Trip Report

Assessment of the Sensitivity of Malaria Surveillance in Nepal

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1. Purpose of Visit

(1) To assess the sensitivity of malaria surveillance in the Terai Region of Nepal.
(2) To determine if Japanese Encephalitis occurs in areas of the Terai other than those already known to have been affected by the disease.

2. Executive Summary

During the last 3 years, about 10,000 cases of malaria have been reported annually in Nepal. The most endemic areas are the forest fringe and foothills of the Terai (i.e., a cultivated plain which borders northern India) and low-lying valleys around the capital, Kathmandu. Since 1985, the number of blood smears examined annually for malaria in National Malaria Control Program laboratories, Ministry of Health hospitals, and health centers has fallen steadily from more than 1.5 million to just 160,293 in 1997. At the same time, the percentage of positive blood smears has doubled from 2.8% to 5.6%. This suggests that many cases of malaria in Nepal are undetected or unreported and that the true incidence of both *Plasmodium falciparum* and *P. vivax* may be higher than reported figures would indicate. Since accurate and timely epidemiologic information is critical to the planning and evaluation of any disease prevention and control program, an assessment of malaria surveillance was undertaken to determine the sensitivity of malaria surveillance in Nepal.

A JE immunization campaign is planned for the population of the known epidemic areas in Nepal, i.e., the Terai region bordering India. However, the incidence of JE outside these areas, e.g., in areas close to formerly epidemic areas and in the forest fringe of the foothills, is unknown. Since complete coverage of the areas of risk is critical for a mass vaccination campaign, about 700 blood specimens were collected to be tested for JE-antibodies and to assess whether JE is occurring outside the known epidemic areas. The results for this part of the study will be available at a later date.

Existing surveillance data were used to select one district each from Eastern Region, Central Region, and Western Region that had reported a high incidence of malaria. Within each of the three districts, three health posts were selected representing a) a high transmission area with a high number of reported cases, b) a presumed high transmission area with fewer reported cases than expected, and c) a low transmission area. Each of the nine selected villages was mapped and a random sample of households was selected. The study team visited each selected household in the 9 villages twice 2 weeks apart, and each time all household members were questioned about demographics and episodes of febrile illness during the preceding 2 weeks, as well as the treatment sought for such an illness. In addition, an axillary temperature and a finger-prick blood specimen, which was examined for malaria parasites, were obtained from each participating family member during the first visit. Information on all cases of malaria and febrile illnesses reported to public health facilities serving the study villages was abstracted from the facilities' records for the study period.

A total of 497 illnesses were reported by the 1,854 persons enrolled in the study and a total of 48 (3%) persons had a positive blood slide result, all of whom came from only two villages. For only 12 (2%) of all febrile illnesses and for 3 (6%) of the 48 persons with a blood slide positive for malaria parasites, a record indicating a clinical or confirmed case of malaria was found in the

logs of the public health facilities. When considering only those patients who were treated at public health facilities, a record was found for 12 (12%) of 99 febrile illnesses and for 3 (21%) of 14 patients with a positive blood slide result, indicating that malaria cases treated at government health facilities are reported poorly through the existing public health surveillance system. For 207 (42%) of the 497 febrile illnesses, patients did not seek any treatment; for 191 (38%) of the illnesses, patients sought treatment outside of the public health care system; and for only 99 (20%) of the illnesses, patients sought treatment at a public health facility. Case definitions used for clinical malaria and reporting of cases of clinical and blood-slide confirmed malaria to HIMS varied greatly within and among health facilities. Thus, the number of malaria cases reported through the system most likely does not reflect the true incidence of malaria cases in Nepal. The focal nature of malaria in the villages studied suggests a sporadic occurrence of malaria in the Terai. Small outbreaks/ epidemics are likely to originate from imported cases in areas with a higher proportion of migrant workers.

Based on the findings of this study, we recommend: 1) the strengthening of the Health Information Management System (HIMS) to improve the sensitivity, specificity, and timeliness of malaria surveillance in Nepal; 2) the timely reporting of the surveillance data to the district public health office to ensure early outbreak detection and to facilitate close evaluation of the effectiveness of control measures; and 3) the promotion of existing guidelines for the appropriate use of blood slide examination, i.e., obtaining blood slides only for patients with fever after exclusion of other causes of fever, and appropriate treatment of febrile illnesses.

3. Background

A. Malaria

During the last 3 years, between 9,000 and 10,000 cases of malaria have been reported annually in Nepal, with 5%-20% due to *Plasmodium falciparum*. The most endemic areas are the forest fringe and foothills of the Terai (i.e., a cultivated plain which borders northern India) and low-lying valleys around the capital, Kathmandu. The major vector of malaria in the forest fringe and foothills areas is *Anopheles fluviatilis*. The intensity of malaria transmission is much lower on the plains, since the principal vector there was eliminated during the malaria eradication era.

Since 1985, the number of blood smears examined annually for malaria in National Malaria Control Program laboratories, Ministry of Health (MOH) hospitals, and health centers has fallen steadily from more than 1.5 million to just 160,293 in 1997. At the same time, the percentage of positive blood smears has doubled from 2.8% to 5.6%. This suggests that many cases of malaria in Nepal are undetected or unreported and that the true incidence of both *P. falciparum* and *P. vivax* may be higher than reported figures would indicate. Many cases of suspected malaria are probably being self-treated, since both chloroquine (CQ) and sulfadoxine-pyrimethamine (SP; e.g., Fansidar^{R}) are widely available in larger villages and towns, and local residents are familiar with the disease and its symptoms. In addition, patients with greater financial resources are frequently treated by private medical practitioners, who rarely take blood smears or report cases. Even those patients who enter the government's health care system often do not have confirmatory blood smears taken and, thus, are not reported.

Epidemiologic information on malaria in Nepal comes from three sources: The national Health Management Information System (HMIS), which relies on reporting from MOH hospitals and health centers; the Early Warning Reporting System (EWARS), a surveillance system based

on 16 sentinel hospitals from around the country which report monthly to the Vector Borne Diseases Research and Training Center (VBDRTC) in Hetauda; and an Annual Internal Assessment (AIA) carried out once a year in which the VBDRTC requests information on malaria (and other diseases) from all hospitals and health centers in the country.

The numbers of cases of *P. falciparum* and *P. vivax* recorded annually by the three surveillance systems differ, making it difficult to know which data to use for planning and evaluation of malaria control activities. Since accurate and timely epidemiologic information is critical to the planning and evaluation of any disease prevention and control program, this assessment of malaria surveillance in nine villages in Eastern, Central, and Western Regions was undertaken to determine the sensitivity of malaria surveillance in Nepal.

B. Japanese Encephalitis

Japanese encephalitis (JE) is a mosquito-borne viral disease that occurs mainly in three areas: (1) China and Korea, (2) the Indian sub-continent, including southern Nepal, and (3) several Southeast Asian countries. In all areas, JE is primarily a rural disease, and transmission is usually seasonal. In China, Korea and other temperate areas, the transmission season extends through the summer and fall. In other subtropical and tropical regions, risk is associated with the rainy season, which varies in each country. For instance, recent epidemics have occurred in northern India, Nepal, and Sri Lanka, from October to December.

A JE immunization campaign is planned for the population of the known epidemic areas in Nepal, i.e., the Terai region bordering India. However, the incidence of JE outside these areas, e.g., in areas close to formerly epidemic areas and in the forest fringe of the foothills, is unknown. Since complete coverage of the areas of risk is critical for a mass vaccination campaign, blood specimens were collected to assess whether JE is occurring outside the known epidemic areas.

4. Activities and Accomplishments:

4.1 Methods:

4.1.1 Selection of Study Sites:

Data from the 1997 and 1998 Annual Internal Assessments were used to select one district each from Eastern Region, Central Region, and Western Region that had reported a high incidence of malaria. Within each of the three districts, three health posts were selected: one in an area that has reported the highest incidence of malaria in both years, one in an area that has reported fewer cases but might be expected to have considerably more cases based on its location (e.g., in the forest fringe), and one in a the low transmission area on the cultivated plain of the Terai (**Table 1**).

District public health office and health post/primary health center records were reviewed to identify the village (population >400-500) within that health post's/primary health center's catchment area that had reported the highest number of cases in 1998 and in June and July of 1999. Thus, three strata of villages selected represent:

a. a high transmission area with a high number of reported cases
b. a presumed high transmission area with fewer reported cases than expected
c. a low transmission area.

Each of the nine selected villages was mapped and a random sample of households was selected.

4.1.2 Timing of Study:

The study was conducted in August and September (i.e., during peak malaria transmission season in Nepal).

4.1.3 Funding:

Funding was provided by the United States Agency for International Development's Infectious Disease Initiative.

4.1.4 Enrollment and Study Procedures:

During the last 2 weeks of August, each selected household in the 9 villages was visited by the study team and the purpose and procedures of the study were explained to the household members. After consent/assent to participate in the survey was obtained, the male or female head of household was questioned about family demographic and socioeconomic information and an axillary temperature and a finger-prick blood specimen for preparation of a thick and thin blood smear for malaria was obtained from each participating family member. In addition, each participating adult family member or parent/guardian (in the case of participating children) was questioned about any episodes of chills and/or fever during the preceding two weeks. Family members were told that the study team would return to inform them of the results of the blood smear, but should they develop any illness before that, they should seek treatment, as they would normally.

Blood smears were stained and examined with routine techniques at VBDRTC. All positive blood slides were re-examined by two additional readers (one experienced laboratory technician and one parasitologist). In addition, 10% of the negative blood slides were randomly selected and re-examined by another reader.

About 2 weeks after the initial visit, the team re-visited all households and again questioned participating family members about the occurrence of any episodes of chills and/or fever in the two weeks since the first visit. Anyone who gave a history of either chills or fever and any one with a positive blood smear was asked a series of questions about where they sought treatment and the type of treatment they received.

Following the second interview, all family members were informed about the results of their blood smears. Complete lists with the names of patients who had a positive blood slide were given to the respective sub-health and health post, as well as district public health offices. These patients were then to be visited by health and sub-health post staff and given antimalarial treatment according to the national malaria treatment policy, if they had not already obtained appropriate antimalarial treatment.

4.1.5 Ascertainment of malaria cases reported through surveillance system:

Information on all malaria cases (including all patients with a reported fever) reported to health centers/hospitals serving the study villages during the study period was abstracted from the health facilities' records.

4.1.6 Seroprevalence of Japanese encephalitis:

To obtain additional information about the sero-prevalence of JE in the Terai, about 700 blood specimens were collected on filter paper from persons in all 9 villages. The blood specimens will be tested for JE antibodies by CDCs' Division of Vector-borne Infectious Diseases. Subsets of the specimens were collected in duplicate to be tested at VBDRTC. The serologic results were not available at the time of this report.

4.2 Results:

4.2.1 Community Survey

A total of 1,854 persons (between 184 and 224 per village) were enrolled in the study (**Table 2**), 1,773 (96%) of whom also were available for the second interview. Of the 1,854 persons, 218 (12%) were <5 years of age (range, 7% in Jagarnathpur to 16% in Godar; p=.002) and 1,017 (55%) were female. The sex distribution was similar for the nine villages. Overall, 430 (23%) of all persons enrolled in the study and 60 (28%) of 218 children <5 years reported having had fevers and/or had a temperature measurement of ≥37.5^{0}C. Of these 430 persons, 67 (16%) reported having had two episodes of febrile illnesses during the study period. The highest rate of persons with febrile illnesses was reported among persons enrolled in Godar and the lowest among persons enrolled in Letang (i.e., 64% and 11%, respectively; p<.0001). With the exception of Dhanusha, no clear trend of a decreasing prevalence of febrile illnesses from a 'high transmission' to a 'low transmission' area was observed.

Of the 184 blood slides collected in Godar and of the 187 blood slides collected in Dhalkebar, 35 (19%) and 13 (7%), respectively, had a positive blood slide result for malaria parasites, but none of the 1,483 blood slides collected in the other seven villages (**Table 2**). Of the 35 positive blood slides collected from Godar, 27 were positive for *P. vivax* and 8 for *P. falciparum*, and of the 13 positive blood slides collected from Dhalkebar, 10 were positive for *P. vivax* and 3 for *P. falciparum*. Thus, 11 (23%) of the 48 blood slides were positive for *P. falciparum*. Of the 48 persons with a positive blood slide, 25 (52%) were male. Only 39 (81%) of the 48 persons reported having one or two febrile illness during the study period, i.e., in the 2-week periods before and after the blood smear was taken.

For 207 (42%) of the 497 febrile illnesses patients did not seek any treatment; for 101 (20%) of the illnesses, patients obtained drugs directly from a pharmacy or shop; for 99 (20%) of the illnesses, patients sought treatment at a health post or other public health facility; and for 78 (16%) of the illnesses, patients sought treatment from a private health care provider (**Table 3**). The 39 patients with a positive blood slide and reported fever were more likely than those with a fever and a negative blood slide result to seek healthcare (p<.001; **Table 4**).

4.2.2 Health Facility Record Review

For 99 (20%) of 497 febrile illnesses reported during the study period, patients sought treatment from a public health source: (sub-) health posts (n=87), village volunteers (n=7), or outpatient clinics of hospitals (n=5). However, for only 14 (14%) of these illnesses the following records were found in outpatient registers, laboratory logs, or laboratory slips of the respective the health facilities: clinical malaria (n=6), blood slide confirmed malaria (n=4), or other illnesses (n=4; i.e., typhoid fever, cold, wound, edema). For only 3 (6%) of the 48 patients with a positive blood slide result a record was found in the registries or logs (all were recorded as having laboratory confirmed malaria), although 14 of the 39 febrile patients with a positive blood slide had reported seeking treatment at a public health facility of a village volunteer.

4.2.3 Healthcare Worker Interviews

The definitions, as well as reporting (see below) of "clinical malaria"[1] varied greatly among the health facilities visited. Most clinical officers used a very broad definition of clinical malaria, including all patients who present with a history of fever, chills, and rigor; only some clinicians would exclude patients who had other possible causes of fever (e.g., acute respiratory infections). Most clinical officers reportedly referred all patients presenting with fever and chills for blood slide examination for malaria parasites. In the facilities with a laboratory and a trained technician, the results of the blood slide examination usually are available on the same day. In facilities without a laboratory, results may be available as early as few days after collection of the slides, but reporting of results to most of these facilities usually takes several weeks.

In the facilities without a laboratory, clinicians treat all febrile patients presumptively for malaria. In facilities with a laboratory, some clinicians stated that they doubt negative blood slide results and would either always prescribe antimalarial treatment to persons whose blood slide results are negative, or prescribe such treatment, if they have a strong clinical suspicion that the patient has malaria or if the patient has no other apparent cause of fever. Only one clinician stated that he would not prescribe antimalarial treatment to a patient with a negative blood slide result. Thus, in general, the results of blood slide examination often do not have any influence on the initial management of febrile illnesses and are used mainly for species determination and patient-follow up after presumptive treatment (e.g., patients diagnosed with *P.-falciparum* infection receive SP).

In one facility, the clinician estimated that the blood slide positivity rate was below 5%, but reported prescribing antimalarial treatment to all patients presenting with (a history of) fever, chills, and rigors irrespective of the presence of other possible causes of fever. Patients would receive treatment other than antimalarials only when the clinical symptoms do not improve after presumptive antimalarial treatment.

Reporting of surveillance data

Most facilities report all patients who are referred for blood slide examination as having a case of clinical malaria (even if the blood slide result is negative) or, if the results are available at the time of reporting, blood-slide confirmed malaria. If the blood slide results are not available at the time of reporting, some facilities do not report these blood-slide confirmed cases at all, whereas others include the results in the report(s) for the following month(s). In addition, reporting of cases of clinical malaria (i.e., both patients who are sent for a blood slide examination and those who are not) was not consistent among facilities. Some facilities would record cases of clinical malaria in their outpatient registry but would report some or all of them as "pyrexia of unknown origin."

The HIMS report form provides two different sections for entry of malaria cases. In most of the forms reviewed, different numbers of cases were reported within the same form: Health facility staff would report in one section data for the immediate catchment area of the individual (sub-) health post only and in the other section the combined data from the entire catchment area of the health-post. However, facilities varied in which of the two sections on the HIMS forms they would enter these data. None of the clinicians or data recorders asked for the HIMS manual with instructions for completion of the report forms had it available, although these manuals at

[1] HIMS definition: "In endemic areas, a person with present fever or history of recent fever is regarded as a case of clinical malaria after the exclusion of other reasons of fever."

one time had been distributed to each facility. In one instance, the entries of the HIMS forms seen at a district public health office did not match those in the forms seen at the respective health post.

5. Summary and Conclusions

For only 99 (20%) of the 497 febrile illnesses reported during the study period, patients sought treatment at a public health facility. For 12 (12%) of these 99, a record indicating a febrile illness was found in the health facilities' logs. Similarly, for 3 (21%) of the 14 patients with a positive blood slide result who went to a health facility, a corresponding record was found in the health facilities' logs. Thus, only 2% of all febrile illnesses and 6% of persons with a blood slide positive for malaria parasites were found to be recorded as having clinical or confirmed cases of malaria and could potentially be reported through HIMS. However, we cannot rule out that some entries may have been missed because patients' names or addresses may have been entered incorrectly into the health facilities' registries.

If "fever" is taken as a proxy for clinical malaria[2], our study indicates that the surveillance system for malaria has a low sensitivity. On the other hand, many cases that are reported as "clinical malaria" from low transmission areas may not be malaria. In fact, although most of the health facilities visited reported a slide positivity rate below 10%, most of them still reported to HIMS the persons for whom a blood slide was examined for malaria parasites as having a case of clinical malaria, which indicates a low specificity of malaria surveillance in these areas. In addition, case definitions used for clinical malaria and reporting of cases of clinical and blood-slide confirmed malaria to HIMS varied greatly within and among health facilities.

For the 497 febrile illnesses reported during the study period, patients did not seek any treatment in 42% of the cases, obtained drugs from shops or pharmacies (20%), sought treatment from a public provider (20%), or sought treatment from a private provider (16%). However, the proportion of persons seeking treatment at a public health facility varied greatly from among districts, which at least in part may be explained by factors mentioned by some villagers during our visits, e.g., transportation problems and/or unavailability of antimalarial drugs at a particular facility in the past.

The focal nature of malaria in the villages studied suggests a sporadic occurrence of malaria in the Terai. Small outbreaks/ epidemics are likely to originate from imported cases in areas with a higher proportion of migrant workers.

6. Recommendations

The Health Information Management System (HIMS) needs to be strengthened to improve the sensitivity, specificity, and timeliness of malaria surveillance in Nepal. In particular, the consistent use of the case definition for clinical malaria and standardized procedures for correct and complete reporting should be achieved through retraining and ongoing supervision of clinical and recording staff. For these activities, additional resources will be needed.

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[2] Especially in low transmission areas, this will be gross overestimation of the true prevalence of malaria (in our study we did not have the ability to rule out, e.g., performing a clinical examination, other causes of febrile illness). However, taking "fever" as a proxy for "clinical malaria" is useful to assess the sensitivity of the surveillance system.

The surveillance data need to be reported to the district public health office in a timely manner to ensure early outbreak detection and to facilitate close evaluation of the effectiveness of control measures. To this end it is also necessary that the district vector control assistants monitor and review the collected information closely.

Existing guidelines for the appropriate use of blood slide examination, i.e., obtaining blood slides only for patients with fever after exclusion of other causes of fever, and appropriate treatment of febrile illnesses should be promoted. These guidelines should be re-evaluated once additional data about the epidemiology of malaria in Nepal becomes available. To this end, additional epidemiologic studies are needed to determine the prevalence of (and risk factors for) malaria infections in Nepal. Of note, the nine villages in our study were purposefully chosen to assess only the sensitivity of malaria surveillance in Nepal, and the data presented here should not be used to estimate the period or point prevalence of clinical malaria and blood-slide confirmed malaria, respectively.

In the discussions about the potential role of rapid diagnostic tests (e.g., "dip sticks"), their potential limited impact should be considered, e.g., the sometimes low confidence of clinicians in the negative results of a blood slide examination, reflected by the practice of treating patients with a negative blood slide with an antimalarial drug as found in the present study in several health facilities. Before wide spread introduction of these new tests, their utility in different clinical situations, feasibility, acceptance, and cost effectiveness (on a regional level) need to be studied.

7. Study Team:

Team Leaders:

Ms. Deborah Lans, PhD
Mr. Jitendra P. B. Shrestrha, MPH

Interviewers:

Mr. Krishna Sundar Awal
Mr. Bhairab Nepali
Mr. Ramadhar Tiwari

Field Technicians:

Mr. Kamal Khadka
Mr. Krishna Bahadur Shrestha
Mr. Keshab Upadhya

Microscopists:

Mrs. Shasta Karki Chetri
Mrs. Bijaya Pondel
Mr. Purna Gopal Shrestha

8. Places visited:

August 16-17	Kathmandu	United States Agency for International for International Development (USAID) Environmental Health Program (EHP)
August 18-21	Hetauda	Vector Borne Disease Research and Training Center (VBDRTC)
August 22-26	Dhanusha District	District Public Health Office (DPHO), Janakpur Godar Health Post (HP) Barathpur Subhealth Post (SHP) Tin Talle Village Dhalkebar HP Barhari Bajar SHP Lalgadh Village Sinurjora HP Dohar Village
August 27	Nawalparasi District	Attempt to reach study sites
August 28-September 1	Morang District	DPHO, Biratnagar Letang Primary Health Center (PHC) Pheruwa Village
	Morang District (contd.)	Kerabari HP Hachuwa Village Haraicha PHC Dangi Tole Village
September 2	Hetauda	VBDRTC

September 3-5	Nawalparasi District	DPHO, Parasi Prattapur HP Badrighat Village Jagarnathpur PHC Panai Village Palhi HP Lokpurwa Village
September 6	Hetauda	VBDRTC
September 7-9	Dhanusha District	DPHO, Janakpur Godar HP Barathpur SHP Tin Talle Village Dhalkebar HP Barhari Bajar SHP Lalgadh Leprosy Hospital Lalgadh Village Sinurjora HP Dohar Village
September 10-12	Morang District	DPHO, Biratnagar Letang PHC Pheruwa Village Kerabari HP Hachuwa Village Haraicha PHC Dangi Tole Village
September 13-14	Hetauda	VBDRTC
September 15-17	Nawalparasi District	DPHO, Parasi Prithivi Chandra Hospital, Parasi Prattapur HP Badrighat Village Jagarnathpur PHC Panai Village Palhi HP Lokpurwa Village
September 18	Hetauda	VBDRTC
September 19-24	Kathmandu	HMG - Ministry of Health USAID EHP

9. Primary Contacts:

HMG Ministry of Health
- Epidemiology and Diseases Control Division
  - Dr. Mahendra B. Bista, Director
  - Dr. Shatrughan P. Bastola, Medical Officer
- Vector Borne Diseases Research and Training Center, Hetauda
  - Dr. Padam B. Chand, Chief
  - Mr. Shambu N. Jha, Parasitologist

World Health Organization
- Dr. M. Jorge Luna, Epidemiologist

United States Agency for International Development
- Health and Family Planning Office
  - Dr. Glenn L. Post, Chief
  - Ms. Catherine Thompson, Technical Advisor

Environmental Health Project, Kathmandu
- Dr. Pandu Wijeyaratne, Country Representative
- Mr. Shreedhar P. Pradhan, Chief Technical Officer

Dhanusha District
- District Public Health Office (DPHO), Janakpur
  - Mr. Surya Kant Jha, Acting District Public Health Officer
- Godar Health Post (HP)
  - Mr. Krishna Kumar Shah, Auxiliary Health Worker
- Barathpur Subhealth Post (SHP)
  - Mr. Ram Dinesh Mahator, Auxiliary Health Worker
- Dhalkebar HP
  - Mr. Ashok Kumar Bhandari, Health Assistant
- Barhari Bajar SHP
  - Mr. Sashi Baran Chaudhary, Auxiliary Health Worker
- Nepal Leprosy Trust Hospital, Lalgadh
  - Mr. Mike Houghton, Director of Support Services
  - Mr. Hem Pradhan, Health Assistant
- Sinurjora HP
  - Mr. Umesh Kumar Roy, Health Assistant

Morang District
- DPHO, Biratnagar
  - Mr. Ramesh Prashad Adikari, MPH, Acting District Public Health Officer
- Letang PHC
  - Mr. Sushil Kumar Joshi, Health Assistant
- Kerabari HP
  - Mr. Sudhir Prashad Karne, Health Assistant
- Haraicha PHC
  - Mr. Madan Mijar, Health Assistant

Nawalparasi District

DPHO, Parasi

Mrs. Durga Neupane, District Public Health Officer

Mr. Shiva Shankah Thakuh, Health Assistant

Prithivi Chandra Hospital, Parasi

Dr. Ghopal Khanal, District Health Officer

Dr. Sagar Rajbhandari, Medical Officer

Prattapur HP

Mr. Chandra Kisor Sing, Health Assistant

Jagarnathpur PHC

Mr. Raghu Bausa Shah, Health Assistant

Palhi HP

Mr. Bhola Thakur, Health Assistant

Table 1. Geographic Location and Characteristics of the 9 Study Villages East, Central, and Western Region, Nepal—August/September 1999

Region	District	Health Post/ Primary Health Center	Characteristics	Reported Malaria Incidence
East	Morang	Letang	forest belt	high
		Kerabari	forest belt	intermediate[1]
		Heraicha	cultivated plain	low
Central	Danusha	Godar	forest fringe	high
		Dhalkebar	forest fringe	intermediate[1]
		Sinurjora	cultivated plain	low
Western	Nawalparasi	Prattapur	flood plain	high
		Jagarnathpur	flood plain	intermediate[1]
		Palhi	cultivated plain	low

[1] expected to be a high transmission area.

Table 2. Demographic, Clinical Characteristics, and Results of the Blood Slide Examination for malaria parasites of the Study Participants from the 9 Villages; East, Central, and Western Region, Nepal—August/September 1999 (n=1,854)

	Dhanusha (n=595)			Morang (n=642)			Nawalparasi (n=617)			
	Godar	Dhalkebar	Sinurjora	Letang	Kerabari	Haraicha	Pratappur	Jagarnath.	Palhi	Total
Total persons enrolled	184	187	224	211	225	206	212	200	205	1,854
Age										
< 5 years	30 (16)[1]	16 (9)	31 (14)	23 (11)	28 (12)	19 (9)	29 (14)	13 (7)	29 (14)	218 (12)
≥ 5 years	154 (84)	171 (91)	193 (86)	188 (89)	197 (88)	187 (91)	183 (86)	187 (94)	176 (86)	1,636 (88)
Sex										
Female	105 (57)	103 (55)	123 (55)	124 (59)	119 (53)	115 (56)	112 (53)	113 (57)	103 (50)	1,017 (55)
Male	79 (43)	84 (45)	101 (45)	87 (41)	106 (47)	91 (44)	100 (47)	87 (44)	102 (50)	837 (45)
Fever- by history or temperature ≥ 37.5^{0}C[2]										
Total	118 (64)	46 (25)	50 (22)	23 (11)	41 (18)	32 (16)	43 (20)	42 (21)	35 (17)	430[3] (23)
< 5 years	20 (67)[4]	4 (25)	5 (16)	3 (13)	10 (36)	1 (5)	7 (24)	4 (31)	6 (21)	60 (28)
Positive blood slide										
Total	35 (19)[1]	13 (7)	0	0	0	0	0	0	0	48 (3)[5]
Fever	30 (86)[6]	9 (69)	-	-	-	-	-	-	-	39 (81)[7]
< 5 Years	7 (20)	1 (8)	-	-	-	-	-	-	-	8 (17)
Fever	7 (100)[8]	0	-	-	-	-	-	-	-	7 (88)

[1] Number (% of total patients)

[2] Any febrile illness reported at any of the 2 visits; includes fever of unknown origin or due to malaria, as well as 32 patients with illness that started before the first visit and continued after the visit (i.e., was again reported as fever at the second visit) and 16 patients with defined illnesses (e.g., acute respiratory tract infections).

[3] 67 patients had two febrile illnesses during the 4-week period (see Table 3).

[4] Number (% children <5 years)

[5] *Plasmodium vivax*: n=37 (77%), *P. falciparum*: n=11 (23%)

[6] Number (% symptomatic)

[7] One person with *P. falciparum* and 8 persons with *P. vivax* did not have fever - by history or temperature ≥37.5^{0}C.

[8] Number (% symptomatic children <5 years)

Table 3 Type of treatment sought by 430 persons ill with a fever of unknown origin or fever due to presumed malaria—Nepal, August/September 1999 (497 illnesses)

	Dhanusha (n=256)			Morang (n=110)			Nawalparasi (n=131)			
	Godar	Dhalkebar	Sinurjora	Letang	Kerabari	Haraicha	Pratappur	Jagarnath.	Palhi	Total
Number of febrile illnesses (number of persons)	147 (118)	53 (46)	56 (50)	24 (23)	48 (41)	38 (32)	49 (43)	45 (42)	37 (35)	497 (430)
Did not seek treatment	43 (29%)	24 (45%)	22 (39%)	7 (29%)	23 (48%)	23 (61%)	31 (63%)	19 (42%)	15 (41%)	207 (42%)
Bought drugs from a pharmacy or shop	60 (41%)	5 (9%)	7 (13%)	5 (21%)	7 (15%)	0 (0%)	7 (14%)	4 (9%)	6 (16%)	101 (20%)
Went to health post[1] or Village Volunteer	38 (26%)	15 (28%)	3 (5%)	3 (13%)	11 (23%)	8 (21%)	7 (14%)	2 (4%)	12 (32%)	99 (20%)
Went to private health care provider[2]	4 (3%)	1 (2%)	24 (43%)	8 (33%)	6 (13%)	7 (18%)	4 (8%)	20 (44%)	4 (11%)	78 (16%)
Other[3]	5 (3%)	8 (15%)	1 (2%)	1 (4%)	1 (2%)	2 (5%)	0 (0%)	0 (0%)	2 (5%)	20 (4%)
Total number of treatments sought[4]	150 (102%)	53 (100%)	57 (102%)	24 (100%)	48 (100%)	40 (105%)	49 (100%)	45 (100%)	39 (105%)	505 (102%)

[1] Includes outpatient departments of government hospitals.

[2] Private physicians, unlicensed practitioners, and persons who give injections.

[3] Unknown (10), obtained medicine from a friend or relative (5), herbal medicine (2), treatment related to a mass survey (2), prayer (1).

[4] 6 persons sought treatment from two and 1 patient from three different sources for an individual illness. Percentages based on number of illnesses.

Table 4. Comparison of kind of treatment sought by persons with a blood slide positive for malaria parasites and persons with fever who had a negative blood slide—Nepal, August/September 1999

	Persons with a positive blood slide			Persons with a negative blood slide
	Godar	Dhalkebar	Total	
Total number of persons	35	13	48	1806
Persons with no fever	5 (14)[1]	4 (31)	9 (19)	1415 (78)
Persons with fever	30 (86)	9 (69)	39 (81)	391 (22)
Number of febrile illnesses	37	14	51[2]	446[3]
Did not seek treatment	7	2	9 (18)	198 (44)
Bought drugs from a pharmacy or shop	18	1	19 (37)	82 (18)
Went to health post[4] or Village Volunteer	9	7	16 (31)	83 (19)
Went to private health care provider	2	1	3 (6)	75 (17)
Other	1	3	4 (8)	16 (4)
Total number of treatments sought	37	14	51 (100)	454[5] (102)

[1] Number (% of total patients).
[2] During the study period, 12 patients with a positive blood slide result had two febrile illnesses.
[3] During the study period, 55 patients with a negative blood slide result had two febrile illnesses.
[4] Includes outpatient departments of government hospitals.
[5] 6 persons sought treatment from two and 1 patient from three different sources for an individual illness. Percentages based on number of illnesses.