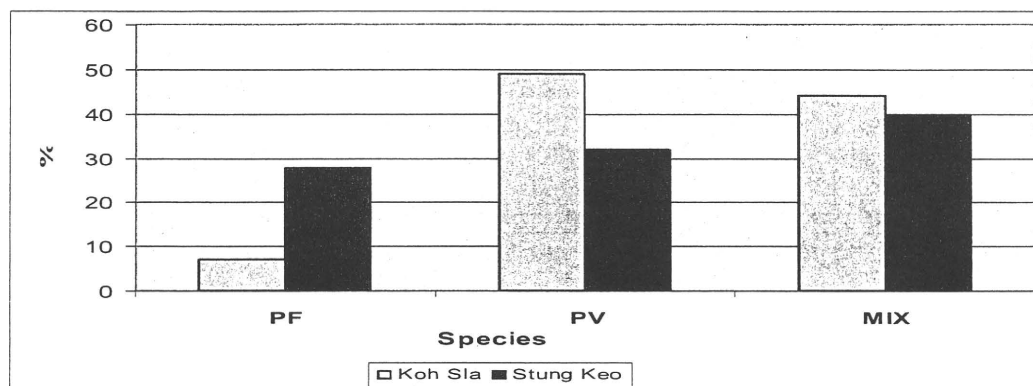


**Fig. 5 : Malaria percentage divided by species in Koh Sla and Stung Keo (Koh Sla=194, Stung Keo=318 cases)**



#### 4.1.5. Malaria cases divided by agegroup

According to the data collected, the main affected group is the age group from 15-49 years old follows by the age group 5-14 years old. The summary data could be depicted in the table below.

**Table 4: Total malaria cases divided by age group**

Village Name	0-4y				5-14y								15-49y								>50y					
	Mix		Pv		Total	Mix		Pf		Pv		Total	Mix		Pf		Pv		Total	Mix		Pv		Total		
	F	M	F	M		F	M	F	M	F	M		F	M	F	M	F	M		F	M	F	M		F	M
317	0	0	0	0	0	1	0	0	0	0	1	2	1	7	0	0	2	10	20	0	1	0	1	2		
Anlong Kram	0	1	6	2	9	1	3	0	0	4	4	12	3	4	0	3	16	7	33	0	0	1	0	1		
Kbal Damrey	0	0	0	0	0	1	0	0	0	0	3	4	5	3	0	0	5	6	19	0	0	0	1	1		
St.Angkanh	0	3	1	0	4	10	2	0	4	5	6	27	18	19	2	4	7	7	57	2	1	0	0	3		
Total	0	4	7	2	13	13	5	0	4	9	14	45	27	33	2	7	30	30	129	2	2	1	2	7		
A.Makprang	1	0	0	0	1	0	0	0	0	1	0	1	1	29	0	1	4	25	60	0	3	0	1	4		
Damrei Phong	0	0	0	0	0	0	0	5	10	2	3	20	0	8	7	30	5	10	60	0	0	0	2	2		
Doung	0	0	0	0	0	0	0	0	0	0	0	0	12	1	6	0	3	22	0	0	0	0	0			
Kampong Chen	0	0	0	0	0	1	0	0	1	0	0	2	1	23	2	13	1	2	42	0	2	1	0	3		
Mlich Kol	0	0	0	0	0	0	0	0	0	0	3	3	1	16	0	0	0	24	41	0	1	0	1	2		
Trapangkak	0	0	0	0	0	0	1	0	0	1	0	2	2	23	12	0	13	50	2	0	0	1	3			
Total	1	0	0	0	1	1	1	5	11	4	6	28	5	111	10	62	10	77	275	2	6	1	5	14		

#### Discussion:

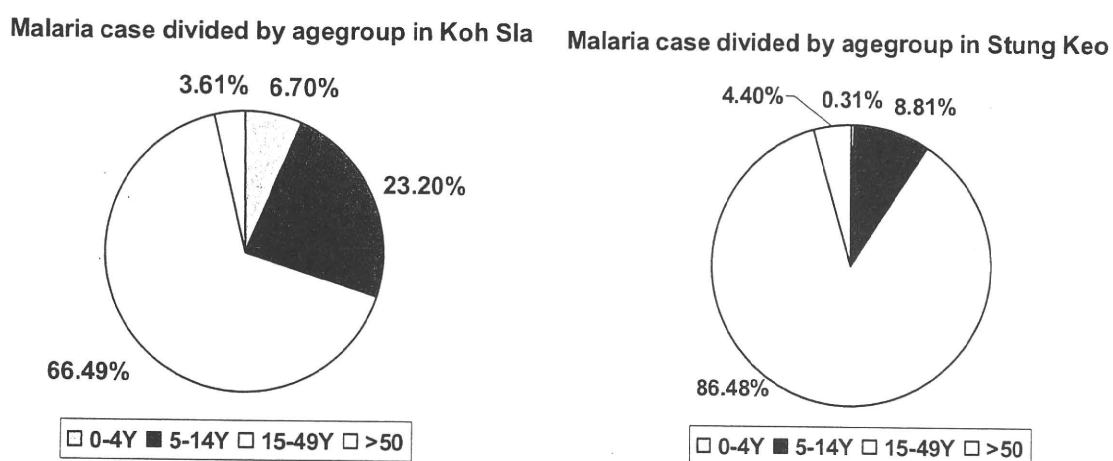
**0-4 years:** In both Koh Sla and Stung Keo sites, no any PF case was detected among the age group 0-4 years and only 13 cases have PV and mix infection were found in 2 of the 4 villages in Koh Sla. Whereas in Stung Keo there is only one case mix infection was detected in one of the 6 villages in the age group 0-4 years. Koh Sla has malaria infected cases than Stung Keo in the agroup 0-4 years.

**5-14 years:** In the agegroup 5-14 years, we observed that 3 villages in Koh Sla and 4 villages in Stung Keo did not have any PF case detected. Two villages in Koh Sla and one village in Stung Keo have remarkable malaria cases if compare to other villages in both sites. Stung Keo has total cases around two third of Koh Sla and men got malaria two times more than female.

**15-49 years:** More people affected by malaria in this age group in Koh Sla by which PV and mix infected rate were the same and equaled 46.51% each. Whereas, in Stung Keo, mix infection consisted of 42% follow by PV 32% and PF 26%. The difference between male (54% and female (46%) for malaria infection is 8% in Koh Sla but in Stung Keo, male infection has 10 times higher than female(250 males vs 25 female infected).

**>50 years:** Not many people got malaria was observed in this age group in both sites. Male and female infection is nearly equally in Koh Sla but in Stung Keo males has four folds higher than female.

**Fig. 6 : Malaria cases divided by age group in Koh Sla and Stung Keo**



#### 4.1.6. Dried blood spot samples collection by filter paper

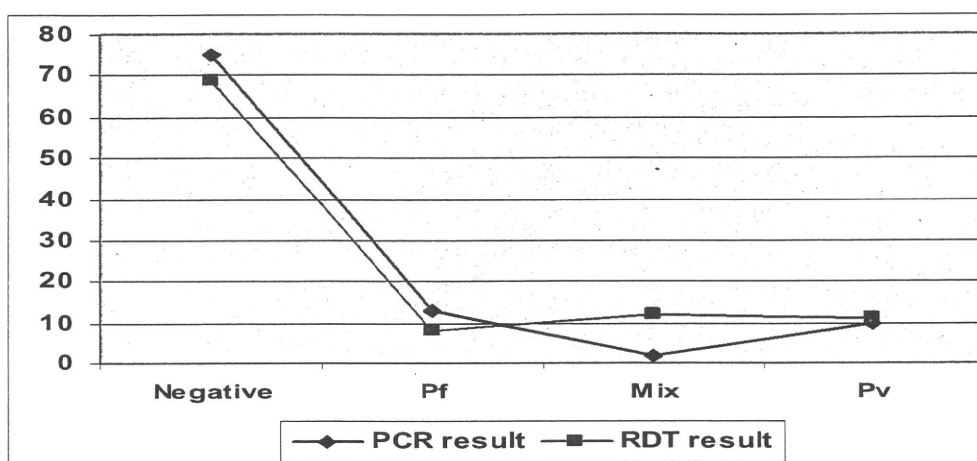
During the project period, the dried blood spot samples were collected by using the filter paper for PCR screening. The total of 862 samples was taken from the villagers with the RDTs testing. Nearly two third of people testing (64.38%) was males and one third was females (35.62%). The sex ratio (Male/Female) among the screening people was 1.80 and the age of the participants was ranked from 2 to 64 years old. The total malaria positive cases confirmed by RDTs are 267 positive cases (31%) as for the result confirmed by PCR is 213 positive cases (25%). The summary findings of the filter paper analysis by PCR and the result of RDTs testing were depicted by the table below.

**Table 5: The result of dried blood spots analyzed by PCR and the RDT result**

PCR result	Total	%	RDT result	Total	%
Total negative	649	75%	Negative	595	69%
Pf	113	13%	Pf	69	8%
Mix	17	2%	Mix	102	12%
Pv	83	10%	Pv	96	11%
Total positive cases	213	25%	Total positive	267	31%
Total tested cases	862		Total	862	

**Discussion:** The malaria positive result confirmed by PCR is 6% lower than the result detected by RDT test but the PCR confirmed negative increased 6% higher than that of RDT test. PCR detected more Pf than RDT test around 5% however RDT test result found more Pv than PCR almost 10%. The graph below showed the comparison of the findings that was conducted by PCR and RDT test.

**Fig. 7: The malaria positive rate by species detected by PCR and RDT test**



### 5. The monitoring of the net distribution and reimpregnation

So far the insecticide treated nets have widely distributed from year to year in the study project for the protection from mosquitoes bite with the monitoring from the health center, operational district and provincial health department staff. The old nets were retreated every year and also the distribution of the new net has been conducted as the replacement of the existing nets that damaged that was estimated around 10% of the total nets owned by the community to be substituted. During the period of the project implementation, the total of 15,035 nets were distributed and retreated. The net received per family ranged from 3 to 7 per family and the average number of nets received per family is around 4 nets per family. After many years of health education and campaign, communities are aware and understand the real cause of malaria so that it leads to the full and active participation in the bed net re-impregnated sessions that have been conducted routinely in their villages.

**Table 6: Result of the insecticide bed nets distributed and re-impregnated**

Village	No.of family	Pop. at risk	Total number of distributed/ retreated nets
Stung Kbal Damrei	1149	3765	3798
Stung Angkanh	312	1121	1125
317	348	1612	1630
Anlung Krom	432	1968	1972
Kampong Chen	322	2142	2151
Trapeang Kak	182	885	879
Doung	169	731	739
Malich Kul	128	527	532
Anlong Meakprang	312	1346	1351
Damrei Phong	182	841	858
<b>Total</b>	<b>3536</b>	<b>14938</b>	<b>15035</b>

## **6. Strengthen the community's knowledge, attitude and practice through the active health education and IEC ditribution**

To prevent the community from getting malaria as well as to increase the knowledge about how to avoid from malaria is also one of the key components of the activities in this study project's objectives. So the health education is play a significant task for increasing the understanding and awareness of the remote and high endemic malaria villagers in the newly developed areas. Since the onset of the project, the health education and IEC materials have been seriously taken into consideration through the intensive health education sessions by health educators and regularly distribution of leaflets, flipcharts, posters, calendars, T-shirts, caps etc...in the purpose of improving the knowledge, attitude and practice of the affected community where malaria is a major problem in those poorest of the poor villages. More than 200 health education sessions were conducted during the project implementation with around 15,000 peoples participated in the education meeting. All the above mentioned IEC materials were widely delivered during each session as well as via the key persons in the target villages. Due to the current survey showed that more than 90% of the villagers know the malaria cause, their signs and how to prevent them selves from malaria.

## **7. Conclusion:**

- Population movement has been observed in the study villages from year to year according to the increasing of bed net distribution and the census reported by the head of the village. Men are more exposed to malaria due to their responsibility and active involvement in routine daily activity which was demonstrated by only 13% of women were tested for malaria in Stung Keo with the sex ratio M/F among screening is 6.42. On the contrary, in Koh Sla, the difference between men and women participation is merely 12% and the sex ratio M/F among screening is 1.29.
- Malaria case in a village is varied from 2 to 7 cases per month with the average around 4 cases per month. Pf infection was little observed in Stung Keo site but Koh Sla has around 3 folds higher. Pv and Mix counted around 2/5 each among the total positive cases in both study sites. There is little difference between the sex ratio M/F among the screening case and the positive case in Koh Sla (1.29 versus 1.13) and Stung Keo (6.42 versus 7.15)
- The predominant species in both sites are PV and Mix among the total positive cases with little discrepancy in percentage between Koh Sla(PV=49%, Mix=44%) and Stung Keo (PV=32%, Mix=40%)
- No any Pf case was observed in most of the villages among the age group 0-4, 5-14 and more than 50 years old as well as little or no infection of PV and Mix in these 3 age groups.
- The malaria is more predominant in the age group 15-49 years old by representing 67% and 87% of all positive cases in Koh Sla and Stung Keo respectively.
- There is no big difference between male and female infection in all age group in Koh Sla but in age group 15-49 in Stung Keo, male infection is 10 folds higher.

- In summary thanks to the project implementation malaria cases in most of the study villages has significantly decreased in the both study sites, especially in Koh Sla even more and more people move to those areas because of the economic reason and land transformation.
- So far no any dead case has been reported since the introduction of the project in the study villages owing to the early screening and on time treatment has been provided to the positive result patients which is to stop the development of the simple cases to severe malaria that in the past had caused many deaths in the project villages.
- There is the difference about 1-10% between the malaria positive, species and negative results detected by PCR and RDT test. PCR confirmed more Pf and negative than RDT test. There was some malaria positive cases that have been confirmed by RDT have shifted to negative result. The change of species confirmed by RDT to another species was also observed in the result detected by PCR. Further study should be carried out to get more information about the quality of RDT test as well as the accuracy of the result interpretation.

## **8. Acknowledgements**

- The National Center for Parasitology, Entomology and Malaria Control would like to express the profound thank to the Ministry of Health, Welfare and Labor, Japan, for their generous support and constant assistance to the Center.
- A special thank also to National Institute of Infectious Disease, Japan for their kind technical support and grant application.
- A sincere thank to the health center, operational district and provincial health department for their good coordination and support.
- A great appreciation to the head of the villages that have strongly supported for this project and provided full assistance during the project implementation in their villages.
- A heartfelt thank to the local authorities at all levels that have offered a great help for this project.
- A profound thank to all people that have not mentioned here for their involvement to the project and made it success.



**Ministry of Health  
National Centre for Parasitology,  
Entomology and Malaria Control  
(CNM)**

**Kingdom of Cambodia  
Nation – Religion - King**

# **The Summary of The Three Years' Project Report**

**ON**

**Strengthening and integrating of Malaria Control  
Activities in newly developed area in  
Kampot Province, Southern Cambodia**

**Period: September 2008 to February 2011**

**Date: 28<sup>th</sup> February, 2011**

**Submitted by**

**Dr. Duong Socheat  
Dr. Chea Nguon**

**Supported By**

**Ministry of Health, Welfare and Labor of Japan (A grant on  
“Research for emerging and re-emerging infections”)**

## **I. Introduction**

Malaria is a major public health problem in Cambodia and a leading cause of mortality and morbidity. It has both short- and long-term consequences for national economic development and has therefore been given high priority by the government and donor agencies. Malaria is the third highest known cause of outpatient attendance (4.6%) and the first cause of hospitalization (13.7%) and hospital death (16%). Real figures are much higher as most malaria cases are either treated first through private clinics and drug sellers or do not seek treatment at all.

In Cambodia the malaria transmission happened in the remote forest with little development or nothing and in very poor areas that created complexity in controlling that disease as well as problem of providing and receiving the service delivery from the public health sector. The main problems are that those areas were isolated with the complicated geographical barriers, no roads or roads are very bad or very far away from the health facility that provoked hurdle for the intervention, especially in the rainy season.

In addition, the dearth of transportation means, the expensive cost of traveling etc...combined with the limited budget provision for malaria control program made those high endemic and secluded areas separated the public service for many years. Besides the above mentioned, there are still many problems involved and contributed to the low utilization of the public health service.

In Cambodia the malaria transmission happened in the remote forest with little development or nothing and in very poor areas that created complexity in controlling that disease as well as problem of providing and receiving the service delivery from the public health sector. The main problems are that those areas were isolated with the complicated geographical barriers, no roads or roads are very bad or very far away from the health facility that provoked hurdle for the intervention, especially in the rainy season.

In order to address to this crucial issue, the Ministry of Health, Welfare and Labor of Japan has funded (A grant on "Research for emerging and re-emerging infections") through the National Institute of Infectious Diseases, Japan, a project in Cambodia entitled "Strengthening and integrating of Malaria Control Activities in newly developed area in Kampot Province, Southern Cambodia" has been implemented in 10 newly villages in Stung Keo and Chhouk commune in Kampot province.

Through this generous support of General National Institute of Infectious Diseases, Japan for the control activities in the project area, the accurate baseline data on malaria incidence and prevalence in those pilot villages were collected. The village volunteers were selected and trained for offering the malaria diagnosis and treatment through rapid diagnosis test and ACT to the community according to the national guideline. The piloted project have demonstrated that village-based volunteers to provide free of charge service to villagers is the only practical emergency solution for Cambodia to reduce the malaria problem in the remote and inaccessible hyperendemic communities.

## **II. Aims of the project**

- To get basic epidemiological information based on the comparison of malaria trend in previous and new targeted villages.
- To strengthen the monitoring of the existing volunteer network with the further integration of other operational and feasible interventions to reduce malaria morbidity and mortality in the newly developed area.

## **III. Objectives of the Project**

### **1) Epidemiological comparison in two village groups**

- To oversee the malaria incidence and epidemiological trend in the villages, especially the male adult and children.
- To oversee the dynamics of the malaria parasites in the villages (including sero-epidemiological results).
- To compare the genetic dynamics of malaria parasites in two targeted villages.

### **2) Activities of the volunteers and village people in the communities**

- To integrate and decentralize the re-impregnation activities to volunteers through the ITN training with the direct monitoring from the HC, OD and PHD.
- To monitor the volunteers' performance related to the malaria control activities based in the community.
- To strengthen the community's knowledge and practice through the active health education through the community-based network for preventing them from malaria and access them to get the prompt and correct treatment at public health service.

## **IV. The implementing agency**

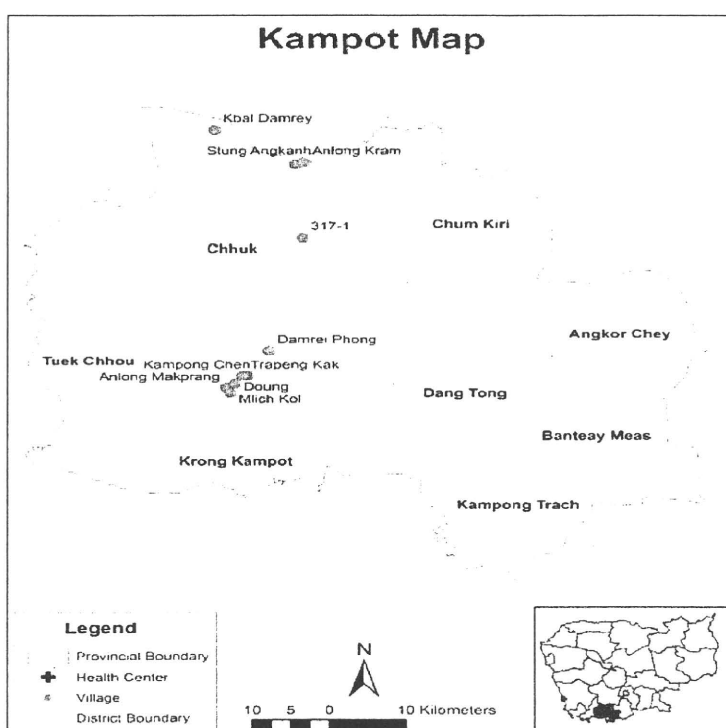
The National Center for Parasitology, Entomology and Malaria Control will play keys roles in implementing and monitoring the above-mentioned project by coordinating with the full participation from the Provincial Health Department, Operational District, Health Centre, Village Malaria Workers.



## V. Study sites

The project sites were located in the two communes of Kampot province: Stung Keo and Chhouk communes that are the two highest malaria communes comparing to other communes in Kampot province. Ten villages of the two above mentioned sites were selected for the study based on the malaria endemicity, remoteness, out of reach by the private provider and the high malaria cases reported by health centers in the catchment areas. Among the ten villages selected villages, six villages (Doung, Malich Kol, Anlong Mac Prang, Trapang Kok, Kampong Chen and Damrei Phong villages) situated in Stung Keo commune and the other four villages (Stung Kbal Domrei, Stung Angkanh, 317, Anlong Krom villages) located in Chhouk commune, Kampot province.

**Fig.1: Location of the study villages in the study areas**



## VI. Summary results of the 3 years' activities implemented during the project period

### A- Results of the baseline data collection and surveys' activities

#### A-1- Results of baseline survey

- The baseline data collection was conducted in the 4 new study villages situated in the Taken commune, Chhouk district, Kampot province.
- More than 90% of villagers earn their living by farming, hunting, wood and bamboo collection and other forest product.
- All most of the families in the villages collect the water from the river as their main water source for daily use. Very few latrines in each study village were observed and reported during the survey.

**Table 1: Summary result of baseline survey in Y1**

No	Name of Village	Total Family	Total Population	Total household	Water Source	Distance from health center
1	Stung Angkanh	416	1596	416	River	40 km
2	Anlung Krom	429	1953	429	River	37 km
3	Stung Kbal Domrei	394	2167	787	River	30 km
4	317	240	643	53	River	38 km
<b>Total</b>		1687	7678	1685		

**A-2- Results of malaria's knowledge**

- A questionnaire related to the malaria signs and symptoms, malaria prevention, treatment seeking behavior was administered to the head of the selected households.

**Table 2: Malaria knowledge of signs, prevention & treatment seeking behavior in Y1**

No	Village Name	Know Sign/ Symptom of malaria in %	Seek treatment at HC in %	Seek treatment at private provider in %	Bed net use in %	ITN use in %	Go to forest in %
1	Stung Angkanh	67	15	85	52	40	15
2	Anlung Krom	62	12	88	60	50	12
3	Stung Kbal Domrei	59	20	80	66	65	20
4	317	72	25	75	58	61	18

**A-3- Results of spleen survey**

- The survey was conducted in 4 villages and in each village 20 children aged from 2-9 years old was screened with rapid diagnosis test during the identification. Three villages have enlarged spleens ranked from 10%-20%. The positive RDT test among the three splenomegaly villages also varied from 10%-15%.

**Table 3: Results of the spleen survey & blood test in Y1**

No	Village Name	UTM East	UTM North	Forest grade	Ethnicity	Spleen enlarged	RDT+	Spleen grade			
								0	1	2	3
1	Stung Angkanh	48P 0409315	1225246	1	Khmer	3 (15%)	2 (10%)	0	1	2	0
2	Anlung Krom	48P 0409688	1227623	2	Khmer	4 (20%)	2 (10%)	0	3	1	0
3	Stung Kbal Domrei	48P 0409758	1228126	2	Khmer	2 (10%)	3 (15%)	0	1	1	0
4	317	48P 0407519	1230008	3	Khmer	0	0	0	0	0	0

**Picture1-4: Spleen Survey activity in the target villages in Y1**



**A-4- Results of spleen survey**

**Table 4: Results of the household blood survey Y1**

No	Name of Village	No of slide	No of slide positive	P. falciparum	P. Vivax
1	Stung Angkanh	22	4 (18.18%)	2 (9.09%)	2 (9.09%)
2	Anlung Krom	36	10 (27.77%)	8 (22.22%)	2 (5.55%)
3	Stung Kbal Domrei	211	47 (22.27%)	31 (14.69%)	16 (7.58%)
4	317	175	4 (2.28%)	3 (1.71%)	1(0.57%)
<b>Total</b>		<b>444</b>	<b>65 (14.63%)</b>	<b>44 (9.90%)</b>	<b>21 (4.72%)</b>

**Picture 5: Activity of the household blood survey in the target villages**



**A-5- Results of spleen survey in school students and children near by school in Y2**

The spleen survey of the children aged from 2-9 years old was conducted in order to detect and assess the local transmission and the degree of endemicity among the school students and children who live around the school campus. A total of 148 children were screened for the spleen enlarged but no any splenomegaly and the positive RDTs were found among all of them.

**Picture 6-9: Spleen Survey activities for the children aged 2-9 years old**



**A-6- Result of dried blood spot sample collection by filter paper in Y2**

During the project period, 45 blood samples by filter paper were collected from the malaria patients who confirmed by RDT test. Among those blood samples, we observed that 87% (39 samples) of them were males and 13% were females. The age of the patients was ranked from 12 to 49 years old.

**Table 5: The result of the blood filter papers collection during the project period**

SI	Villages	Number of Blood filter papers collected	Age rank of patient	Female patient	Male patient	% of female patient infected	% of male patient infected
1	Trapangkok	12	16-26	1	11	8%	92%
2	Kampong Chen	4	18-23	0	4	0%	100%
3	Anglungmakprang	5	17-25	1	4	20%	80%
4	Malickul	16	16-42	0	16	0%	100%
5	Dong	2	18-25	0	2	0%	100%
6	317	3	23-49	2	1	67%	33%
7	Anlungkrom	3	12-38	2	1	67%	33%
<b>Total</b>		<b>45</b>		<b>6</b>	<b>39</b>	<b>13%</b>	<b>87%</b>

**A-7-Results of the student blood survey in Stung Keo School in Y2**

The blood survey was conducted in the primary and secondary school in project area in Stung Keo commune and all students come from those 6 near by villages that situated around the school. All 560 students in Stung Keo School were screened for malaria by using RDT that could detect Plasmodium Falciparum, Plasmodium Vivax and mix infection. 55% of the students screened are female and their ages rank from 2 to 17 years old.

The collection of 560 blood samples by filter paper was carried out during the blood survey through the finger prick blood sample taken for gene analysis. Another 560 samples of the blood slide were also collected for the microscopic examination of Giemsa stained blood smears to examine the presence of malaria parasites in school student in study villages.

**Table 6: Result of student blood survey in Koh Sla School Y2**

Age	Total number of slides examined	Male	Female	Number of slides positive	Number of RDTs positive	<i>Pf</i>	<i>P.v</i>	<i>Mix</i>
2-7y	94	37	57	0	0	0	0	0
8-12y	291	133	158	0	0	0	0	0
13-17y	175	83	92	1	0	0	1	0
<b>Grand Total</b>	<b>560</b>	<b>253</b>	<b>307</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>

**Picture 10-13: Activities of the student blood survey in Koh Sla School**



**A-8- Dried blood spot samples collection by filter paper inY3**

During the project period, the dried blood spot samples were collected by using the filter paper for PCR screening. The total of 862 samples was taken from the villagers with the RDTs testing. Nearly two third of people testing (64.38%) was males and one third was females (35.62%). The sex ratio (Male/Female) among the screening people was 1.80 and the age of the participants was ranked from 2 to 64 years old. The total malaria positive cases confirmed by RDTs are 267 positive cases (31%) as for the result confirmed by PCR is 213 positive cases (25%). The summary findings of the filter paper analysis by PCR and the result of RDTs testing were depicted by the table below.

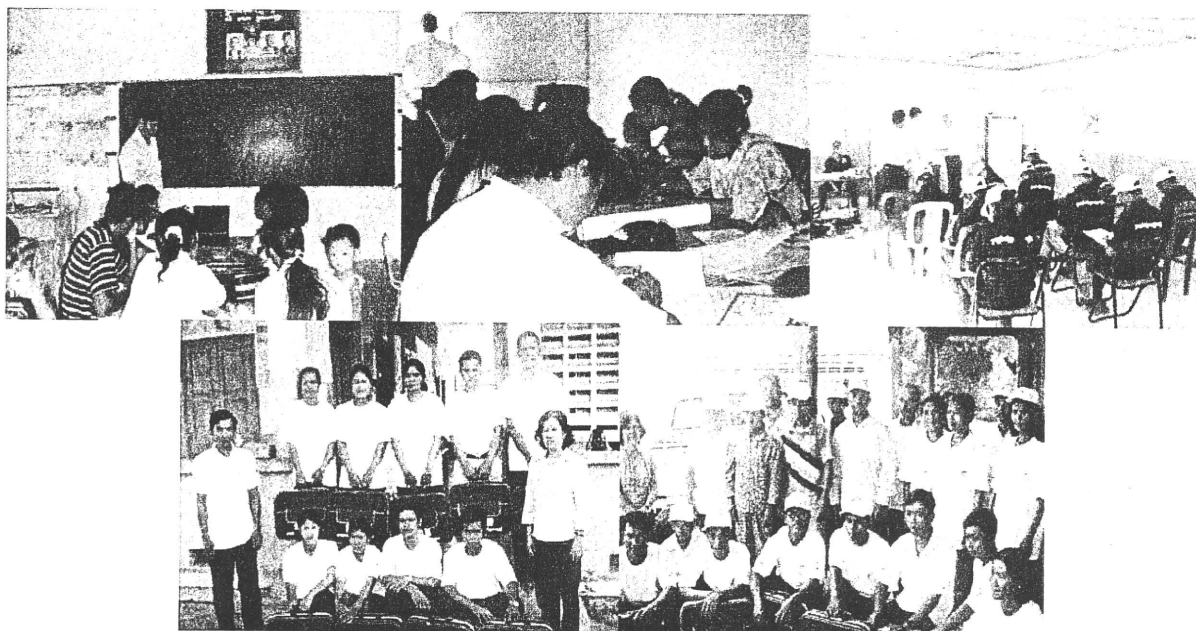
**Table 7: The result of dried blood spots confirmed by PCR and the RDT test**

PCR result	Total	%	RDT result	Total	%
Total negative	649	75%	Negative	595	69%
<i>Pf</i>	113	13%	<i>Pf</i>	69	8%
<i>Mix</i>	17	2%	<i>Mix</i>	102	12%
<i>Pv</i>	83	10%	<i>Pv</i>	96	11%
Total positive cases	213	25%	Total positive	267	31%
Total tested cases	862		Total	862	

## **B- The training/refresher activities during the project implementation**

The 3 day training/refresher sessions organized by the provincial health department collaborated with the national malaria center were conducted malaria collectors for implementing the project's activity by using the rapid diagnosis test to the fever patients consulted and provide ACT for all positive cases tested.

**Picture 14-18: Trained/refreshed activities during the project implementation**



## **C- Epidemiological trend in the study villages**

### **C-1- Monitoring result of the malaria cases in the study village in the 1<sup>st</sup> year**

The monitoring and supervisory visits have been made regularly on the monthly basis by the provincial coordinator and from central level. During the project implementation, 635 cases were tested and 395 cases were positive and treated in the target villages. The positive rate was 62.20%. In Koh Sla and Stung Keo the positive rate were 60% and 65% respectively. The data collected from the villages could be depicted in the following tables:

**Table 8: Data collected from the project villages in Koh Sla & Stung Keo in 1<sup>st</sup> year**

Village	RDT Results		Age 0-4		5-14 Y	Age 15-49				Age >=50		
	Total tested	Total RDT +	RDT+	RDT -	RDT +	RDT -	M+	F+	RDT -	M+	F+	RDT -
<b>Kbaldomrey</b>	128	70	4	0	26	9	26	7	45	1	1	4
<b>Angkanh</b>	81	52	2	1	6	4	27	12	24	4	1	0
<b>Anglungkrom</b>	97	60	2	0	18	7	21	17	29	2	0	1
<b>317</b>	46	29	0	0	3	3	16	7	13	2	1	1
	352	211	8	1	53	23	90	43	111	9	3	6

Village	RDT Results		Age 0-4		5-14 Y	Age 15-49			Age >=50			
	RDT tested	RDT +	RDT+	RDT -	RDT+	RDT-	M+	F+	RDT-	M+	F+	RDT-
Anglungmakprang	72	55	0	0	4	1	49	0	16	2	0	0
Dong	16	4	0	0	0	1	2	1	11	1	0	0
Kampongchen	42	27	0	0	2	0	23	1	13	1	0	2
Malickul	53	38	1	0	1	0	33	0	14	3	0	1
Domreyphong	54	27	0	0	2	0	19	3	26	3	0	1
Trapangkok	46	33	0	0	1	3	26	5	10	0	1	0
	283	184	1	0	10	5	152	10	90	10	1	4

Fig.2-3 : Monthly malaria cases distributed in the project villages in the 1<sup>st</sup> year

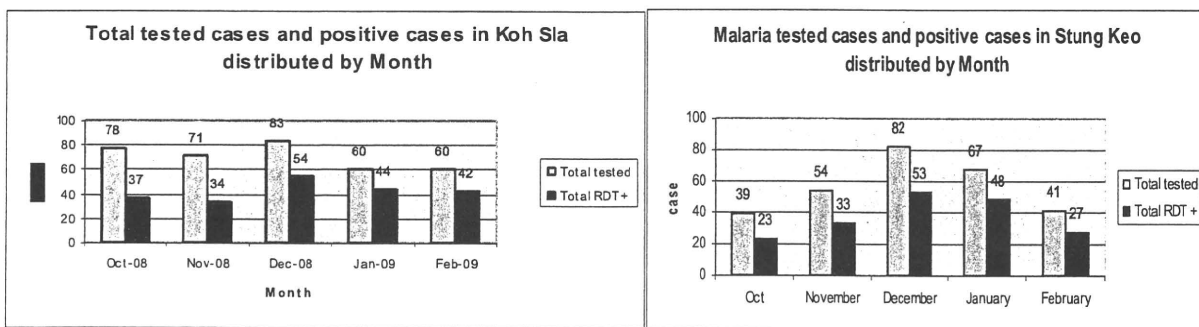


Fig.4-5: Monthly malaria cases distributed by villages project villages in the 1<sup>st</sup> year

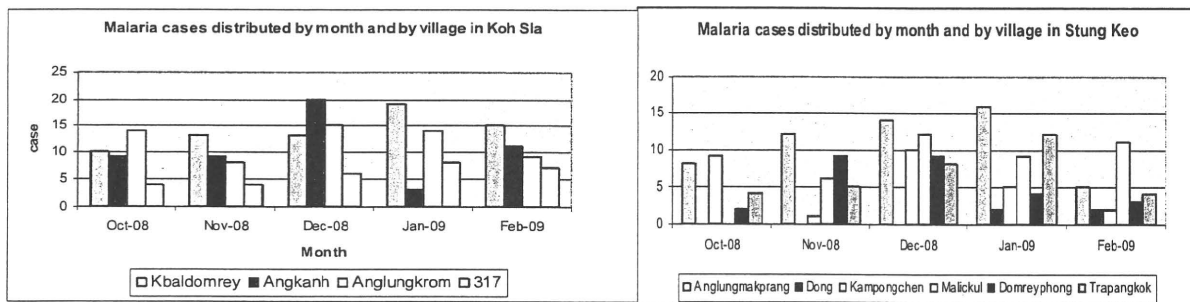
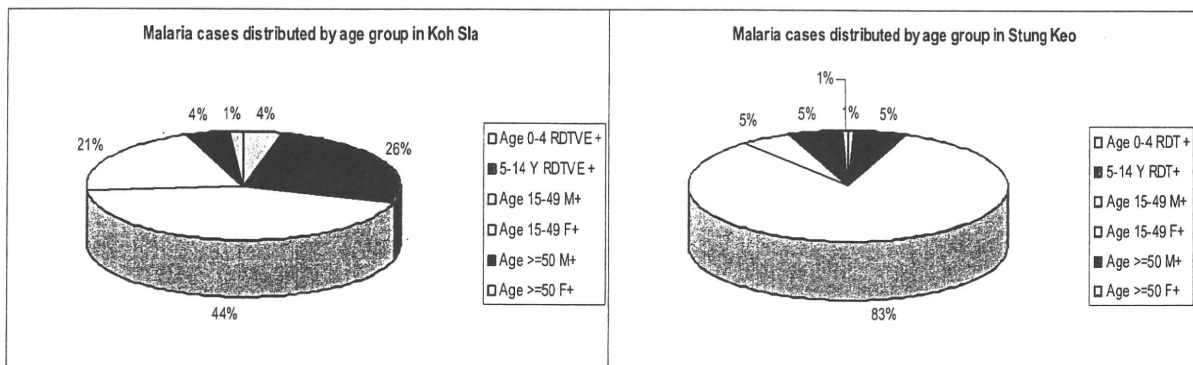


Fig.6-7: Malaria cases distributed by agegroup in study areas in the 1<sup>st</sup> year



### C-2- Monitoring result of the malaria cases in the study village in the 2<sup>nd</sup> year

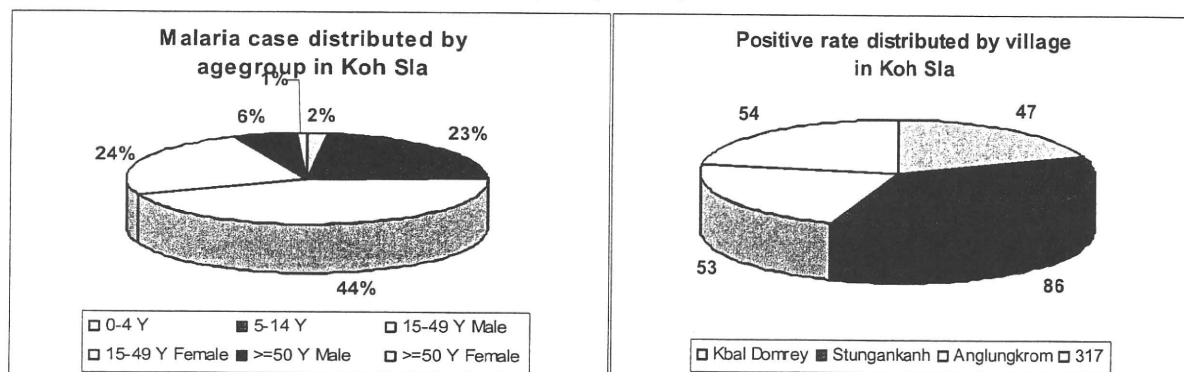
There were 214 patients were positive(57.53%) among 372 patients tested in Koh Sla and 79.44% (170 patients) of them were mainly Plasmodium Falciparum(PF) and the remaining 18.22% and 2.34% belonged to Plasmodium Vivax(PV) and Mix infection correspondingly.

During the project implementation, a total of 624 patients in Stung Keo were tested and 66.99% (418 patients) of them were positive and treated by antimalaria drug. 82.06% of all positive cases were PF and the remaining 9.33% and 8.61% belonged to PV and Mix infection respectively. The data collected could be summarized in the table below:

**Table 9: Malaria data collected from the project villages in Koh Sla and Stung Keo**

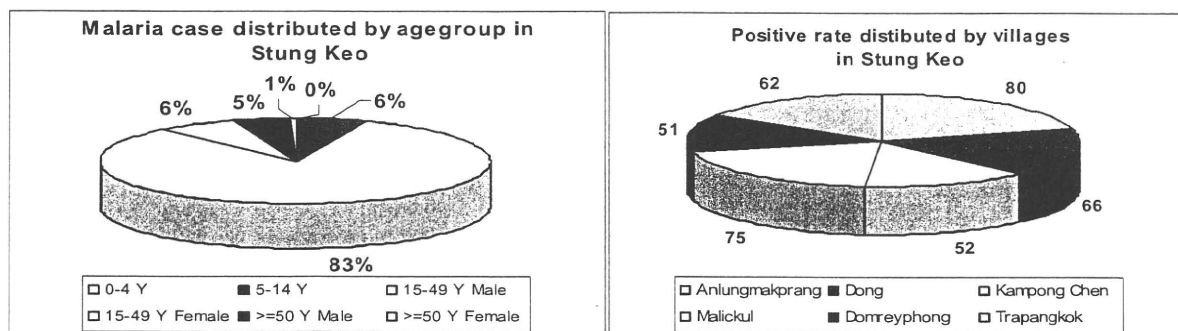
Koh Sla Village	RDT Results					Age 0-4			5-14 Y			Age 15-49						Age >=50					
	Total tested	Total RDT +				RDT +			RDT +			PF		PV		MX		PF		PV		MX	
		Total+	PF	PV	MX	PF	PV	MX	PF	PV	MX	M	F	M	F	M	F	M	F	M	F	M	F
Kbal Domrey	98	46	42	4	0	2	0	0	19	0	0	13	6	2	2	0	0	2	0	0	0	0	0
Stungankanh	64	55	44	10	1	1	0	0	3	3	0	25	12	3	4	1	0	3	0	0	0	0	0
Anlungkrom	87	46	27	17	2	1	0	0	9	5	1	8	5	6	5	1	0	3	1	0	1	0	0
317	123	67	57	8	2	0	0	0	9	0	0	32	13	3	5	1	0	3	0	0	0	1	0
<b>Total case</b>	<b>372</b>	<b>214</b>	<b>170</b>	<b>39</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>40</b>	<b>8</b>	<b>1</b>	<b>78</b>	<b>36</b>	<b>14</b>	<b>16</b>	<b>3</b>	<b>0</b>	<b>11</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>
Stung Keo Village	RDT Results					Age 0-4			5-14 Y			Age 15-49						Age >=50					
	Total tested	Total RDT +				RDT +			RDT +			PF		PV		MX		PF		PV		MX	
		Total+	PF	PV	MX	PF	PV	MX	PF	PV	MX	M	F	M	F	M	F	M	F	M	F	M	F
Anlunmakprang	163	130	108	16	6	0	0	0	6	4	0	93	5	9	3	6	0	4	0	0	0	0	0
Dong	64	42	36	2	4	0	0	0	2	0	0	29	3	2	0	4	0	2	0	0	0	0	0
Kampongchen	77	40	31	2	7	0	0	0	2	0	0	25	2	2	0	3	0	2	0	0	0	4	0
Malickul	134	100	74	11	15	0	0	0	2	1	0	66	2	10	0	13	0	3	1	0	0	2	0
Domreyphong	88	45	41	3	1	0	0	0	5	0	0	33	2	2	1	1	0	1	0	0	0	0	0
Trapangkrok	98	61	53	5	3	0	0	0	2	0	0	41	7	4	1	2	1	2	1	0	0	0	0
<b>Total case</b>	<b>624</b>	<b>418</b>	<b>343</b>	<b>39</b>	<b>36</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>19</b>	<b>5</b>	<b>0</b>	<b>287</b>	<b>21</b>	<b>29</b>	<b>5</b>	<b>29</b>	<b>1</b>	<b>14</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>

**Fig.8-9: Malaria cases divided by age group and positive rate in Koh Sla**

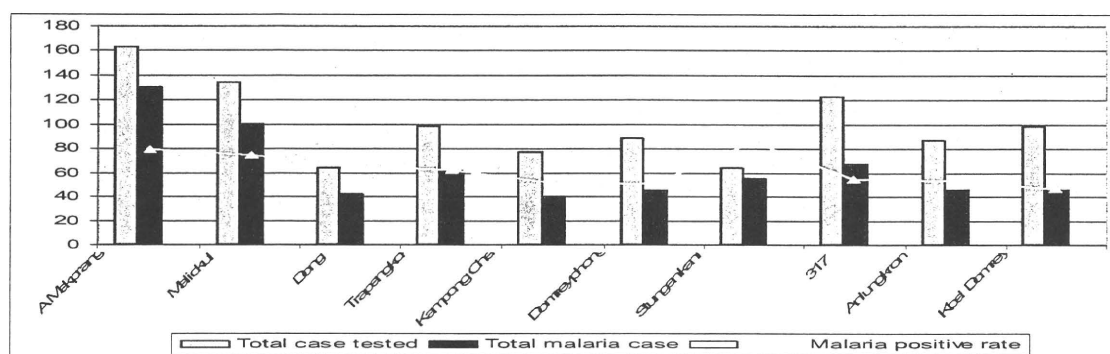




**Fig.10-11: Malaria cases divided by age group and positive rate in Stung Keo**



**Fig.12: Total cases tested, positive cases and malaria positive rate by village**



**C-3- Monitoring result of the malaria cases in the study village in the 3<sup>rd</sup> year**

- During the implementation of the project, the total of 754 cases was screened for malaria in both Koh Sla and Stung Keo study sites and 58% of them were from Stung Keo site, the rest belongs to Koh Sla site. The overall percentage of male tested predominant again female is 74% and 26% respectively.

**Table10: Total test cases divided by gender**

Project sites	Village Name	Total tested	Total test divided by gender			
			Male	%	Female	%
Koh Sla	317	38	31	82	7	18
	Anlong Kram	124	65	52	59	48
	Kbal Damrey	44	25	57	19	43
	Stung Angkanh	110	57	52	53	48
<b>Total</b>		<b>316</b>	<b>178</b>	<b>56</b>	<b>138</b>	<b>44</b>
Stung Keo	Anlong Makprang	72	65	90	7	10
	Damrei Phong	115	89	77	26	23
	Doung	44	42	95	2	5
	Kampong Chen	70	59	84	11	16
	Mlich Kol	55	54	98	1	2
	Trapeng Kak	82	70	85	12	15
<b>Total</b>		<b>438</b>	<b>379</b>	<b>87</b>	<b>59</b>	<b>13</b>
<b>Grant total</b>		<b>754</b>	<b>557</b>	<b>74</b>	<b>197</b>	<b>26</b>

**- Proportion of positive cases among total positive**

The data collected from the Koh Sla site showed that male malaria positive rate among total positive tests is very high in village 317(83%) compare to female that is on only 17%. The rest 3 villages showed little difference from one village to another, conversely, in all villages in Stung Keo, the discrepancy of positive rate between male and female are significantly dissimilar as depicted in the table below. The sex ratios (Male/Female) among positive malaria cases are 1.13 and 7.15 in Koh Sla and Stung Keo respectively.

**Table 11: Total positive cases divided by gender**

Project sites	Village Name	Total positive	Total positive divided by gender			
			Male	%	Female	%
Koh Sla	317	24	20	83	4	17
	Anlong Kram	55	24	44	31	56
	Kbal Damrey	24	13	54	11	46
	Stung Angkanh	91	46	51	45	49
<b>Total</b>		<b>194</b>	<b>103</b>	<b>53</b>	<b>91</b>	<b>47</b>
Stung Keo	Anlong Makprang	66	59	89	7	11
	Damrei Phong	82	63	77	19	23
	Doung	22	21	95	1	5
	Kampong Chen	47	41	87	6	13
	Mlich Kol	46	45	98	1	2
	Trapeng Kak	55	50	91	5	9
<b>Total</b>		<b>318</b>	<b>279</b>	<b>88</b>	<b>39</b>	<b>12</b>
<b>Grant total</b>		<b>512</b>	<b>382</b>	<b>75</b>	<b>130</b>	<b>25</b>

**- Number of malaria positive divided by species**

The total malaria positive 194 cases in Koh Sla site, 49% of them were accounted by Plasmodium Vivax (PV) and 44% by mix infection and Plasmodium Falciparum (PF) is only 7% and no any case of PF was detected in 317 and Kbal Damrey villages. Whereas, the Stung Keo site, all aspect of species were identified except the village Mlich Kol that is no PF found. The positive rate in Stung Keo is 28%, 32% and 40% for PF, PV and Mix infection accordingly. There is a bite difference between the PF rate in Stung Keo site that has more PF than in Koh Sla (28% vs 7%), however Koh Sla has 17% and 4% of PV and Mix infection higher than Stung Keo.

In general, the average percentage of these two sites together, PF is responsible for one fifth as for PV and Mix infection is around two fifth each.

The data collected could be summarised in the table below.

**Table 12: Total malaria positive cases divided by species**

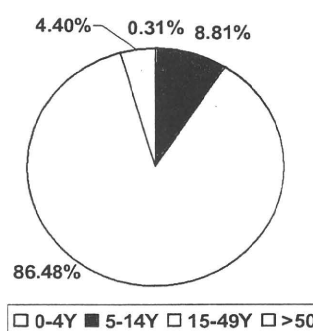
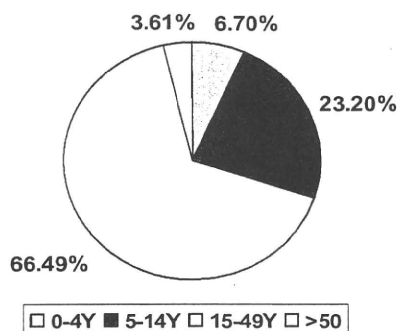
Village Name	Total positive	Number of positive by species					
		PF	% of PF	PV	% PV	MIX	% of Mix
317	24	0	0	14	58	10	42
Anlong Kram	55	3	5	40	73	12	22
Kbal Damrey	24	0	0	15	63	9	38
Stung Angkanh	91	10	11	26	29	55	60
<b>Total</b>	<b>194</b>	<b>13</b>	<b>7</b>	<b>95</b>	<b>49</b>	<b>86</b>	<b>44</b>
Anlong Makprang	66	1	2	31	47	34	52
Damrei Phong	82	52	63	22	27	8	10
Doung	22	7	32	3	14	12	55
Kampong Chen	47	16	34	4	9	27	57
Mlich Kol	46	0	0	28	61	18	39
Trapeng Kak	55	12	22	15	27	28	51
<b>Total</b>	<b>318</b>	<b>88</b>	<b>28</b>	<b>103</b>	<b>32</b>	<b>127</b>	<b>40</b>

**Table 13: Total malaria cases divided by age group**

Village Name	0-4y				5-14y								15-49y								>50y			
	Mix		Pv		Total	Mix		Pf		Pv		Total	Mix		Pf		Pv		Total	Mix		Pv		Total
	F	M	F	M		F	M	F	M	F	M		F	M	F	M	F	M		F	M	F	M	
317	0	0	0	0	0	1	0	0	0	0	1	2	1	7	0	0	2	10	20	0	1	0	1	2
Anlong Kram	0	1	6	2	9	1	3	0	0	4	4	12	3	4	0	3	16	7	33	0	0	1	0	1
Kbal Damrey	0	0	0	0	0	1	0	0	0	0	3	4	5	3	0	0	5	6	19	0	0	0	1	1
St.Angkanh	0	3	1	0	4	10	2	0	4	5	6	27	18	19	2	4	7	7	57	2	1	0	0	3
<b>Total</b>	<b>0</b>	<b>4</b>	<b>7</b>	<b>2</b>	<b>13</b>	<b>13</b>	<b>5</b>	<b>0</b>	<b>4</b>	<b>9</b>	<b>14</b>	<b>45</b>	<b>27</b>	<b>33</b>	<b>2</b>	<b>7</b>	<b>30</b>	<b>30</b>	<b>129</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>7</b>
A.Makprang	1	0	0	0	1	0	0	0	0	1	0	1	1	29	0	1	4	25	60	0	3	0	1	4
Damrei Phong	0	0	0	0	0	0	0	5	10	2	3	20	0	8	7	30	5	10	60	0	0	0	2	2
Doung	0	0	0	0	0	0	0	0	0	0	0	0	12	1	6	0	3	22	0	0	0	0	0	0
Kampong Chen	0	0	0	0	0	1	0	0	1	0	0	2	1	23	2	13	1	2	42	0	2	1	0	3
Mlich Kol	0	0	0	0	0	0	0	0	0	0	3	3	1	16	0	0	0	24	41	0	1	0	1	2
Trapangkak	0	0	0	0	0	0	1	0	0	1	0	2	2	23		12	0	13	50	2	0	0	1	3
<b>Total</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>5</b>	<b>11</b>	<b>4</b>	<b>6</b>	<b>28</b>	<b>5</b>	<b>111</b>	<b>10</b>	<b>62</b>	<b>10</b>	<b>77</b>	<b>275</b>	<b>2</b>	<b>6</b>	<b>1</b>	<b>5</b>	<b>14</b>

**Fig 13: Malaria cases divided by age group in Koh Sla and Stung Keo**

Malaria case divided by agegroup in Koh Sla      Malaria case divided by agegroup in Stung Keo



#### **D- The monitoring of the net distribution and reimpregnation**

Personal prevention and protection against malaria's transmission through the insecticide treated nets have been considered as the main priority and effective measure for the malaria control's strategy to prevent from mosquito bites.

During the period of the project implementation in year one, the total of 6,661 new bed nets were distributed to the study villages with 2,179 old nets, were retreated by health centers collaborated with village worker and monitored by the project officers to ensure the correct utilization and the appropriate net keeping after use. The percentage of net coverage for risk population in each village is more than 100% with 2.3 people per net's protection criteria. The net received per family ranged from 1.44 to 5.90 per family and the average number of nets received per family is around 2.6 nets per family. The community actively involved in the bed net re-impregnation sessions conducted by the volunteers since they start to aware the importance of the insecticide treated net for preventing themselves as well as to protect their families. In year two, there are the total number of 9,331 of bed nets were distributed and retreated in the study villages with the rank of coverage varies from 100 to 164%.

During the year three of the project implementation, the total of 15,035 nets were distributed and retreated. The net received per family ranged from 3 to 7 per family and the average number of nets received per family is around 4 nets per family.

**Table 14: Bed nets distributed and re-impregnated during the project implementation**

<b>Village</b>	<b>Total number of the distributed/ retreated nets in year one</b>	<b>Total number of the distributed/ retreated nets in year two</b>	<b>Total number of the distributed/ retreated nets in year three</b>
Stung Kbal Damrei	1365	1945	3798
Stung Angkanh	800	700	1125
317	866	1132	1630
Ang krom	1025	1125	1972
Kampong Chen	891	1150	2151
Trapeang Kak	610	571	879
Doung	943	637	739
Malich Kol	402	446	532
Anlong Meakprang	1308	1039	1351
Damrei Phong	548	586	858
<b>Total</b>	<b>8758</b>	<b>9331</b>	<b>15035</b>

**Picture 19-22: Activities of the bed nets distribution during the project period**

