

Control of malaria: a successful experience from Viet Nam

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Objective To follow malaria prospectively in an ethnic minority commune in the south of Viet Nam with high malaria transmission and seasonal fluctuation, during malaria control interventions using insecticide-treated bednets (ITBNs) and early diagnosis and treatment (EDT) of symptomatic patients.

Methods From 1994 onwards the following interventions were used: distribution of ITBNs to all households with biannual reimpregnation; construction of a health post and appointment of staff trained in microscopic diagnosis and treatment of malaria; regular supply of materials and drugs; annual cross-sectional malaria surveys with treatment of all parasitaemic subjects, and a programme of community involvement and health education. Surveys were held yearly at the end of the rainy season. During the surveys, demographic data were updated. Diagnosis and treatment of malaria were free of charge. *Plasmodium falciparum* infection was treated with artesunate and *P. vivax* infection with chloroquine plus primaquine.

Findings The baseline survey in 1994 recorded 716 inhabitants. Of the children under 2 years of age, 37% were parasitaemic; 56% of children aged 2–10 years, and 35% of the remaining population were parasitaemic. *P. falciparum* accounted for 73–79% of these infections. The respective splenomegaly rates for the above-mentioned age groups were 20%, 56%, and 32%. In 1999, the proportion of parasitaemic subjects was 4%, 7% and 1%, respectively, of which *P. falciparum* contributed 56%. The splenomegaly rate was 0%, 5% and 2%, respectively.

Conclusions A combination of ITBNs and EDT, provided free of charge, complemented by annual diagnosis and treatment during malaria surveys and community involvement with health education successfully brought malaria under control. This approach could be applied to other regions in the south of Viet Nam and provides a sound basis for further studies in other areas with different epidemiological patterns of malaria.

Keywords Malaria, Falciparum/prevention and control/diagnosis/drug therapy; Malaria, Vivax/prevention and control/diagnosis/drug therapy; Sesquiterpenes/therapeutic use; Chloroquine/therapeutic use; Primaquine/therapeutic use; Pyrethrins/Bedding and linens/utilization; Knowledge, attitudes, practice; Health education; Ethnic groups; Prospective studies; Viet Nam (source: MeSH, NLM).

Mots clés Paludisme plasmodium falciparum/prévention et contrôle/diagnostic/chimiothérapie; Paludisme plasmodium vivax/prévention et contrôle/diagnostic/chimiothérapie; Sesquiterpènes/usage thérapeutique; Chloroquine/usage thérapeutique; Primaquine/usage thérapeutique; Pyrèthrine; Lingerie et linge/utilisation; Connaissance, attitude, pratique; Education sanitaire; Groupes ethniques; Etude prospective; Viet Nam (source: MeSH, INSERM).

Palabras clave Paludismo falciparum/prevenición y control/diagnóstico/quimioterapia; Paludismo vivax/prevenición y control/diagnóstico/quimioterapia; Sesquiterpenos/uso terapéutico; Cloroquina/uso terapéutico; Primaquina/uso terapéutico; Piretrinas; Ropa de cama y ropa blanca/utilización; Conocimientos, actitudes y práctica; Educación en salud; Grupos étnicos; Estudios prospectivos; Viet Nam (fuente: DeCS, BIREME).

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Introduction

Malaria remains a threat to almost 50% of the world's population. With 200 million estimated new cases and 1–2 million deaths per year, the disease remains a major cause of morbidity and mortality (1, 2). No new methods of controlling malaria have appeared since the introduction of insecticide-treated bednets (ITBNs) in the 1980s, and they are not expected in the near future. A control strategy comprising proper application of existing means is advocated: early

diagnosis and treatment (EDT) of symptomatic malaria to prevent progression to severe and potentially fatal stages; preventive measures including use of ITBNs and selective residual spraying; and prediction, containment and, if possible, prevention of epidemics; and strengthening of local capacities (2, 3). Although use of ITBNs has been shown to reduce malarial morbidity and mortality, this measure needs to be supported by an adequate health care system providing EDT, possibly at the household level (2, 4). WHO advocates the combined approach of ITBNs and EDT in its Roll Back

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Malaria initiative, but there has been little study of the combined efficacy of these two approaches (5).

In Viet Nam, malaria became a serious problem during the late 1980s and early 1990s. In 1991, a total of 1 642 000 cases of uncomplicated malaria, 32 000 cases of severe malaria, and 4 650 deaths from the disease were reported, and resistance to chloroquine and sulfadoxine-pyrimethamine was widespread (6). The mountainous, forested regions of the country, which have limited basic health care facilities, and are populated by ethnic minorities, were especially affected. In 1992, a malaria control strategy based on the above-mentioned principles was adopted. It was decided that diagnosis and treatment of malaria should be free, and two important elements were added to the basic approach: development and application of artemisinin drugs; and health education at the community level. The price of drugs such as mefloquine on the international market was an important incentive for the development and use of artemisinin drugs.

A programme of malaria control was started in Binh Thuan Province, in the south of Viet Nam, in accordance with national guidelines. All health posts were provided with a microscope and health staff were trained in diagnosis and treatment of malaria. Support was obtained from several parties, including nongovernmental organizations, and through scientific collaboration projects. The present paper reports the results of an assessment of the effectiveness of this combined approach in an ethnic minority commune, Phan Tien, carried out using a longitudinal follow-up of the population and annual surveys carried out from 1994 to 1999.

Methods

Population and study site

Phan Tien village, an ethnic minority community, is situated in Bac Binh district in the mountainous part of Binh Thuan Province. The population is composed of several ethnic minority groups. Phan Tien has been in existence for approximately 20 years as one of the areas for resettlement of members of displaced hill tribes, and there is still some influx of families. People live in families of 5–6 persons in one hut; the huts have clay walls and a thatched roof. In 1993, a primary school was started; it also serves families of a nearby commune. Prior to 1999, Phan Tien was isolated: during the wet season it could not be reached by car and in the dry season only after a drive of several hours in an all-terrain vehicle. However, a permanent, gravel road, built in 1999, substantially increased the movement of people to and from the village. There is no electricity, and until 1994 the water supply was from a small river. In 1994, the first wells were drilled with the help of UNICEF. The people lived from subsistence farming, mainly rice and forest labour. Food supplies were supplemented under the national malnutrition programme. In general, living conditions were very poor.

Before 1994, malaria was considered a great problem but of unknown magnitude. During the first half of 1994, a total of 30 persons out of a total population of about 750 died, many of them with fever. Most deaths were among children. There was no health care facility and malaria surveys had not been performed. *Anopheles dirus* and *A. minimus* were the principal vectors in that part of the province. The transmis-

sion intensity in Phan Tien was thought to be very high but precise data, including the entomological inoculation rate, were not available. Cases of both *Plasmodium falciparum* and *P. vivax* malaria were present in the region (approximately 70% and 30%, respectively). The number of reported cases peaked from October through December–January (annual reports, Binh Tan health post and Malaria Station), i.e. during and after the rainy season, which starts about April and continues through October–November. Transmission continues throughout the year, however, in the forested regions around Phan Tien.

Design and procedures

A population-based intervention study was undertaken with repeated cross-sectional surveys and census updates.

Demography, yearly census. A full census of Phan Tien was taken in 1994. Houses were numbered and all individuals were registered. A record was completed for each individual with name, unique identifier, age, sex, and ethnic group. Over the period 1994–99, surveys were conducted every year at the end of the rainy season and demographic data were updated, including registering neonates, deaths, and population movement.

Interventions

Health care. In 1994 a health post was built, two medical staff were appointed, and a microscope, materials and drugs supplied. Subsequently, 10 community members (“health co-workers”) were appointed. They regularly discussed malaria and other health issues with the population, monitored the use of bednets, and checked fever in persons unable to come to the health post. Between surveys, detection of malaria was passive. All those reporting with fever at the health post were examined for malaria and those who could not come to the health post were examined and treated during home visits. The diagnosis of malaria depended on the microscopic demonstration of parasites in Giemsa-stained thick and thin blood smears. All slide-positive cases were treated, in accordance with national guidelines, as follows: *P. falciparum* malaria, with artesunate for 5 days; and *P. vivax* disease with chloroquine and primaquine for 3 and 10 days, respectively.

Bednets. A double-sized bednet impregnated with permethrin was supplied to each family in 1994, and a second net was supplied in 1995. From then until 1997, the number of double-bednets was gradually increased to one net for every two persons. Bednets were reimpregnated with permethrin twice yearly. Nets and reimpregnation were supplied free of charge.

Malaria survey. Each year, at the end of the rainy season, a survey was conducted in which the total population was examined. Questions were asked about health and complaints, splenomegaly was assessed, and blood samples were taken for detection of malaria parasites. Complaints were assessed and treated when possible or patients were referred. From 1995 onwards, assessment of splenomegaly was done by the same clinician every year. Malaria was diagnosed by microscopic demonstration of parasites in Giemsa-stained thick and thin blood smears. The slides were read on the spot during the surveys by experienced microscopists; 200 high power (10 × 100) fields were examined before a slide was considered negative. Two independent laboratories reviewed the slides afterwards. There was a discrepancy of less than 1% between the results from both laboratories. The results of the supervising teaching laboratory are reported here. All positive

cases were treated during the survey with the same regimens as at passive case detection. Results were analysed for three age groups: neonates and infants up to 2 years of age (group A), children aged 2–9 years (group B), and children aged ≥ 10 years and adults (group C). Children under 2 years old are usually carried by their mothers, and children aged ≥ 10 years often assist their parents working in the fields or in the forests after school-time. Children aged 2–10 years go to school and play in the commune, and leave the village rarely; malaria in this group probably reflects local transmission. Data for schoolchildren who did not reside in Phan Tien were included in the surveys but excluded from the analysis.

Health education. A baseline survey of knowledge, attitude and practice (KAP) was held in 50 households in Phan Tien in 1995 and 2000. On the basis of the survey's findings, a continuous health education programme was instituted, which was regularly adapted. The programme focused on malaria but also included other aspects of health and hygiene. The principles and techniques were based on a health programme for Vietnamese ethnic minority communities, which was set up with the aid of the nongovernmental organization Care International. The health education campaigns were carried out by the health post workers, subsequently also by the health co-workers and the survey team during the annual surveys.

Data analysis. Data were entered in a computerized database and analysed using SPSS 10.05 software (SPSS Inc., Chicago, IL, USA). Results were expressed as a proportion (p) of the population sample studied (n); the 95% confidence interval (95% CI) of the proportion was calculated with a correction for a finite total population (N):

$$SE = \sqrt{(p \cdot (1-p) / n) \cdot \sqrt{(N-n) / N}}; (95\% \text{ CI} = p \pm 1.96SE)$$

For comparison of proportions between respective years, the χ^2 test with Yates' correction was used.

Results

Population structure

In October 1994, a total of 716 persons living in 128 houses were registered in Phan Tien village. By 1999 the population had increased to 1082 but the population structure remained the same, with approximately 50% being younger than 15 years of age (Table 1).

Malaria surveys

The malaria control measures and timing of surveys are shown in Fig. 1. During the rains the village could not be reached. Throughout the study period the rains started in April–May and continued through to October–November, in 1998 also to December (Fig. 2). During the first survey in 1994, we examined a total of 537 persons (237 male, 300 female), i.e. 75% of the population. The main reasons for not participating in the survey were attending boarding secondary school elsewhere (registered in the village but only present during holidays) and working in the forest. After 1997, when malaria incidence had started to decline, the population became less interested in participating. In 1999, we examined only 47% of the population: 62% of group A, 63% of group B and 39% of group C. Table 1 gives the numbers examined and infected persons per age group. Positive slide rates in the various age groups are shown in Table 1 and Fig. 3, and splenomegaly rates in Fig. 4. The rates of positive slides and splenomegaly declined significantly from year to year, except for 1999.

In 1994, a total of 41% of the population had positive blood smears; in 1998, no positive slides were found (χ^2 test = 148, $P < 0.001$). An adult febrile forest worker from another commune who sought medical help at the time of the 1998 survey was found to be positive for *P. falciparum*. In 1999, a resurgence of malaria occurred (3%) exceeding the level of

Table 1. Results of malaria surveys in Phan Tien village, southern Viet Nam, 1994–99

	1994	1995	1996	1997	1998	1999
Total population	716	793	866	976	1028	1082
No. examined	537 (75)	713 (90)	627 (72)	695 (71)	413 (40)	507 (47)
Malaria type found in surveys						
<i>Plasmodium falciparum</i>	154	124	35	9	0	9
<i>P. vivax</i>	60	33	10	7	0	8
Mixed infection	7	3	0	0	0	1
Total malaria cases	221 (41)	160 (22)	45 (7)	16 (2)	0	18 (3)
Malaria cases, by age group						
Group A (≤ 2 years)						
Total population	44	54	50	48	42	37
No. examined	41 (93)	33 (61)	48 (96)	44 (92)	26 (62)	23 (62)
Total malaria cases	15 (37)	6 (18)	3 (6)	1 (2)	0	1 (4)
Group B (2–9 years)						
Total population	199	214	245	279	292	313
No. examined	162 (81)	206 (96)	223 (91)	234 (84)	170 (58)	197 (63)
Total malaria cases	90 (56)	65 (32)	21 (9)	9 (4)	0	13 (7)
Group C (≥ 10 years)						
Total population	473	525	571	655	694	732
No. examined	334 (71)	474 (90)	356 (62)	417 (64)	217 (31)	287 (39)
Total malaria cases	116 (35)	89 (19)	21 (6)	6 (1)	0	4 (1)

^a Figures in parentheses are percentages.

Fig. 1. Timetable of malaria interventions and surveys in Phan Tien village, southern Viet Nam, January 1994 to January 2000

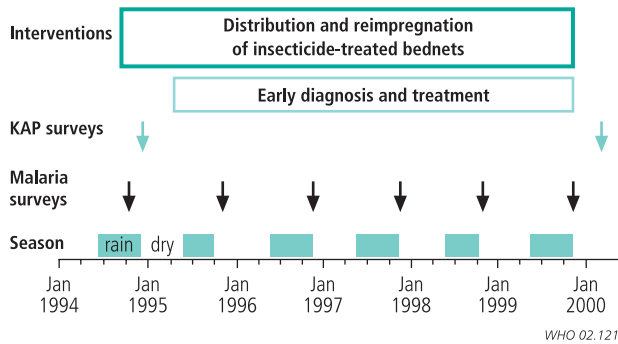
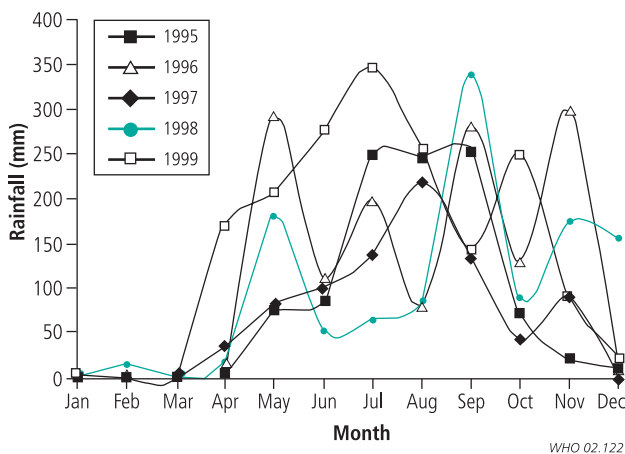


Fig. 2. Monthly rainfall in the province of Binh Thuan, southern Viet Nam, 1995–99



1997 (2%) but significantly lower than that of 1996 (χ^2 test = 5.7; $P = 0.017$) and before. Early in 1999, Phan Tien was connected to the main road (Highway No. 1, Ho Chi Minh City–Hanoi) by a gravel road. In the first months of 1999, malaria was diagnosed in road workers (“imported malaria”), later also in the local population including children, suggesting local transmission. The number of passive cases had dropped steadily from year to year (despite an increase in population), but rose again in 1999 (Table 2).

In 1995, the splenomegaly rate in the population was 32%, which dropped to < 2% in 1998 (χ^2 test = 100, $P < 0.001$) in parallel with the parasite index. In 1999, there was a small increase (2.1%) compared to 1998, but the rate was still significantly lower than in 1997 (5%, χ^2 test = 5.2; $P = 0.02$) and previous years.

KAP surveys. A summary of the results of the KAP surveys is shown in Table 3. In the 50 households that participated in both surveys, there were 54 bednets for 306 persons in 1995 and 146 nets for 326 persons in 2000. The KAP surveys revealed an increase in knowledge about malaria and preventive measures in 2000 compared with 1995.

Discussion

In 1994, Phan Tien was rather isolated and the level of malaria transmission was not defined exactly, but was probably meso- to hyperendemic. This study shows that the combination of a

Fig. 3. Proportion of parasitaemic subjects in different age groups (A ≤ 2 years; B > 2 to < 10 years; C ≥ 10 years) in Phan Tien village, south-Viet Nam, observed during malaria surveys, 1994–99.

Error bars indicate the 95% confidence intervals of the sample proportion

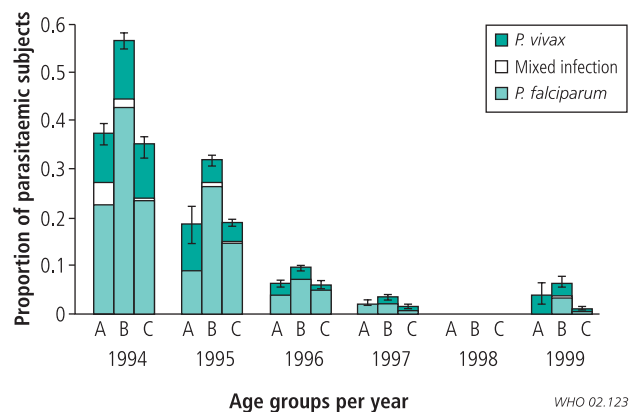
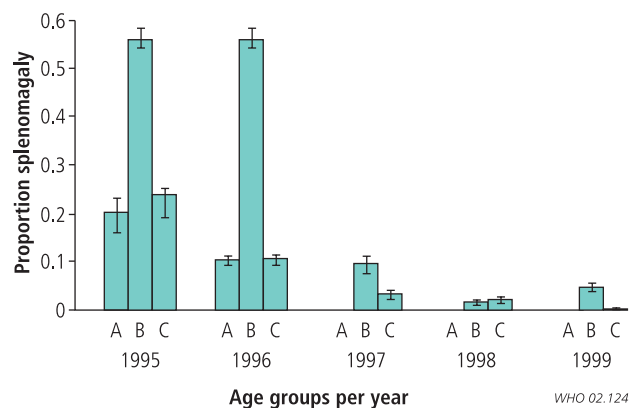


Fig. 4. Proportion of subjects with splenomegaly in different age groups (A ≤ 2 years; B > 2 to < 10 years; C ≥ 10 years) in Phan Tien village, south-Viet Nam, observed during malaria surveys, 1994–99. Error bars indicate the 95% confidence intervals of the sample proportion



bednet programme, a community-based primary health care system and annual malaria surveys brought malaria under control remarkably fast. The nationwide decline of malaria in Viet Nam during the last decade can be attributed to the application of the same methods. The rapid socioeconomic changes that have taken place in the country have also undoubtedly played a role.

Malaria control is a public health priority in Viet Nam, with a (vertical) national control programme integrated into the (horizontal) basic health care system. Malaria control is considered a responsibility of the community, to be dealt with locally through the primary health care structure, with guidance and assistance from the district and provincial health authorities. These are: the provincial malaria station, the three national institutes of malarology, parasitology and entomology and, ultimately, the national malaria programme of the Ministry of Health. The vertical programmes of bednet supply and reimpregnation, of surveys, and of instruction on diagnosis and treatment can only be successful when accepted within the basic health service and the community.

The system of early diagnosis (by microscopy) and treatment is important to prevent development of severe

Table 2. Passive case detection of malaria at the health post in Phan Tien village, southern Viet Nam, 1995–99

Malaria cases	1995	1996	1997	1998	1999
<i>Plasmodium falciparum</i>	104	69	53	34	102
<i>P. vivax</i>	66	28	10	8	10
Mixed infection	3	0	0	0	0
Total	173	97	63	42	112

malaria and death. With a good system of microscope posts and availability of proper treatment, the risks of the situation becoming out of control should be limited. Good “malaria care” may improve the confidence of the population in the health care system; in Phan Tien it provided a starting point for other interventions in hygiene, sanitation, nutrition and control of intestinal parasites.

Early diagnosis and treatment

The contribution of EDT to the control of malaria is not yet fully clear. In several African studies, treatment at health post and district level did not reduce mortality, and involvement of community health workers did not improve the situation (7–10). Involvement of mothers, however, led to reduction of severe malaria in Burkina Faso, where mortality was not assessed (11). In Ethiopia, it was shown that teaching mothers to provide home treatment of malaria reduced mortality dramatically in children under 5 years of age (4). In the small community of Phan Tien, passive case detection by the health post, with diagnosis and treatment in the home for those too sick to go to the post, certainly reduced morbidity. The annual surveys, with artesunate treatment of symptomatic patients and asymptomatic parasite carriers, in all probability also contributed to the quick reduction of malaria transmission. From 1994 through 1997, 70–90% of the population participated in the surveys ($\geq 80\%$ of infants and children up to 10 years) but participation dropped to 40% ($\geq 50\%$ for children) in 1998 and 1999 because malaria was no longer considered a serious problem. Both active (Table 1) and passive (Table 2) case detection data for 1994–1997 demonstrate this diminishing trend.

It is unlikely that we missed many persons with malaria parasites in 1998 and 1999 (there is no selection by indication) because malaria generally becomes symptomatic in this area of low transmission, and people would attend during the surveys because of the medical care available and because otherwise the nearest health post would be at least an hour away by bicycle. Data on local rainfall for the village are not available; such data for the province are shown in Fig. 2. Rainfall was lowest in 1997, still at the considerable level of 851 mm per year, and highest (1768 mm per year) in 1999. Entomological data for the village and surrounding area are lacking but the meteorological data and the timing of the surveys do not lend support to the hypothesis that dry weather, and thus fewer mosquitoes, led to a reduction in transmission.

The stage at which malaria surveys and treatment of those found to be parasitaemic could have been omitted, with further control left to bednets and passive case detection, is not clear. In the case of Phan Tien, further treatments of asymptomatic persons during surveys might not have been necessary after 1995 or 1996. Cases are likely to have become

Table 3. Summary of the results of knowledge, attitude and practice surveys in 50 households in Phan Tien village, southern Viet Nam, 1995 and 2000

	% positive responses in:	
	1995	2000
Knowledge of the cause of malaria	18	74
Knowledge of the symptoms of malaria	28	60
Practice of sleeping under bednet	10	88
Seeking early help at health post when ill	28	98
Awareness of possibilities for preventing and eradicating malaria	19	80

symptomatic and the individuals concerned would have reported to the health post. Acquired immunity will probably wane if not regularly boosted, and this underscores the need for an adequate primary health care system once interventions are successful. Since the start of this project, it has become clear that artesunate drugs reduce the number of malaria parasites very efficiently. This may influence transmission because of reduction of gametocytogenesis (12, 13) and is probably an important contribution to the reduction of malaria transmission in Viet Nam.

The efficacy of ITBNs has been demonstrated in many endemic areas in the world, especially in Africa (2, 14–18). In well-designed and -controlled programmes, ITBNs reduced all-cause mortality in children under 5 years of age with varying results (15–63%; (15), but questions about effectiveness (application outside studies, within the health service programme), costs, cost-recovery, sustainability (15, 17) and possible increases in disease and mortality after reduction in transmission (17, 19) remain to be answered. It is likely that, in most study areas, there was also a boost in the primary health care system with improvement of diagnosis and treatment, such that reductions in morbidity and mortality could not be attributed to bednet use only.

Health education

Lack of knowledge about health issues is an important problem (20). If the cognitive level of the population is low, people are less interested in participating in a malaria control programme. Health education enhances the knowledge of the population so that they know better how to prevent malaria and how to act when they have malaria, provided proper means are available and affordable. This increased awareness is an important contribution to the reduction of severe and fatal cases and possibly also of malaria transmission. However, health education interventions are not generally undertaken alone but are accompanied by other interventions, such as improving care and supply of bednets. It is therefore difficult to establish the precise contribution of each of the components.

Increased malaria transmission in 1999

After the sharp reduction of transmission in Phan Tien in 1998, there was a slight increase in 1999 when malaria was first diagnosed in road workers, and later also in the local population. The adults might have acquired malaria in the forests but malaria in infants and schoolchildren suggests local transmission. The low parasite rate observed in the survey of

December 1999 indicates that the level of local transmission remained low and that a good system of bednets and early diagnosis and treatment keeps the situation under control. There are several possible explanations for the increase: imported malaria due to improved communication and transport; early start of heavy rains in 1999 (possibly accompanied by an increase of mosquitoes); more forest work undertaken because of a bad harvest and the low price of rice in 1998; and the poor quality of the permethrin that was used to re-impregnate the bednets in March 1999 (after this re-impregnation people complained that mosquitoes were bothering them more than after previous impregnations). In a small test series carried out by the provincial malaria station, it was found that only 20% of the anopheline mosquitoes brought into contact with nets impregnated in March 1999 died, in contrast to 100% previously. Apparently permethrin of inferior quality had penetrated the market.

All these factors also contribute to the explanation of the countrywide small increase in malaria that occurred in 1998–99.

Conclusions

The data presented here show that meso- to hyperendemic malaria in the Vietnamese context can be controlled with a combination of interventions. It is not possible to say which component was the most important and which should be given priority for resource allocation. ITBNs have shown benefits, but logistics, high costs, and the need to re-impregnate them

are disadvantages. Proper primary health care, providing early diagnosis and treatment, is important to prevent severe and potentially fatal malaria and has the additional advantage of potentially improving other aspects of health and health care. Whether annual surveys with treatment of parasite carriers should be part of routine malaria control efforts depends on the local situation, but without doubt they contributed to the reduction of malaria in this programme.

The results of this study provide the basis for further research into the advantages and disadvantages of these combined interventions, including operational and economic studies in areas of seasonal transmission or continued low-intensity transmission with seasonal increases. For example, the timing of surveys and targeting of vulnerable groups need to be studied in a situation where ITBNs have been supplied and an adequate primary health care system exists. In areas of perennial high transmission, the contribution of the different components may be different. Here too studies on the combination of interventions are urgently needed. ■

Acknowledgements

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Conflicts of interest: none declared.

Résumé

Lutte antipaludique : une expérience réussie au Viet Nam

Objectif Suivre de manière prospective l'évolution du paludisme dans une communauté de gens appartenant à une minorité ethnique du sud du Viet Nam, où la transmission du paludisme est élevée et où l'on observe des fluctuations saisonnières, au cours d'interventions de lutte antipaludique faisant appel aux moustiquaires imprégnées d'insecticide et au diagnostic et au traitement précoces des malades symptomatiques.

Méthodes A partir de 1994, les interventions suivantes ont été appliquées : distribution de moustiquaires imprégnées d'insecticide à tous les ménages et réimpression de ces dernières deux fois par an ; construction d'un poste de santé et nomination d'un personnel formé au diagnostic (examen microscopique) et au traitement du paludisme ; approvisionnement régulier en matériel et en médicaments ; enquêtes transversales annuelles sur le paludisme avec traitement de tous les sujets présentant une parasitémie, et programme de participation communautaire et d'éducation pour la santé. Les enquêtes ont été effectuées chaque année à la fin de la saison des pluies. Au cours de ces dernières, les données démographiques ont été mises à jour. Le diagnostic et le traitement du paludisme étaient réalisés gratuitement. Les infestations à *Plasmodium falciparum* ont été traitées par l'artésunate et celles à *P. vivax* par la chloroquine plus primaquine.

Résultats L'enquête initiale de 1994 a recensé 716 habitants. Parmi les enfants de moins de 2 ans, 37 % présentaient une parasitémie ; 56 % des enfants âgés de 2 à 10 ans et 35 % du reste de la population présentaient une parasitémie. *P. falciparum* représentait 73 à 79 % de ces infestations. Les indices spléniques respectifs des classes d'âge mentionnées précédemment étaient de 20 %, 56 % et 32 %. En 1999, la proportion de sujets présentant une parasitémie était respectivement de 4 %, 7 % et 1 %, et 56 % d'entre eux étaient infestés par *P. falciparum*. L'indice splénique était respectivement de 0 %, 5 % et 2 %.

Conclusion En associant les moustiquaires imprégnées d'insecticide au diagnostic et au traitement précoces des cas, le tout étant fourni gratuitement et complété par un diagnostic et un traitement annuels au cours des enquêtes sur le paludisme et par la participation de la communauté à l'éducation pour la santé, on est parvenu à bien maîtriser le paludisme. C'est une approche qui pourrait être appliquée à d'autres régions du sud du Viet Nam et qui offre une base solide à partir de laquelle effectuer d'autres études dans d'autres régions présentant des caractéristiques épidémiologiques différentes.

Resumen

Control del paludismo: experiencia provechosa en Viet Nam

Objetivo Vigilar prospectivamente el paludismo en una comunidad de personas pertenecientes a una minoría étnica en el sur de Viet Nam, en unas condiciones de alta transmisión y fluctuación estacional

del paludismo, mediante intervenciones de control basadas en el uso de mosquiteros impregnados con insecticida (MI) y el diagnóstico y tratamiento precoz (DTP) de los pacientes sintomáticos.

Métodos A partir de 1994 se llevaron a cabo las siguientes intervenciones: distribución de MII a todos los hogares, con reimpregnación semestral; construcción de un puesto de salud y designación de personal capacitado en el diagnóstico microscópico y el tratamiento del paludismo; suministro regular de material y medicamentos; encuestas anuales transversales sobre el paludismo, con tratamiento de todas las personas con parasitemia, y un programa de participación de la comunidad y educación sanitaria. Las encuestas se realizaban cada año al final de la estación de las lluvias y se aprovechaban para actualizar los datos demográficos. El diagnóstico y el tratamiento del paludismo eran gratuitos. La infección por *Plasmodium falciparum* se trataba con artesunato, y la infección por *P. vivax* con cloroquina y primaquina.

Resultados En la encuesta de base de 1994 se registró a 716 habitantes. Entre los menores de 2 años, el 37% presentaban parasitemia; también presentaban parásitos en la sangre el 56%

de los niños de 2–10 años y el 35% de la población restante. *P. falciparum* era el agente causante del 73%–79% de estas infecciones. Las tasas de esplenomegalia para los grupos de edad citados fueron respectivamente del 20%, 56% y 32%. En 1999, la proporción de personas con parasitemia fue del 4%, 7% y 1%, respectivamente, atribuyéndose a *P. falciparum* el 56% de los casos, y la tasa de esplenomegalia del 0%, 5% y 2%, respectivamente.

Conclusión La combinación de MII y TDP, proporcionada gratuitamente y complementada con medidas anuales de diagnóstico y tratamiento durante las encuestas sobre el paludismo y con la participación comunitaria en la educación sanitaria, permitió controlar eficazmente la enfermedad. Este enfoque podría aplicarse en otras regiones del sur de Viet Nam y proporciona una base sólida para emprender nuevos estudios en otras zonas con distintos modelos epidemiológicos del paludismo.

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