I

INTRODUCTION

In oxford dictionary Malaria is defined as “recurrent fever caused by a parasite transmitted by a mosquito bite”. Microsoft Encarta dictionary defined the disease “as an infectious disease caused by a parasite that is transmitted by the bite of infected mosquitoes which is common in hot countries and the disease is characterized by recurring chills and fever”. The name of the disease malaria was given as far as back as 17th century. Lancisi (1717) an Italian Scientist linked malaria with poisonous vapours of swamps and thus originated the name malaria meaning bad air. It was also known as Roman fever (Chaterjee 2000).

Malaria is the most important tropical disease, remaining widespread throughout the tropics, but also occurring in many temperate regions. Malaria has become a global problem. More than half of the world population in 102 countries is exposed to malaria and is responsible for over 300 to 500 million clinical cases and more than a million deaths each year. Previously extremely widespread malaria is now mainly confined to Africa, Asia and Latin America. It exacts a heavy toll of illness and death - especially amongst children and pregnant women. It also poses a risk to traveler's and immigrants with imported cases increasing in non - endemic areas (WHO, 2000).

Malarial disease is one of the main health problems in the world with 300-500 million cases yearly and about one million deaths. In 1998 the new secretary general of World Health Organization Mr. Gro Harlem Brundtland established the Roll Back Malaria Programme, with the aim to markedly reduce malaria morbidity and mortality. Governments in malaria - affected countries are encouraged to take the lead in Roll Back Malaria. RBM encourages and promotes malaria research which hopefully will result in new medicines, vaccines and other tools which will improve the malaria - related deaths and suffering.

Purpose of RBM is to create an environment that helps country's development policies and implement relevant elements of RBM strategy. There are six elements to Roll Back Malaria. They are early detection of malaria, illness, rapid treatment of those who are ill, multiple means for preventing infection, strengthening of health

sector and inter sectoral activities, a powerful sustained social involvement and movement, focused research for new tools and better implementation (Binkaf, 2000).

Even today malaria continues to remain one of the most prevalent infectious diseases in the world with the African continent being the largest malaria stronghold on the globe (Loban, 1985). The disease is also rather widespread in a number of countries of South America and South East Asia. Over 42% of the world's population live where there is a risk of malaria and 1.5 million of deaths occur annually due to the disease (WHO,1999). In many countries where the large scale spray of insecticides has been discontinued following malaria eradication, population of mosquito of genus *Anopheles* has been restored. This is the main cause of post - elimination epidemics with several countries where malaria had been practically eliminated. The most significant of these out breaks have occurred in Sri Lanka, Pakistan, India and Nepal (Loban, 1985).

The disease is caused by four species of the microscopical protozoan genus *Plasmodium.* They are *P. falciparum, P. vivax, P. malariae* and *P. ovale. P. malariae* causes quartan malaria. Benign tertain malaria is caused by *P. vivax* and *P. ovale* while malignant tertian malaria caused by *P. falciparum* has the highest death rate.

The illness is characterized by a cyclic course with periods of acute febrile attacks and paroxysm at free intervals as well as splenohepatomegaly, anemia, occasional severe lesions of CNS, kidneys and other organs. Paroxysm begins with frequent bed Shakinar chills, followed by high fever, sweating, headache and muscular pain. Relapses are also common.

Nepal also participated in the regional meeting organized by WHO-SEARO in 1998. The Government submitted a proposal to WHO for the implementation of the first phase of RBM in September 1999 and a RBM task force committee and National Review Team with multi-sectoral representation have been established (http://www.malareanetwork.org). Several partners are involved. The RBM task force committee comprises of high level representatives from different divisions within the ministry of Health Departments of Agriculture, Irrigation, Forest and Education, UNICEF, UNDP and WHO (USAID). The National Review of Team also comprises representatives from different partners.

About 70% of Nepal's population lives in areas with unstable malaria transmission. Nepal has four distinct epidemiological belts of malaria (WHO, 1987).

(I) Cultivated Plain terai
(II) Forested Plain terai (Charkoshe Jhari)
(III) Inner terai (between Churia - siwalik hills and mahabharat mountain)
(IV) Mountains and upper valleys (usually 1000m and above the sea)

In Nepal approximately 12.75 million people i.e. 64.6% of the total populations are at risk of contracting malaria (Malaria Control Division,1997). *Anopheles fulviatilis, A. maculatus, A. minimus, A. annularis* and *A. willmori* are the five proven vectors for malaria transmission in Nepal especially in inner Terai (Shrestha *et al.*, 1991).

Significance of the Study

Among the many health problems prevalent in Nepal, parasite infection constitutes a major health problem which is associated with poverty and awareness. World Bank in 1990 reported that 7% population of the country is in absolute poverty (Chhetri 1997). The literacy rate for the male and female is 54% and 25% respectively (Chhetri, 1997). Poor economy health education and sanitation have resulted high incidence of parasites in the country. So the study of the parasite infection is crucial.

Principally, Malarial diseases are preventable diseases. But the prevalence of malaria has not expectedly declined. So the high prevalence of the malarial parasite might be indication of human behaviours like sleeping outside, walking and working without clothes, low socioeconomic status, illiteracy and lack of awareness.

So there is a need to study human behaviours regarding parasitic infections. The present work is aimed to endeavour relationship between the human behaviours and malarial parasitic infections.

II

OBJECTIVES

2.1 General

The study is to determine the prevalence of malaria among Yaduv and Tharu communities of 3 villages of Gugauli VDC in relation to their socio-economic and socio-cultural aspects.

2.2 Specific

- To observe thick and thin blood smears for the detection of malarial parasites.
- To determine the prevalence of malaria during April – Sept., 2006.
- To determine the knowledge, attitudes and practices of people in relation to malaria transmission.
- To compare malaria situation among three wards of Gugauli VDC of Kapilvastu district.
- To compare malaria situation among different occupational groups, age-wise and sex-wise.

III

LITERATURE REVIEW

The malarial disease continue to survive with new threats for more than a century since its first scientific elucidiation. Major research efforts have been directed towards malaria chemotherapy, malaria immunology and vaccines, malaria molecular biology etc. in recent years. The portion of the work and reports related to the epidemiology have been mentioned here.

3.1 Global Situation of Malaria

A report in 1935 indicated that there was an estimated 100 million cases and 1 million deaths annually in the Indian sub-continent (Sinton, 1935).

For the year 1995, estimated number of clinical malaria cases and of antimalarial drug resistance in SEAR is 6% and 30% respectively in relation to global figure (WHO, 1997).

It is estimated that 1.2 billion people out of the 1.4 billion people of SEA-region live in malarious areas. In 1995, malaria cases, in the region were estimated to be 21.9 million with almost 32,000 deaths. India accounts around 85% of the total reported cases in the region in the same year. During 1996 also, India contributed 83% of total malaria cases in SE Region. Thus, around 80% of reported cases in the region is contributed by India.

Bell *et al.* (1997) found that a history of fever alone was not a good indicator of parasitaemia. Most precautions, including bed-nets, window screen and personal precautions were of little benefit. Many patients had a good knowledge of malaria transmission and mosquitoes, but this did not translate into a lower rate of parasaitemia of malaria.

Carles *et al.* (1998) reported 143 cases of pregnant women infected by *P. falciparum* in French Guyana. The consequences on the fetus in this area, where the maternal premunition rate is low, are serious: the rates of prematurity, hypotrophy and still birth are 3 times higher among pregnant women infected by malaria. The consequences for the fetus are all more serious if the infestation is repeated or prolonged the closer one is to delivery.

Jose, (1999) in 1916, the French army in Macedonia, suffer the serious malaria epidemics, where between June and December 60,000 cases were recorded. Belgian Cango in 1918 to 1920, 1229 cases in 1921 to 1930, 1129 cases in 1931 to 1960, 1638 and in 1941 to 1949, 3777 cases were recorded the malaria positive.

Arez *et al.*, (1999) presented parsitological, molecular and longitudinal analysis of an isolated outbreak of malaria, which occurred on Santiago island. *P. falciparum* was the only species detected by PCR.

Granja *et al.* (1998) the central hospital of Maputo, Mozambigue in 15.5% of the deaths were directly attributable to malaria and 19.7% of the women who died were found to be parasitaemic with *P. falciparum* prior to death. The current policy of prescribing antimalarials in pregnancy based on symptomatic malaria alone should be reviewed.

Poinsignon *et al.* (1999) reported a case of *P. falciparum* infection observed in Paris and presumably acquired in Guadeloupe a French Caribbean Island where malaria has been considered to be eradicated since 1970.

WHOa, (2000) malaria affects more than 2400 million people over 40% of the world's population in more than 100 countries in the tropics from South America to the Indian Peninsula. The tropics provide ideal breeding and living conditions for the *Anopheles* mosquito and hence this distribution. Every year 300-500 million people suffer from this disease 90% of them in Sub-Saharan Africa, two thirds of the remaining cases occur in six-countries – India, Brazil, Sri Lanka, Vietnam, Columbia and Solomon Islands.

"WHO forecasts a 16% growth in malaria cases annually. About 1.5 million to 2.7 million people die of malaria every year (85% of these occur in Africa), accounting for about 4-5% of all fatalities in the world". It is excepted that by the turn of the century malaria would be the number one infectious killer disease in the world. It accounts for 2.6 percent of the total disease burden of the world (WHOb, 2000).

WHO SEARO, (2001) malaria in Thailand is forest-related with disease being prevalent along with international malaria transmission areas covered 3.87 million or 6.7% of the country's population i.e. 6789 villages or 9.85% of the total villages.

WHO SEARO, (2002) the population of Indonesia were 203 million in 2000 of the total population 149.7 millions reside in malarious areas. Approximately 1.5 million cases are detected annually.

Mulberger *et al.,* (2004) between January 1999 and September 2003 a total of 4801 patients with travel-related malaria were reported within in the 16 Tropnet Europe Network. Within surveillance period 4801 cases of imported malaria were reported. *P.falciparum* was leading number followed by *P. vivax.* All 16 Trop-Net Europe countries reported *P. vivax* malaria.

3.2 Malaria Situation in Nepal

Malaria was highly prevalent in past. Brain Hodgson (1857) mentioned that the epidemics of the plains hardly ever reached the Himalayas and that the Terai region of Nepal was notorious as a malarious region. Writing about malaria Dr. Oldfiled (1880) wrote the tribes inhabit with impurity the lowest and hottest valleys in Nepal.

Rana, (2001) mentioned that malaria in its various forms has been the cause of mortality in Nepal throughout the ages. The vast forests of the Terai, stretching like a blanket across the Southern belt of Nepal have been known to harbour virulent forms of malaria often rapidly fatal for the unwary travelers. This fact has contributed to the isolation of Nepal from the rest of the world, resulting in a slow socio-economic development. The prevalence of malaria upto an altitude of 4000 feet forced valley dwellers to migrate to the inhospitable higher regions in order to escape the ravages of the disease. During the seventeenth and eighteenth centuries virtually all the aspects of life were affected either directly or indirectly by malaria which has been one of the most important causes of deterioration engendering poverty diminishing quantity and quality of food production lowering physical and intellectual stands of the nation and hampering prosperity and economic progress in every way.

Out of Nepal's total population of 28 million approximately 17.6 million (74%) of the people are at risk distributed at 64 districts in 5 development regions (DOH, 2002-2003).

Malaria in its various forms has been the major cause of mortality in Nepal through out the ages. It has become one of the important causes of economic standards of the nation and hampering prosperity and economic progress in every

way. Up to the 1950s (before the Mc-activities was under taken) it was estimated that approximately two million cases of malaria (40% of the total population) occurred annually and ten to fifteen percent among those resulted in death (EDCD, 2001).

The decade of sixty had high proportion of *P. falciparum* at the beginning (more than 35%) and was down to around 8% by 1970. The major event in 1960's was the incrimination of *An. minimus* and *An. fluviatilis* responsible for transmission of malaria in terai belt and *A. willmori* as a vector responsible for transmission of malaria of an altitude of 6500 ft. in Mugu district of Mid-Western region. The virtual disappearance of *An. minimus* the primary vector with anthropholic index and high sporozoite rate was also the magnificent achievement. During early seventies there were massive outbreaks in Kapilvastu, Nawalparasi and Rupandehi of western region and Parsa district of Central region. The number of cases is increased to 9375 in 1973 and to 14647 in 1974. The resurgence was due to resistance of *An. annularis* against DDT. The effort directed to change the insecticide from DDT to Malathion, Ficam and larviciding with abate controlled the epidemic in western region and the causes were reduced to 10123 by 1976. By the time the epidemics were controlled the cases started increasing almost all over the country and by 1980 increases again 14148. However, during the half of the decade the percentage of pf increased with the increase of case but in the later half the same percentage of pf decreased in spite of gradual increase in cases (EDCD, 2002). The decade of 1980 had massive epidemics in Far-Western region with smaller epidemics in Central region in 1985 to 1988. In all the years the cases were well above 15,000 annually escalating to as high as 42,321 in 1985. Proportion of *P. falciparum* was also very high (18 to 19% in 1984 and 1985) by the end of the decade the causes reduced to 22,000. The decade of 90s also experienced periodic epidemic resulting into 29,000 cases in 1991 in Central and Far-Western region. Again efforts like regular IRS in epidemic prone areas reduce the cases to 97000 in 1995 (EDCD, 2001).

The cases remained below 10,000 annually from 1996 onwards. Proportion of *P. falciparum* in 1996 and 1997 was high because of the outbreak in Kanchanpur in 1996 and in Nawalparasi in 1997. There were 7981 cases in 2000. The major burden of malaria during the time was found in refugee camp. As compared to 6396 cases of 2001, the epidemic of 2002 reported 12,750 cases. In epidemic of 2002 the highest numbers of malaria cases were reported from Far-West 1856 and least from Western-

Region (117). Similarly, *P. falciparum* cases were highly concentrated in Far-Western (1721) and least in Western-Region (21).

Annual report on malaria EDCD (2003) in 2003, the distribution of malaria cases by regions showed highest in Far-West (4987). However, the highest numbers of pf were concentrated in Jhapa (749) in Eastern-Region. The number of pf dropped down to 267 in Far-Western (Bista et. al 2002). In the year 2002 highest parasite incidence was reported very low with comparison to the last three successive years. A rise was observed in 1996 with comparison to previous year and after which it starts to decline up to 2000, where it was below 1/1000. But unexpected increase was reported in 2001 and 2002 during which parasite incidence was 7.27 and 21.29 respectively. Out of total 75 districts, it is endemic in 65 districts and 12 districts are related as malaria priority districts. The disease is more prevalent in Southern Terai districts bordering with India. Malaria epidemic is the major cause of death, reduction in the agriculture productivity, hinders travel and tourisms; the affecting novel investments (Parajuli et. al 2003). In the mean time the parasites are becoming resistant to commonly used antimalarial drugs. The vectors of disease, the mosquitoes are also becoming resistant to the insecticides. This is how malaria is spreading in a new area each year. This is the main cause for the increased number of cases each year. The malaria situation in Nepal from 1994-2003 is shown in the table.

Malaria Situation in Nepal from 1994-2003

Year	**Approximately population at risk (in million)**	**Total examined**	**Positive**	***pv***	***pf***	***Pf* %**
1994	12750286	430801	9884	8684	1200	12.04
1995	12298141	338189	9718	8765	844	8.68
1996	15225411	204355	9020	8069	951	10.4
1997	15619053	160293	8957	7807	1150	12.8
1998	16344287	175879	8498	7978	520	6.12
1999	15361979	132044	8959	8317	632	6.94
2000	15295571	156370	7981	7145	836	10.4
2001	13215972	126962	6393	6131	424	6.38
2002	16147782	183519	12786	10621	2165	16.93
2003	17.3 million	194901	9394	8177	1192	13.03

(Source: Annual report on malaria, EDCD, 2003 & Bista *et al.*, 2002)

IV

MATERIALS & METHODS

4.1 Materials

Equipment: - Microscope, slide and slide box, cotton wool, staining troughs, measuring cylinder, beaker, timing clock, slide-drying rack, sterile lancets, clean lint-free cotton cloth, record form or register.

Chemicals: - Giemsa stain, Methanol, Distilled water, methylated spirit and water.

4.2 Method

Study area and population: -

Kapilvastu, a beautiful place in terai of Nepal, is the native land of Lord Siddhartha Gautam Buddha. Thus it is one of the historical as well as religious place in Nepal and in the world. It occupies 1738 sq. km i.e. 1.1% of total area of Nepal. Rupandehi is in the east, Dang in the west, Arghakhachi in north and Uttar Pradesh (UP) state of India in the south. Administratively district is divided into 78 VDCs and one municipality. The total population of Kapilvastu is 4,81,976 in which 2,47,875 are males and 2,34,101 are females. The total Tharu population in Nepal is 15,33,879 in which total population of Tharu in Gugauli VDC is 937 and 357 are Yaduv. (Central Bureau of Statistics, census 2001)

Major occupations are paddy cultivation, cattle farming (Yaduv community), collection of forest products and other daily wage jobs. The villages are close thick populated, open defaecation in crop fields. The houses have two to three rooms often with adjacent cattle sheds made of bamboos, khar (local name) grass with thatched roof, some houses is cemented. The temperature ranges from 22 to 40 degree celcius.

4.3 Sample Size

Investigation was carried out in three wards inhabited by two castes. Ward no.1 (Nevalganj-Tharu population ward), ward no. 2 (Gugauli-Yaduv population) and ward no. 8 (Padrauna-Yaduv population) situated in jungle of Shivghari. Blood samples were collected from the symptomatic people visiting Gaugauli Health Post and Jansewa Swastyha Kendra in Gugauli VDC. People having fever, anaemia, headache, splenomegly and hepatomegaly were included in the sample. Among them 220 samples were from ward no. 2 of Tharu community, and 140 samples from ward

no. 2 and 8 both of Yadav community. The blood films were prepared and stained at Gagauli HP and JSSK, and were transferred to a privately owned Prem Pathology situated at Siddharthanagar, UP (India) for diagnosis.

4.4 Study Duration

The study period was April to Sept. 2006.

4.5 Survey Study

The study area ward no 1,2 and 8 was visited and the sanitation (open field) measure, poverty, household condition, water supply, sleeping areas, educational condition, and activity in their free time were observed. The meetings with various persons were conducted to get various information about the study area as well as the various activities and traditions of the people. The questionnaire was translated in Awadhi and Nepali language to take proper information.

4.6 Preparation of thick and thin blood films on the same slide

After details about patients were recorded in the appropriate form on the register, the blood films were made as follows: The patient's left hand was selected and the middle finger was punctured with a sterile lancet, using a quick rolling action. Gentle pressure was applied to the finger to obtain a drop of blood and collected two to three drops on the middle of the slide, for the thick and thin film.

Thin Film: - The thin film consists of a single layer of red blood cells and determined the stages of parasite of the patient. It is used to assist for the identification of the malaria species or other morphological character of the parasite whenever not seen clearly in thick film.

Thick Film: - The thick film was made for the large numbers of dehaemoglobinized red blood cells. Any parasites present are concentrated in a smaller area than in the thin film and so are more quickly seen under the microscope. For routine examination, thick film was used followed by thin film if necessary.

4.7 Data Analysis

The study is based on the primary data as well as secondary data, which was collected from different sources. Data collected were qualitative and quantitative and were presented and analyzed with appropriate statistical methods.

V

RESULTS

As the study was based on two ethnic groups viz. Tharu and Yaduv, a total of 360 blood samples only belonging to these two ethnic groups i.e. Tharu and Yaduv were collected from suspected cases having some symptoms of malaria visiting at health post and Jansewa clinic at Gugauli VDC during April to Sept. 2006. These cases mostly belonged to wards 1, 2 and 8.

The result of the present study is presented in two ways:

(i) Result of blood examination for malarial parasites.

(ii) Result of survey analysis regarding malaria.

Result of Blood Examination for Malaria

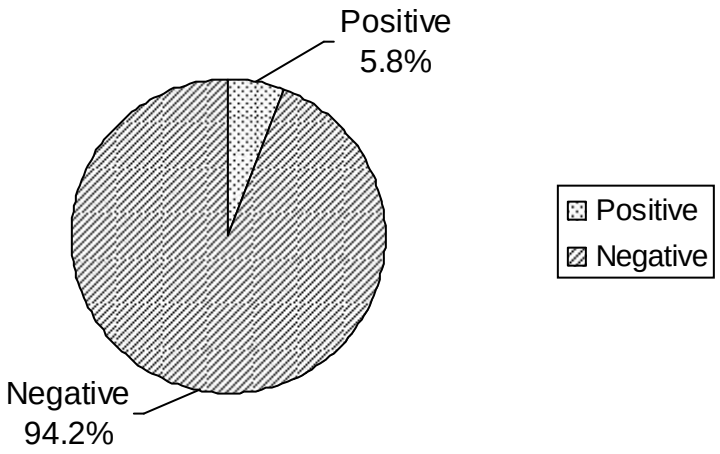
) General Prevalence of the Malaria Parasite

Among 360 blood samples from malaria suspected cases, only 21 were found to be infected with malaria i.e. the slide positivity rate was found to be 5.8%.

Table no. 1: Prevalence of Malaria

S.N.	Total samples examined	Positive samples	
		No.	%
1	360	21	5.8

Figure 1: Prevalence of Malaria



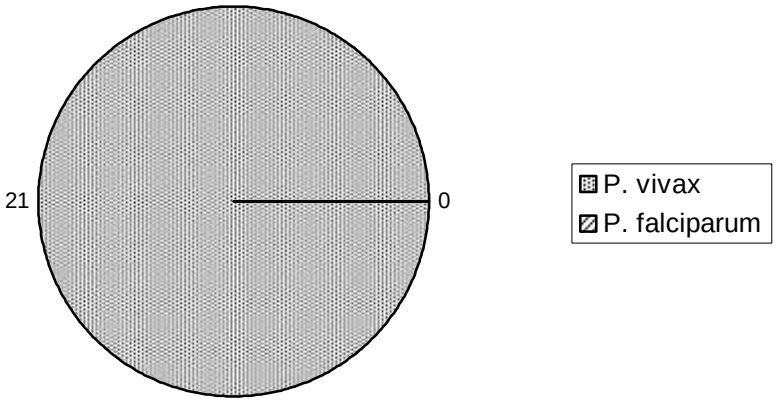
) Species-wise Prevalence of Malaria

Species-wise identification showed that all the 21 positive slides had *P. vivax* species No *P. falciparum* case was found.

Table no. 2: Species-wise Prevalence of Malaria

S.N.	Total positive samples examined	Positive samples	
		P. vivax	*P. falciparum*
1	21	21	0

Figure 2: Species-wise Prevalence of Malaria



) Caste-wise Prevalence of Malaria

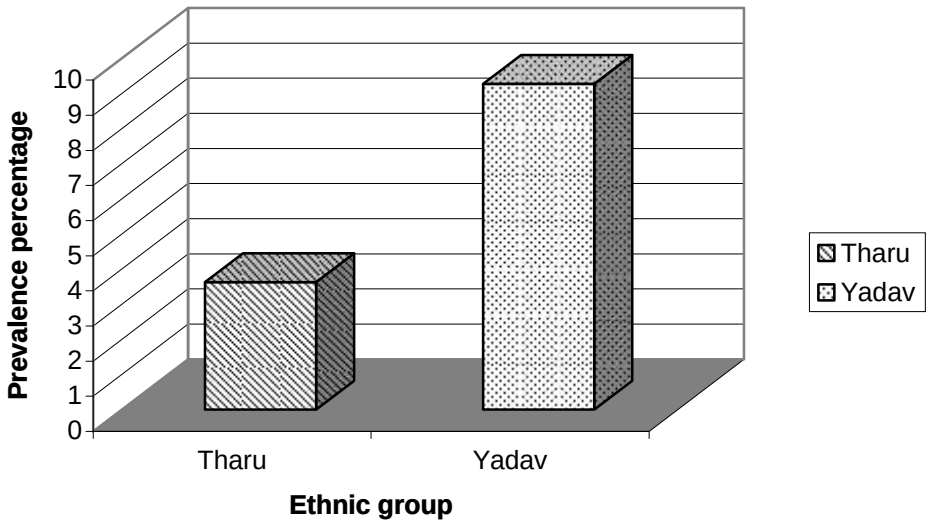
Out of 220 blood samples collected from Tharu community, 8 (3.63%) samples were recorded as positive for malaria. Likewise, out of 140 blood samples collected from Yadav community, 13 (9.28%) samples were found to be positive. Comparison among the two ethnic groups showed Yadav community to be more infected than Tharu community (Table no. 2, Fig. 2).

Statistically significant difference was observed in the prevalence of malaria in the two ethnic groups (χ^2 cal X6.934, P Ψ0.05) .

Table no. 3: Prevalence of Malaria in two Ethnic Groups

S.N.	Ethnic groups	Total Samples Examined	Positive Samples	
			No.	%
1	Tharu	220	08	3.63
2	Yadav	140	13	9.28
	Total	360	21	5.80

Figure 3: Caste-wise Prevalence of Malaria



) Sex-wise Malaria Situation in two Ethnic Groups

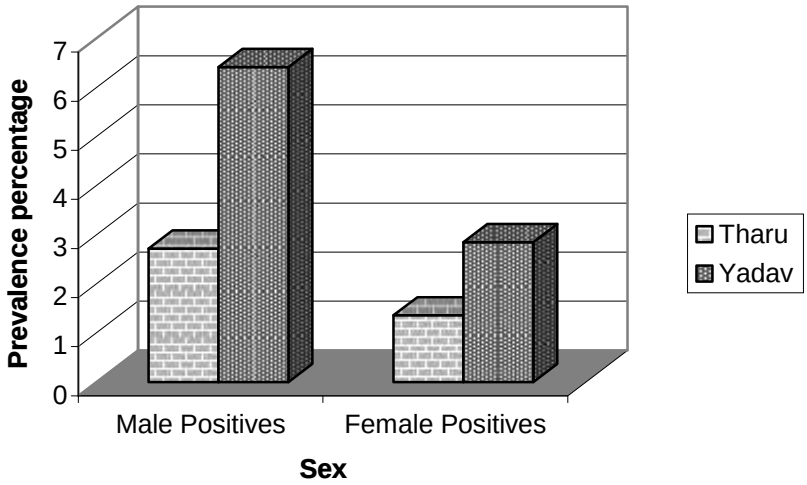
Regarding sex-wise, malaria situation in the two ethnic groups, males were found to be more infective [14 (3.88%)] than the females [7 (1.94%)]. Overall study also showed that Yadav males and females were more infected (6.42% and 2.85%) than Tharu males and females (2.72% and 1.36%) (Table no. 4, Fig. 4).

Statistically, the malaria ratio of males to females is nearly 2:1. There was significant difference in the occurrence of malaria in males and females (χ^2cal X18.467, P Ψ0.05).

Table no. 4: Sex wise Malaria Situation in two Ethnic Groups

S.N.	Ethnic groups	Total samples examined	Sex-wise positive cases				Total positive cases	
			Male No.	%	Female No.	%	No.	%
1	Tharu	220	05	2.72	3	1.36	08	3.63
2	Yadav	140	09	6.42	4	2.85	13	9.20
	Total	360	14	3.88	7	1.94	21	5.80

Figure 4: Sex wise Malaria Situation in two Ethnic Groups



) Age-wise Malaria Situation in two Ethnic Groups

The entire study population was categorized into seven age groups. In Tharu community prevalence rate of malaria was found to be the highest i.e. 7.14% in age group above 11 years, while prevalence rate was recorded the lowest in age groups 0 – 10 years and above 51+. Like-wise in Yadav community infection rate of malaria was found to be the highest i.e. 20.83% in age groups above 21+ whereas infection rate of malaria was recorded the lowest in 0 – 10 years and above 51+.

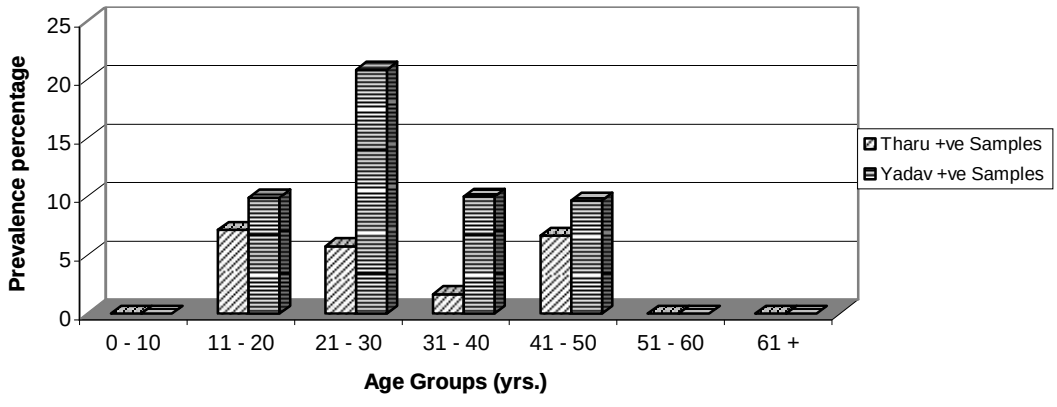
Table no. 5 shows that in infants and people above 51+ no malarial infection was found in both the communities. Similarly in Tharu and Yadav communities above 11+ to 50 malaria infections was found to be higher. Age-wise in Tharu community people of age 11 – 20 years was highly infected but in Yadav community above 21 – 30 age group was found to be highly infected.

Statistically, age-wise difference in the prevalence of malaria was found to be significant ($\Re^2$cal X14.467, P Ψ0.05).

Table no. 5: Age-wise malaria situation in the two ethnic groups

S.N.	Age groups	Tharu			Yadav		
		Total samples examined	Positive samples		Total samples examined	Positive samples	
			No.	%		No.	%
1	0 – 10	20	0	0.00	05	0	0.00
2	11 – 20	28	2	7.14	33	3	9.90
3	21 – 30	52	3	5.76	24	5	20.83
4	31 – 40	60	1	1.66	20	2	10.00
5	41 – 50	30	2	6.67	31	3	9.67
6	51 – 60	18	0	0.00	22	0	0.00
7	61 +	12	0	0.00	05	0	0.00
	Total	220	8	3.63	140	13	9.28

Figure 5: Age-wise malaria situation in the two ethnic groups



) Literacy Condition and Malaria Positivity in two Ethnic Groups

Out of 220 respondents, 12 (5.56%) were literate whereas 208 (94.44%) were illiterate in Tharu community. Likewise out of 140 respondents, 35 (25%) were literate, while 105 (75%) were illiterate in Yadav community. Literacy rate of Yadav community was better than Tharu community.

Table no. 6 shows that malaria prevalence is higher in illiterate people (86.94%) than literate people (2.127%). In Yadav Community, both literate and illiterate are more infected (2.85%, 11.42%) than literate and illiterate of Tharu Community (0%, 3.6%) (Table no. 6, Fig. 6).

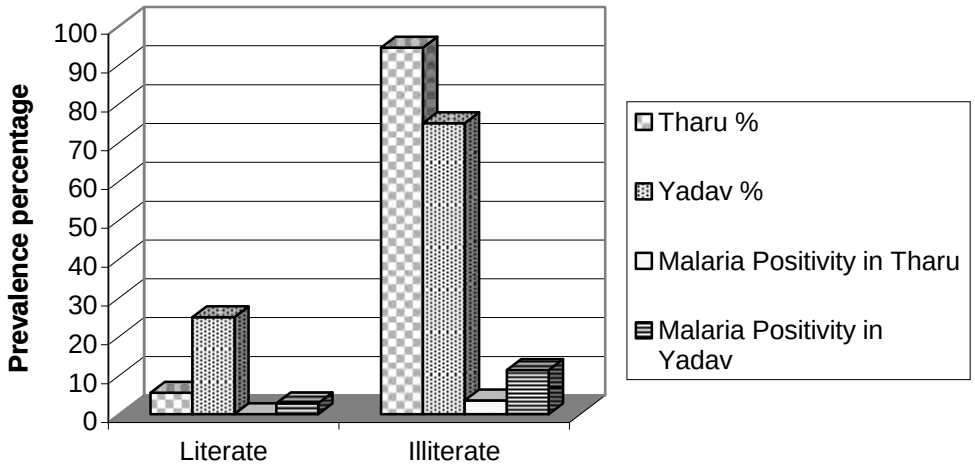
Statistically, significant difference was observed in literacy and illiteracy group of two ethnic groups. ($\Re^2$cal X9.28, P Ψ0.05)

Table no. 6: Literacy condition in two Ethnic Groups

S.N.	Ethnic groups	Interviewed and examined samples	Literate				Illiterate			
			No.	%	Malaria +ve		No.	%	Malaria +ve	
					No.	%			No.	%
1	Tharu	220	12	5.56	0	0.00	208	94.44	08	3.60
2	Yadav	140	35	25.00	1	2.85	105	75.00	12	11.42
	Total	360	47	13.05	1	2.12	313	86.94	20	6.38

Note: All respondents were under S.L.C. except only one person from Yadav community who is a teacher.
Literate: Respondents able to read and write.
Illiterate: Respondents unable to read and write.

Figure 6: Percentage of Literacy and Illiteracy condition in two Ethnic Groups



) Awareness and Malaria Positivity in two Ethnic Communities

Table no. 7 revealed that 25.45% Tharu were aware about their health and were knowing about malaria and its transmission, whereas 164 (74.54%) Tharu people were unaware about malaria. 105 (75%) Yadav were unaware about malaria and 25% were knowing and were careful about malaria.

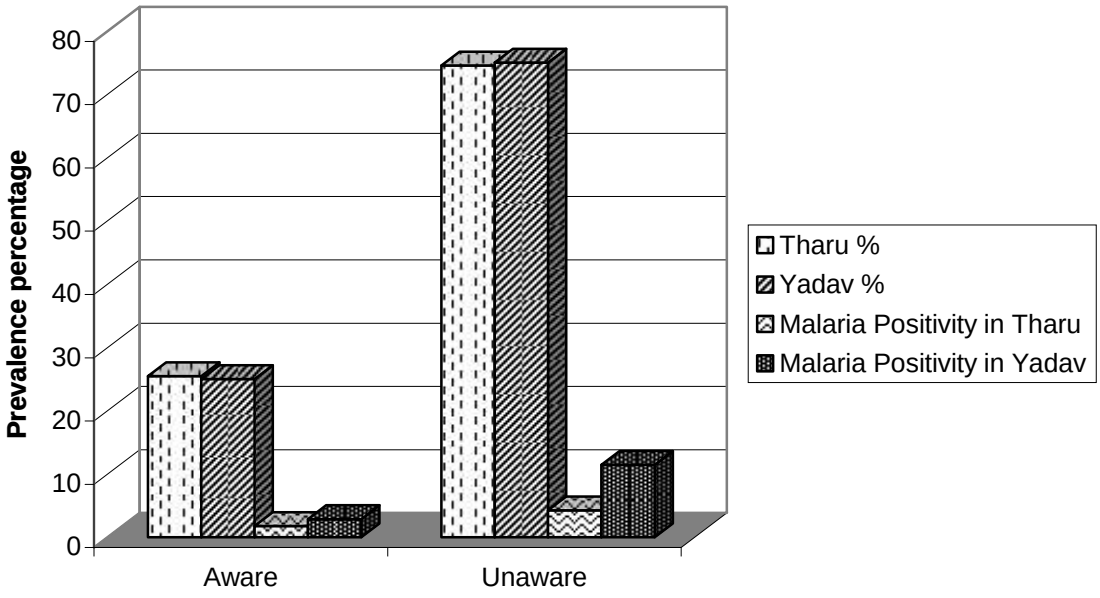
Overall study showed that many people were not aware about malaria transmission in both the communities (Tharu and Yadav) (Table no. 7, Fig. 7).

Statistically the malaria transmission aware and unaware ratio is nearly 1:3. Statistically, the difference was found to be significant. ($\Re^2$cal X9.28, P Ψ0.05)

Table no. 7: Awareness and Malaria Positivity in two Ethnic Communities

S.N.	Ethnic Groups	Interviewed	Aware				Unaware			
			No.	%	Malaria +ve		No.	%	Malaria +ve	
					No.	%			No.	%
1	Tharu	220	56	25.45	1	1.78	164	74.54	07	4.26
2	Yadav	140	35	25.00	1	2.85	105	75.00	12	11.14
	Total	360	91	25.27	2	2.19	269	74.72	19	7.06

Figure 7: Percentage of awareness situation in two communities.



) Distribution of Malaria during different months

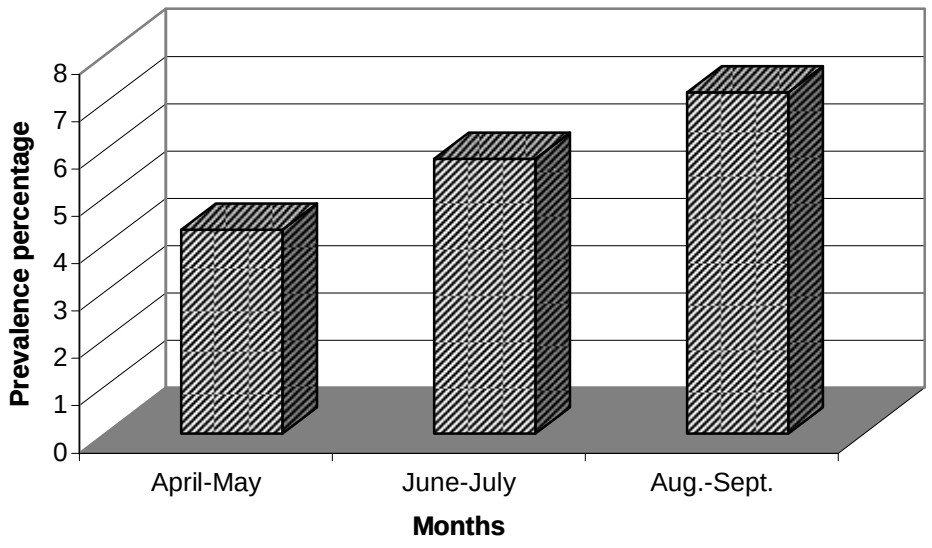
The entire study month-wise was categorized into three groups. Among month-wise, prevalence rate of malarial parasite was found to be higher in Aug.-Sept. months, 7.2%. Likewise, infection rate of malarial parasite was found to be lower in April-May months, 4.3% (Table no. 8, Fig. 8).

Statistically, the significant difference in month-wise (χ^2 cal = 6.27, P > 0.05)

Table no. 8: Month-wise Malaria Situation.

April – May 2006			June – July 2006			Aug. – Sept. 2006			Total		
Total Slides	Positive		Total Slides	Positive		Total Slides	Positive		Total slides	Positive	
	No.	%		No.	%		No.	%		No.	%
116	5	4.3	120	7	5.8	124	9	7.2	360	21	5.8

Figure 8: Month-wise malaria situation



) Occupation-wise malaria prevalence in two ethnic groups

The entire study occupation was categorized into five groups. Among occupation-wise, prevalence rate of malaria parasite was found to be higher in cattle farming and attached shelter work in both communities (Tharu and Yadav) 11.42 % and 7.36%. Likewise, infection rate of malarial parasite was found to be lower in students of both communities. This table shows that the prevalence of malarial parasites were minimum in farmer and other daily-wages workers.

Overall study concluded that the cattle farming, main occupation of Yadav community was more infected than the Tharu communities. (Table No. 9, Fig 9)

Statistically, the insignificant difference occured in the occupation-wise in both communities ((ℜ̊cal X9.28, P Ψ0.05).

Table No. 9: Occupation-wise malaria prevalence in two ethnic groups.

S. No.	Occupation	Ethnic groups							
		Tharu				Yadav			
		Total Examined				Total Examined			
		No.	%	+ ve No.	+ ve %	No.	%	+ ve No.	+ ve %
1	Farmer	100	45.45	2	02	30	21.42	02	6.67
2	Cattle farming	20	9.09	2	10	50	35.71	06	12.00
3	Shelter/Houseworking	60	27.27	3	05	35	5.00	04	11.42
4	Students	10	4.54	0	0.0	10	7.14	00	0.00
5	Other job	30	13.63	1	3.3	15	10.71	01	6.67
	Total	220		8	3.63	140		13	9.28

) Use of Bed-nets (for preventive measure to malaria) and Malaria Positivity in Two Ethnic Groups

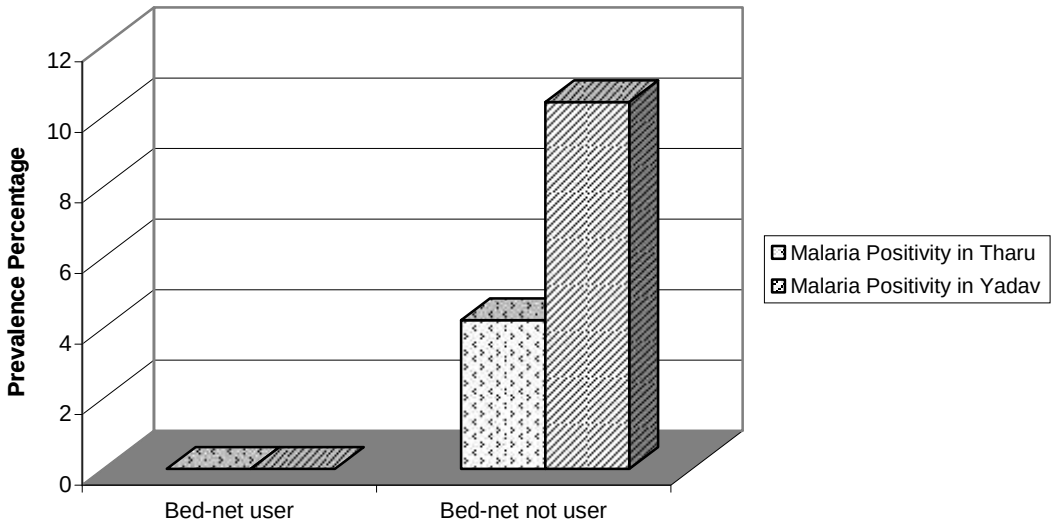
Out of 220 respondents, 30 (13.68%) respondents were Bed-net users whereas, 190 (86.3%) respondents were not Bed-net users in Tharu community. Likewise, out of 140 respondents, 15 (10.71%) respondents were Bed-net users and 125 (89.2%) were not Bed-net users. Hence, respondents not using bed-nets were higher in Yaduv community than Tharu community. So that malaria infections occur in not Bed-net users. So, malaria prevalence was found higher in Yaduv community than Tharu community (Table no. 10, Figure 10).

Statistically, the significant difference occurs in the Bed-net user and not Bed-net user.

Table no. 10: Use of Bed-nets and Malaria Positivity in Two Ethnic Groups

S. No.	Ethnic Groups	Interviewed and examined samples	Bed-net user				Bed-net not user			
			No.	%	Malaria +ve		No.	%	Malaria +ve	
					No.	%			No.	%
1	Tharu	220	30	13.63	0	0	190	86.3	8	4.2
2	Yadav	140	15	10.71	0	0	125	89.2	13	10.4
	Total	360	45	12.5	0	0	315	87.5	21	6.7

Figure 10: Use of Bed-nets and Malaria Positivity in Two Ethnic Groups



VI

DISCUSSIONS AND CONCLUSIONS

The first documented epidemiological survey dates back to 1925 by Major Philips of Indian Military Service in Makwanpur and Chitwan-valley. Out of 889 children examined, 712 or 80% had enlarged spleen. The average enlargement of spleen ranged from 65% to 100%. The mortality rate in children was estimated at about 43% among pahadis (hill people) and 17% among Tharus (tribal of the Terai areas). Upto that period it was further estimated that approximately two million cases of malaria (40% of the total population) occurred annually and ten to fifteen percent among those resulted in death (EDCDa, 2003).

In the present surveillance, a total of 21 positive cases were detected out of 360 slides. The SPR came to be 3.63% and 9.28% for Tharu and Yadav communities respectively. The national figure of SPR is 4.85% in 2003, for Bhutanese refugee camps 14.89% in 2000 and for Kapilvastu district 2.24% in 2001 (EDCD, 2002). In an active surveillance of this kind, the SPR is certainly influenced by samples which were random based on fever or history of fever and by time.

In both the community males were found to be more infected. This can be explained due to male mobility to malarious areas in economic pursuit and practice of norms, usual contact with bite of mosquitoes. The hundred percent of the cases have occurred in males and no positive cases of malaria have been reported from females (Upreti, 1998).

Sharma (2004) showed that there was great variation in the prevalence of malaria infection in two ethnic groups, Pode and Brahmin. He showed malaria prevalence in Pode 5.1% and in Brahmin 0.84%. The present study concentrated towards the Yadav and Tharu communities. This study revealed that prevalence rate of malaria in Yadav community was more than Tharu community.

In the present study, age-wise prevalence of Malaria parasites was found to be less among peoples below 10 years and above 51+ of age in both Yadav and Tharu community. Low prevalence below 10 years may exist due to immunity that has been taken through mother’s milk, care by their parents. Above 51+ people enabled to involve in the physical work like grazing animal, do not live in the shelter, mostly

prefer to live in the home, where mosquitoes density are negligible. Maximum prevalence of malaria parasites in Yadav community was found to be 20.88% in age group 21-30 years while maximum prevalence of malaria parasites in Tharu community was reported as 7.14% in age group above 11-20 years. The result of this study was found to be very much similar as EDCDb (2003).

Month-wise distributions of malarial blood samples showed the highest prevalence during Aug – Sept 9 (7.2%) and the least in April – May 5 (4.3%) for both the communities. The occurrence of highest percentage in Aug. – Sept. may be due to the drains, ditches, ponds and the stagnant water in those places which provides suitable breeding places for mosquitoes. Most of Tharu and Yadav communities by this month go into the jungle areas for the purpose of grazing animal, collecting wood and khar etc.

The use of Bed-nets for malaria in an endemic areas is one of the basic preventive tools as described by WHO recommendation. Malaria has been a major killer in Africa for curing mosquito diseases but the use of bed-nets have saved the lives (Roll back malaria). In the present study Yadav community showed the percentage of slide positivity higher than Tharu community. The low percentage of slide positivity in Tharu community might be due to regular use of bed-nets and using mosquito killing agent like Sal leaf, Neem leaf and black berry (Jamun) tree bark. The highest percentage of slide positivity in Yadav community may be due to use of irregular bed-nets and ignorance of malaria and its vectors.

Tharu community was found to built their dwellings clustered together on the side of jungle (Shivgarhi). They have little fertile land areas. So it is not sufficient for bearing large household expenses. These factors have resulted into socially depressed and deprived condition, which is responsible for low economic condition and poor literacy. Yaduv community are slight better in all conditions than Tharu community. The low rate of prevalence in Tharu community than Yadav community inspite of comparatively higher socio-economic and literacy rate shows that Tharu community must have some kind of immunity power for malaria and it needs study. Inspite of higher socio-economic conditions of Yadav community than Tharu community, persons of Yadav community revealed high prevalence rate of vivax malaria than Tharu community. Person of Tharu community regularly visit crop field and jungle

with bare clothes and foot to collect Kandamul and cereal crops etc. Yadav also spent time in cow-sheds, crop field, and outer environment.

At last, simple, trible life style, lack of health education and lack of technical knowledge govern towards poverty. Social discrimination result high illiteracy, which in turn is responsible for lack of awareness in health and hygiene. Hence extensive study is needed from the determination of epidemiological of etiological factors that cause the prevalence of malaria parasites in different communities.

VII

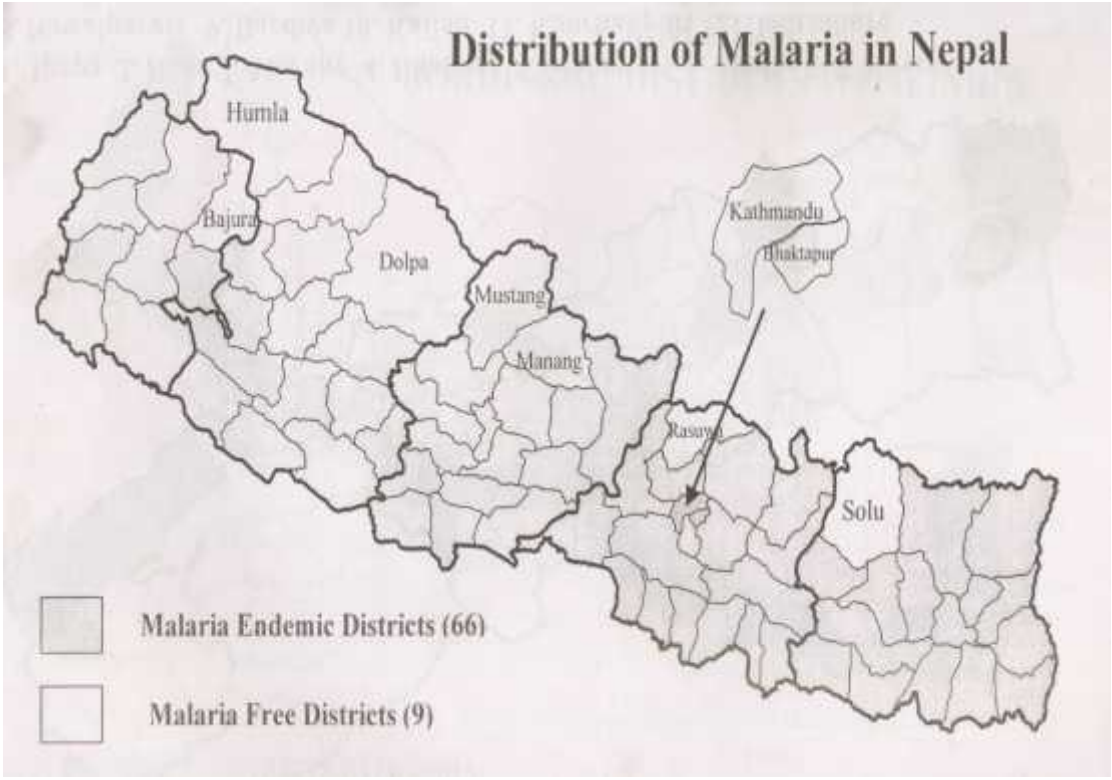
RECOMMENDATIONS

Taking advantage of discussion with the area people, field experience and observation, the recommendations for efficient control of malaria in the Gugauli VDC of Kapilvastu district areas are as follows:

- Awareness program about the preventive measure of malaria disease should be launched from time to time.
- To motivate people not to take anti malarial drugs without blood examination.
- Spraying of insecticides in the problem area as well as adjacent area.
- Cases should be detected and treated actively.
- Avoid sleeping outside as well as in animal shelter house.

Prevent mosquitoes from biting people

- Sleep under mosquito-net.
- Long sleeves and trouser should be worn outside the house.
- Repellent cream and mosquito-net should be used to protect from mosquito bites.


Distribution of Malaria in Nepal
Humla
Bajura
Dolpa
Mustang
Manang
Kathmandu
Bhaktapur
Solu
Malaria Endemic Districts (66)
Malaria Free Districts (9)

REFERENCES

Arez, A.P.; Showman G.; Pinto, J.; Souza, L.A.; Modiano, D.; Ribeiro, H.; Franco A.S.; Aleves, J. and Rosairo, V.E., (1999): *P. falciparum* population in an isolated outbreak of a malaria in The Republic of Caboverda. *Parasitology* 118 (4) April: 347–355.

Banerjee, M.K. and Bista, M.B., (2000): Epidemiological Surveillance System of Vector borne Disease in Nepal: *A paper presented to the inter-country, workshop on cross-border issues in Malaria, Kala-azar and JE Prevention and Control*, July 25-28, 2000, Hetauda, Nepal.

Banerjee, M.K., Bista, M.B., (2000): Epidemiological Surveillance Systems of Vector Borne Disease in Nepal-2000. A paper presented to the inter-country Workshop on Cross-border Issues in Malaria, Kala-azar and J.E. Prevention and Control, July 25-28, 2000, Hetauda, Nepal.

Bell, D; Bryan, J.; Cameron, A.; Fernando, M.; Leafesia, J. and Pholsynak; (1997): Malaria in Honiara, Solomon Islands: Reasons for presentation and Human and Environmental factors influencing prevalence: *Southest Asian Journal of Tropical Medicine and Public health* 28 (13) Sept.:482-488.

Bista, M.B.; Chand, P.B. and Banerjee, M.K., (1998): A Village level Efficacy Trail of Deltamethrin 2.5 WP (K-othrine) to determine the impact on the incidence of malaria and its vector in two VDCs fo Kabrepalanchok District, Nepal: Epidemiology and Disease Control Division (EDCD), *Department of Health Services, Ministry of Health* (MOH), Nepal.

Bista, M.B.; Vaidaya, R.G.; Thakur, G.D. and Pokhrel, R.K., (2002): The annual internal assessment of Malaria and Kala-azar Control activities in Nepal: Epidemiology and Disease Control Division (EDCD), *Department of Health Services, Ministry of Health* (MOH), Nepal.

Carles, G.; Bousqnot, F.; Raynal, P.; Peneac, C.; Mignot, V. and Arbeille. P., (1998): Pregnancy and Malaria: A study of 143 cases in French Guyana: *Journal de Gynecologie obsterigue et Biologie de la Reproduciotn* **27** (8) December: 798-805.

Carles, G.; Bousqnot, F.; Raynal, P.; Peneac, C.; Mignot, V. and Arbeille, P.; (1998): Pregnancy and malaria: A Study of 143 cases in French Guyana. *Journal de Gynecologic obsterigue et Biologie de la Reproduction* 27(8) Dec: 798-805.

Chaterjee, K.D. (2000): Parasitology (Protozoology and Helminthology), 12th edition, Chaterjee Medical Publishers, Culcutta, India.

Chaterjee, K.D., (2002): Parasitology (Protozoology and Helminthology), 12th edition: Chaterjee Medical Publishers, Calcutta, India: 70-100.

Chhetri, M.K., (1997): Parasitic Infection in Nepal. *Journal of Nepal Medical Association* 35: 60-65.

DoH (2002-2003): The Annual Internal Assessment of the Malaria and Kala-azar control activities of the year 2003.

EDCD (2001-2002): Epidemiology and Disease Control Division, Annual Report, *Department of Health Services, Ministry of Health* (MOH), Nepal: 1-96.

EDCD (2002-2003): Epidemiology and Disease Control Division, Annual Report, *Department of Health Services, Ministry of Health* (MOH), Nepal: 1-103.

EDCDa (2003): Epidemiology and Disease Control Division, Control of Communicable Disease Manual, Annual Report, *Department of Health Services, Ministry of Health* (MOH), Nepal: 64-68.

EDCDb (2003): Epidemiology and Disease Control Division, Malaria in Kanchanpur District, Annual Report, *Department of Health Services, Ministry of Health* (MOH), Nepal.

EDCDc (2003): Epidemiology and Disease Control Division, The Annual Internal Assessment of Malaria and Kala-azar Control Activities, Annual Report, *Department of Health Services, Ministry of Health* (MOH), Nepal: 1-151.

Grainja, A.G.; Machungo, F., Gones, A.; Berygstram, S. and Brabin, B., (1998): Malaria – related maternal mortality in Urban, Mozambique. *Annulus of tropical medicine and parasitology* 92(3) April: 257-263.

Jose, Peters W., Dewar Sc and Manandhar T.L. (1999): A prelimarny note on the anophelines of he Rapti valley area of Nepal Terai. Indian J. Mal 1: 207-212.

Joshi, D.; Pandey, P.R.; Khatri, K.; Parajuli, K. and Ghimire, P., (2003): *Falciparum* malaria outbreak in Kanchanpur district: JNAMILS, **6**, No. 6,04: 28-31.

Joshi, D. (2004). *An Epidemiological Study of Malaria in Kanchanpur District during 2003*. A dissertation submitted to Central Departmetn of Microbiology for the partial fulfillment of M.Sc. Degree in Microbiology, T.U., Nepal.

Loban, K.M.; Polozok E.S., (1985): Malaria English Translation by Alexander Shelepin, Mir Publisher, Moscow.

Mulberger, N., T. Jelinek J. Gascon, M. Probst, T. Zoller and M. Schunk (2004). *Epidemiology and Clinical Features of Vivax Malaria Imported to Europe: Sentinel Surveillance data from Trop Net Europe*, Malaria Journal, 3:5,

Old Field H.A. (1880): Sketches in Nipal. Vol. I, Allen, London.

Parajuli, K.; Khatri, Y.; Shrestha, R.B.; Shrestha, M.K.; Shrestha, H.G. and Ghimire, P., (2003): Diagnosis of malaria suspected patients attending Tribhuvan University Teaching Hospital (TUTH), *Journal of NAMLS*, vol. 6, Kathmandu, Nepal.

Poinsignon, Y.; Arfic; Sarfatic; Farge, D. and Raccurt C.P. (1999): French West Indies – a tourist destination at risk for *P. falciparum*, transmission? *Tropical medicine and international health* 4 (4) April: 255-256.

Rana, K.J., (1998): Epidemiological situation and control of Malaria and Kala-azar in Inter country bordering areas of Bangladesh, Bhutan, India and Nepal.

Rana, K.J., (2001): History of malaria and malaria control in Nepal: *World health Organization* (WHO), Arawali Publishers, New Delhi.

Sharma, P.K. and Chaudhary, A.K., (2004): Statistical methods: Khanal Books and Stationary, Kathmandu: 364-398.

Sherchand, J.B.; Shrestha, M.P.; Jommel, M.; Ohara, H. and Sherchand, S., (1998): Hospital based study in Southern Nepal on morbidity of malaria: *Journal of the NHRC 1998:* **2** (1): 18-22.

Sherchand, J.B.; Shrestha, M.P.; Shrestha, B.L.; Banerjee, M.K. and Shakya, S., (1996): Preliminary study on field trails with insecticide treated mosquito-nets for malaria control in rural endemic communities of Nepal: *J Nep Med Association*, 1996: 195-203.

Sinton, J.A., (1935): What malaria costs India nationally, socially and economically. *Malaria survey of India **1935***: 5:223-264.

Uprety, M., Chhetri, M.K., (1998): Parasitic Infection in Nepal. *Journal of Nepal Medical Association* 35: 55-65.

WHO, (1997): Malaria in the south-east Asia region 50 years: Commemorative series -1.

WHO, (1999): New Perspectives: Malaria Diagnosis. Report of a Joint WHO/USAID Informal Consultation, October 25-27, 1999. Geneva. WHO/MAL/2000.

WHO; SEARO, (2002): Malaria situation in SEAR countries.

WHOa, (2000): Management of several malaria, A Practical Handbook, second edition.

WHOb, (2000): Technical Report Series No. 892: *WHO Expert Committee on Malaria, Twententh Report*: WHO, Geneva.