seen only in monsoon months in Baigachak while in Kanha, it was prevalent throughout the year and significantly higher in Kanha villages (t=2.42, p<0.02). Indoor resting density of *Anopheles fluviatilis* remained low at both the sites. However, it is significantly higher in Baigachak than Kanha (t=2.24, p <0.02). Light trap catches revealed that per night per trap catch of *An.fluviatilis* was higher in Baiga villages (2.01) than Kanha villages (1.3) and constitute 31.5 and 5.8% of the total anopheline trapped.

Specimens of *An. culicifacies* and *An. fluviatilis* ovaries were analyzed at NIMR Delhi for sibling species identification. Specimens were examined by Polytene chromosome preparation. Species C is the predominant species at both sites followed by B in Kanha and D in Baigachak. Only few specimens were identified as species A from both the areas. Twenty specimen of *An.fluviatilis* from Baigachak and 10 from Kanha were analyzed using PCR technique of which 5 were identified as species S from Baigachak and all specimens from Kanha were species T which is non vector.
Study is in progress.

2.2 Prevalence of dengue in Jabalpur city

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Status : Completed (November 2003 - October 2005)

Rationale

Dengue fever (DF) and Dengue haemorrhagic fever (DHF) has emerged as major vector born disease in recent past. The epidemics of this disease are very fast and some times claims heavy toll of human life. World Health Organization has recently categorized DHF as number one emerging and uncontrolled disease. In India many outbreaks have been reported from many parts of the country particularly from rural areas. Recognizing its importance Indian Council of Medical Research has set up a task force for initiating a research on Dengue and recommended that a study on prevalence of Dengue infection and its vector may be initiated in Jabalpur city. The current study is an endeavor in this direction.

Objectives

1. To study the prevalence of dengue vectors in different seasons and their potential breeding habitats.
2. To determine the virus infection in vector species in study area.
3. To determine the prevalence of dengue infection in humans using Haemagglutination inhibition (HI) Technique.

Methodology

Study was carried out in four areas of Jabalpur city that were selected randomly covering all direction and all socio-economic groups. Every fourth house in each area was searched for water holding containers and presence of *Aedes larvae* in those using flashlight. Larvae from these containers were collected and reared up separately to adult stage for identification up to species level to determine its breeding preferences. *Stegomyia* indices like House index (HI) Container index (CI) Breteau index (BI) and Pupal index (PI) were calculated. Wild caught and laboratory emerged specimens of *Aedes aegypti* were analyzed for dengue infection by ELISA technique at CRME, Madurai.

* CRME, Madurai

Results

In all 6422 household were surveyed in different months and 25300 water holding containers were checked. Overall HI, CI ,BI and PI were 8.7, 2.42 , 9.6 and 4.11 respectively which varied from season to season. Overall *Aedes aegypti* infestations were higher than threshold level of >5% of HI and below threshold level of BI (>20%).

Area-wise house, container and breteau index: Prevalence of Aedes species was not uniform in all the areas. Values for all the indices were significantly higher in Gwari Ghat area compared to other three areas ($p < 0.05$) and lowest in SBI colony (Fig. 2.2.1). Breteau index is higher in Gwari Ghat than the threshold level. Data were further analyzed to find the prevalence of the same in different seasons. *Aedes* infestation was recorded in all the seasons and all the areas (Fig. 2.2.1). Higher values were recorded in monsoon months followed by post monsoon months. (The trend was not uniform in all the areas (Fig. 2.2.2). CI was significantly less during summer season ($\chi^2 = 24.2$, $p<0.001$).

Aedes aegypti breeding habitat: Over all 18 types breeding habitats were searched. Except Plastic over head tank *Aedes* breeding was recorded in all type of containers. Highest positivity for *Aedes* infestation was recorded for cement tank (CT) followed by under ground tank (UGT), ceramic drum (CeD), cement cistern (CC) and mud pot (MP) (Fig. 2.2.3). Among positive containers mud pot constitutes over 28% of the total positive containers followed by cement tank. About 50% of all the collected pupae were from cement tank followed by mud pot, ceramic drum and under ground tank. Together these containers yield more than 85% of the total pupal crop.

Species composition: A total of 1848 specimens of *Aedes* genera were emerged from the wild caught larvae. *Aedes aegypti* was the predominant species in all the months sharing 95.7% and *Aedes albopictus* (1.8%) and *Ae. vittatus* (2.5%). *Aedes albopictus* was found during Post monsoon while the *Ae. vittatus* was found during monsoon and summer season (Table 2.2.1).

Indoor resting density: Limited efforts were made to collect adult Aedes mosquito to determine man-hour density (MHD) and species composition. Over all MHD of *Ae.aegypti* and *Ae. albopictus* was 1.7 and 0.02 respectively. Highest density was recorded during summer (3.0) followed by monsoon season (1.6). MHD of *Ae. aegypti* was directly proportional to pupal yield which is about 50 % in summer followed by monsoon (25%). Over all *Ae. aegypti* constitute 98% of *Aedes. genera* (Fig. 2.2.4).

Species composition of resting adults was similar to the composition of laboratory emerged adults.

Vector incrimination: Seventy specimen of wild caught *Ae. aegypti* and 140 laboratory emerged specimens from field collected larvae were analysed using ELISA technique at CRME Madurai in 17 pools. None was found positive for dengue infection.

Dengue infection in Human: Three hundred eighty blood samples have been collected from school going children between the ages of 6-12 years from three study sites. These are being analysed at CRME Madurai for any possibility of Dengue infection.

Study thus indicates that *Aedes aegypti* is present in all the seasons and in all parts of the city with peak prevalence during monsoon months. The specimen analyzed so far shows that dengue is not an immediate threat. However, there is a need to be vigilant because of perennial prevalence of vector.

Fig. 2.2.1: Seasonal variation in Container Index (CI) in study areas

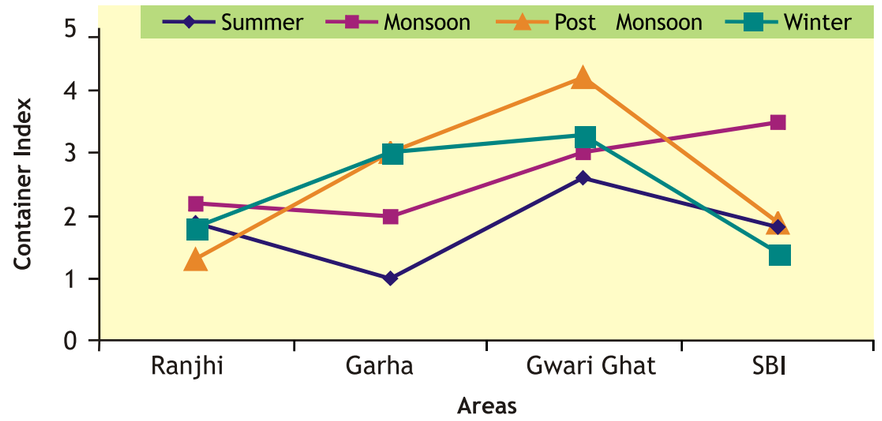


Fig 2.2.2: Season-wise Breteau, House and Container index in Jabalpur

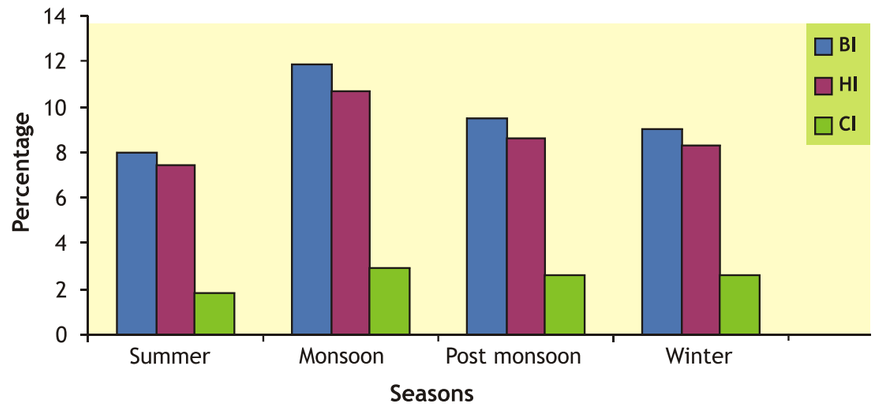


Fig 2.2.3: Major breeding habitats of Aedes aegpti

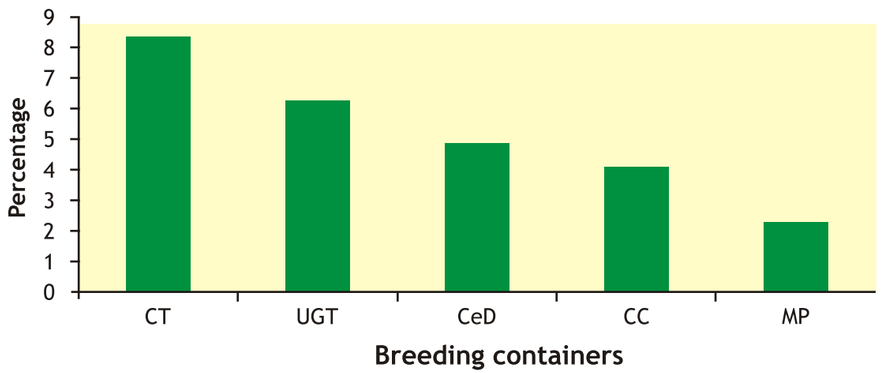
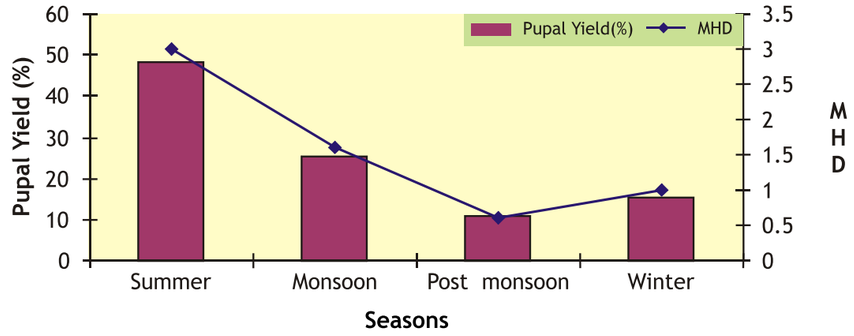


Table 2.2.1: Species composition of *Aedes*

Season	*Ae. aegypti*	*Ae. albopictus*	*Ae. vitattus*
Summer	473(98.3)	0	8(1.7)
Monsoon	428(91.6)	0	39(8.4)
Post Monsoon	384(92.5)	31 (7.5)	0
Winter	483(91.6)	2 (0.4)	0
Total	1768(95.7)	33 (1.8)	47(2.5)

NB: Figure in parenthesis refer to percentage

Fig 2.2.4: Pupal yield and man hour density (MHD) in different seasons



2.3 Concomitant infection of intestinal parasites with filariasis

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Status: Ongoing project (June 2004-May 2006)

Funding Agency : ICMR (Extramural)

Rationale

In the context of filariasis elimination programme an effort was made to obtain information about the true prevalence of filarial infection by Circulating Filarial antigen (CFA) detection and the presence of intestinal parasites in a rural area of Madhya Pradesh.

Objectives

1. To estimate the prevalence of filariasis by antigen detection method.
2. To estimate the infestation of intestinal parasites in the study population.

Methodology

During this year we have collected stool and blood samples from 338 individuals. The subjects of villages Tikuri, Khajuwa and Udayapura of Rajnagar block, Chhatarpur district were assessed for prevalence of filariasis by night blood smear and Og4C3 ELISA. An attempt was made to collect stool samples from these individuals. Stool samples were examined directly by wet smear and on preserved samples by sugar floatation method.

Results

We could collect 148 stool samples from 338 subjects participated in the filariasis prevalence study. About 27% of 338 individuals examined were found to be positive for filarial infection by Og4C3 ELISA and 29% showed filarial disease (Table 2.3.1). About 41% inhabitants of the study area were suffering from filariasis. Out of 148 stool samples collected, 54 samples were found to be positive for some type of intestinal parasite. The major intestinal parasites observed were Round worm and *H. nana* (Fig. 2.3.1). It was observed that a higher percentage of individuals having intestinal parasites were found positive for filarial infection than individuals without intestinal parasites (Table 2.3.2).

The study is in progress.

Table 2.3.1: Filariasis Prevalence in Rajnagar Block, Chhatarpur district

Total Population Surveyed	Mf +ve (%)	CFA +ve (%)	Filarial Disease CFA +ve/ CFA -ve (%)	Endemic Normal (%)
338	49 (14.5)	91 (26.9)	12 / 51 (28.8)	198 (58.6)

Fig 2.3.1: Distribution of intestinal parasites (n=148)

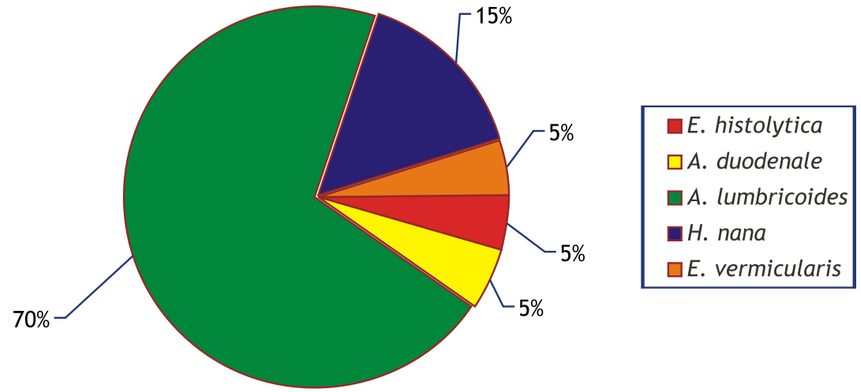

Table 2.3.2: Relationship between Intestinal Parasites and CFA

Intestinal parasite +ve (n=54)		Intestinal parasite -ve (n=94)	
CFA +ve	CFA -ve	CFA +ve	CFA -ve
23	31	22	72