

NEW CHALLENGES FOR MALARIA CONTROL IN NORTHERN VIETNAM

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SUMMARY: In recent years a comprehensive malaria control strategy, including disease management and prevention, was applied in northern Vietnam. This resulted in a quick decrease of morbidity and mortality due to malaria. Currently malaria transmission is low, but epidemics remain a permanent threat. With decreased malaria incidence, acquired immunity will not occur and malaria disease can possibly lead to severe pathology in all age groups. Therefore the next challenge is how to consolidate the obtained results rather than how to further improve the malaria situation. In the present paper problems of diagnosis, treatment, prevention, the information system and the general health system are discussed for the province of Hoa Binh. In recent years, local malaria transmission was nearly eliminated in this province. However, vectors are present and infected migrants can reintroduce malaria transmission at any time. Good case management, surveillance by the basic health structure and vector control are essential to consolidate the current low malaria morbidity. In the long term, it can be expected that the budget for malaria control will be reduced. In order to guarantee sustained results, improved resource management will be required.

KEY WORDS: Malaria, control strategy, northern Vietnam.

INTRODUCTION

In Vietnam, malaria became a priority after specific mortality and morbidity reached alarming proportions in 1991. Consequently, control efforts by the Vietnamese government increased and a Global Malaria Strategy has been applied (WHO, 1993). Simultaneously, foreign donors were asked to support the programme. These efforts lead to a rapid decrease of the problem, particularly in northern Vietnam, where malaria is currently hypo-endemic in most provinces. The main question is how to consolidate these results. A similar low incidence was obtained in the 1980s following massive spraying with DDT, but this situation could not be maintained when the insecticide supply was cut short (AM, 1993). With decreased immunity, malaria disease can possibly lead to severe pathology and death in all age groups. Not surprisingly, malaria is still considered a major health problem by the population.

In the following an overview of the activities of the National Malaria Control Programme is given based on the experiences in the Province of Hoa Binh. This province is one of the 22 northern provinces considered at risk for malaria. It has received additional support from the Belgian government for its malaria control programme from 1995 onwards. The complexities involved and some remaining problems are discussed.

HOA BINH PROVINCE

Hoa Binh province is located south-east of Hanoi and comprises a variety of landscapes: plains, narrow valleys (<100 m), hills and mountain slopes (400 to 900 m) (Fig. 1). Eleven peaks are higher than 1000 m, the highest

being 1373 m. The total surface is 4751 km²; about 75% is mountainous covered with forest. Some 172500 ha are suitable for agriculture. Annual rainfall ranges from 1500 to 2500 mm. Most rain falls from May to October. Average monthly temperatures range from 15° C in January to about 30° C in June. Humidity is very high all year round, the monthly average being rarely lower than 80%.

The Province is divided into 10 districts and contains 211 communes. On average a commune consists of 8 hamlets. The total population is about 700000. Population density of the districts ranges from 51/km² to 206/km². The average population per commune is 3320 inhabitants.

ORGANISATION OF NATIONAL HEALTH SERVICES

The development of the Primary Health Care (PHC) system is the first priority for the Ministry of Health. Its core entity is the Community Health Centre (CHC). Each commune of Hoa Binh has a CHC with 3 or more staff members, trained for several years. Theoretically, 27 inter-communal polyclinics are the first reference centres, but apart from a microscope, diagnostic and therapeutic means are similar to those of the CHC. The real reference centres are the district hospitals and the provincial hospital.

In addition to the PHC system, there are 6 national vertical programmes of which the National Malaria Control Programme (NMCP) is one. Each district has a mobile team which should assist and supervise the CHC staff for the implementation of the different national health programmes.

In 1995, the total health budget of the province amounted to US \$ 1545350 (infrastructure not included),

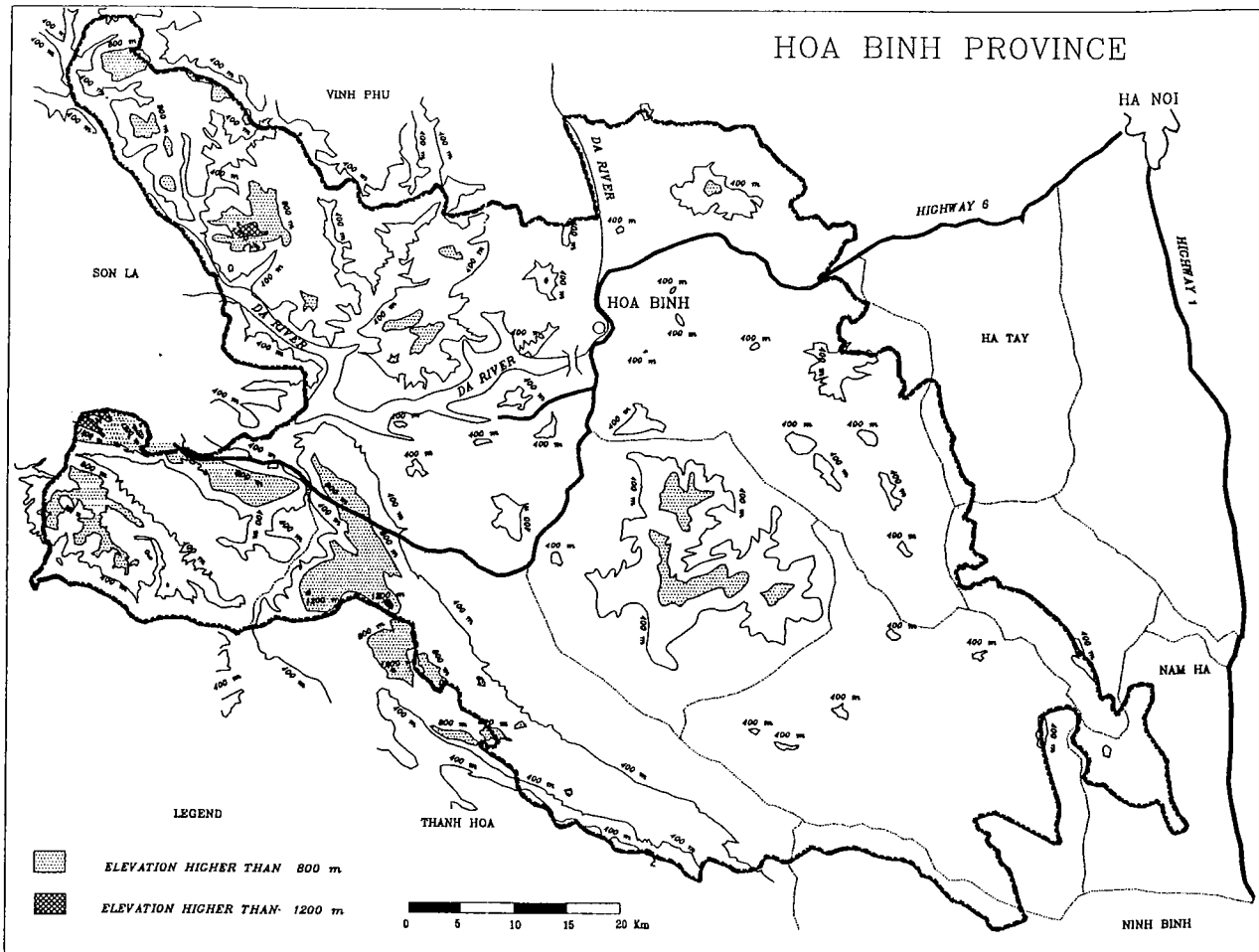


Fig. 1.— Map of Hoa Binh Province in northern Vietnam.

of which US \$ 471650 was granted by the Ministry of Health and US \$ 1073700 (69%) allocated by the Province. This corresponds with a per capita expenditure on health of US \$ 2,2 per year. In 1989, user fees were introduced by the government for various types of health services. Free health care is reserved for individuals who obtain a certificate of indigence from the People's Committees. However, theoretically all malaria control activities are still provided free of charge. With the introduction of a market economy, a private health sector is quickly developing (GELLERT, 1995). Hospital inpatient care is provided by the public sector only.

MALARIA CONTROL ACTIVITIES

The malaria situation in Hoa Binh improved considerably in recent years (Table 1). In 1998, 5439 clinical cases were recorded, which is only 12% of the number reported in 1993. During the same period the overall number of consultations increased (436892 in 1998 compared to 204784 in 1995). In 1997 only 59 out of

35915 slides were found positive for malaria parasites (35 *Plasmodium falciparum* and 24 *P. vivax*). No malaria outbreaks have been reported since 5 years.

The discrepancy between the number of cases and the number of positive slides is due to the definition of malaria. According to national guidelines, each fever case of which the cause cannot be defined should be regarded as a case of malaria and treated as such. Considering the high number of slides taken, the slide results give a much better estimation of the malaria incidence, which currently can be considered as extremely low.

The decline of malaria was reached by a comprehensive approach. It is impossible to say which action was most effective. In short, the following actions were conducted simultaneously.

Case-management

The number of operational laboratories was extended. In 1997, thick film examination for routine diagnosis of malaria was possible in all district hospitals and inter-communal polyclinics, i.e. one checkpoint for about

Year	No. of cases	No. of severe cases	No. of deaths	No. of treatments	No. slides taken	No. of positive slides	No. of outbreaks
1992	32673	328	18	136345	45377	1189	2
1993	46244	917	13	94697	49043	592	1
1994	15669	126	0	78503	34739	258	0
1995	11624	40	0	58566	28955	117	0
1996	8589	15	1	37076	32679	62	0
1997	6772	15	0	19704	37039	57	0
1998	5439	10	0	15607	48330	74	0

Table 1.— Evolution of the malaria indicators in Hoa Binh Province (northern Vietnam) based on the records of the public health services.

19000 people. Traditionally, most slides were taken by mobile teams during semestrial campaigns from subjects without symptoms. A survey in 1995 showed that results of slides taken from patients at CHC level only returned after several weeks, if at all. Not surprisingly CHC staff was not motivated to take slides and most reported cases of malaria were based on clinical symptoms only. Since 1995, CHC staff has been encouraged to take slides from all patients with fever in exchange for quick feed-back of results, in particular when slides are positive. Motorcycles provided to all districts made this possible. The number of slides taken by the CHC rose from 2100 in 1994 to over 14000 in 1997.

In the 1990s the overall stock of anti-malaria drugs has been enlarged. Chloroquine and sulfadoxine-pyrimethamine treatments represented more than 80% of the treatments, but were not always present at the lowest level (1995, unpublished data). Since 1995 improved drug provision and application of national treatment guidelines at all levels has been a priority.

Chloroquine remains the first-line drug for clinical cases and confirmed *P. vivax*. However, all confirmed *P. falciparum* cases are treated with artemisinin or its derivatives.

In addition, national guidelines recommend administering primaquine for 5 days in *P. vivax* infections (to eliminate hypnozoites) and for 1 day in *P. falciparum* infections (to kill gametocytes). All confirmed cases are followed up systematically to obtain a radical cure.

Prevention

Two surveys in 1995 revealed that 90% of the individuals used bednets (unpublished data). Since 1992, impregnation of mosquito-nets with permethrin (0,2 g/m²) has been introduced. A KAP study in 1995 revealed that vector control was very popular: 94% of household-leaders claimed to like spraying and 97% to like impregnation of nets (n = 421). Shortage of insecticides was the main reason why no more people were protected by vector control in the past. The number of people reportedly protected rose from about 100000 in 1994 to about 362000 people in 1997, of which 86% were by impregnation and 14% by spraying. Theoretically, spraying is reserved for epidemics, but because epidemics were absent and the shelf life of these insecticides is only 2 years, spraying

has been part of the routine preventive actions in recent years. In 1996, the total cost for impregnated bednets per person per year amounted to US \$ 0,90 compared to US \$ 0,47 for spraying. The National Malaria Control Programme bears the entire cost of spraying, and only 36% of impregnated nets, because the vast majority of nets are bought by the population (VERLE *et al.*, 1999).

The necessity of specialised staff is often a major constraint for the application of vector control, but this is not a problem in Hoa Binh province. Both residual spraying and impregnation of nets are community-based activities, directly involving CHC staff and villagers under the supervision of competent provincial and district staff. This form of collaboration is a major asset for the sustainability of both methods.

Health education

In 1995, 59% of household leaders questioned knew how malaria is transmitted. Since then, health education activities have been further developed with distribution of posters (40000 in 1997) and training of health educators (100 in 1997).

Surveillance

Special efforts have been made to improve surveillance of malaria. Every confirmed case is thoroughly investigated to understand the origin of infection and to prevent spread.

Graphs of the number of fever cases have been introduced at CHC level; a rise on this graph should result in immediate action. Contacts with networks outside the health system were strengthened (e.g. administration, women's unions, etc.). These contacts proved effective: in recent years several confirmed cases, in particular migrants, have been directed to the health system by administrative authorities.

REMAINING PROBLEMS AND POSSIBLE SOLUTIONS

A flare-up of malaria transmission in Hoa Binh province is still possible. Ninety-three percent (55/59) of the

persons with confirmed malaria detected in 1997 had recently stayed in provinces of central and southern Vietnam where endemicity of malaria is still relatively high. *Anopheles minimus*, the main malaria vector, and suspected vectors such as *A. aconitus*, *A. jeyporiensis*, *A. vagus*, *A. maculatus* and *A. sinensis*, are widespread in the province almost all year round (HINH *et al.*, 1997). It seems therefore prudent to presume that malaria transmission could occur at almost any time of the year.

Active detection is needed to control the problem of travelling and migration. In 1997, nearly half of the confirmed cases (25/59) were recorded among individuals who had returned to their home village on the occasion of the Vietnamese New Year. In 1997 local transmission was detected in a forestry exploitation site where hundreds of people from different provinces occasionally work together for a few weeks only. This forest area was not covered by the national health system, since officially nobody lives there.

With malaria under control, most likely a budget cut for the NMCP from the government and withdrawal of foreign aid may be expected in the future. A resurgence of malaria disease with dramatic consequences, as occurred at the end of the 1980s when DDT spraying was strongly decreased, is then to be feared. This is reminiscent of the spectacular example of a similar evolution observed in Sri Lanka. Residual spraying reduced malaria incidence from around 500000 cases per year to just 17 cases in 1964, of which 11 were imported. Consequently spraying was abandoned, but in 1967 malaria came back to epidemic proportions, leading to over

500000 cases reported in 1969 (WIJESUNDERA, 1988; SCHOFIELD, 1991).

Therefore operational research, improved resource management and rationalisation are essential in the coming years. An overview of the most pertinent issues studied in northern Vietnam has been listed in Table 2.

Case-management

Diagnosis of malaria at the CHC level continues to be based on clinical symptoms only. A slide should be sent to a polyclinic or hospital for confirmation. Theoretically, introduction of microscopes at CHC level and training of one CHC staff member as a lab technician is possible. However, with a positive slide rate of < 2/1000, even fully trained laboratory technicians need to be retrained regularly. Continuous negative results lead to discouragement. Pressure from patients and colleagues to provide positive results may be expected. Hence CHC technicians with limited training would have to be supervised and encouraged continuously. This would require much more extra effort than improving feedback from reliable reference centres.

An alternative could be the use of dipsticks, which are relatively easy to use and which do not require a lot of material (SHIFF, PREMJI & MINJAS, 1993). However, they are more expensive (US \$ 1,5) than most complete adult treatments and cannot be used for the detection of *P. vivax*. Hence even if the test is negative, a chloroquine treatment would still be indicated. Systematic use of such a dipstick in all fever cases cannot be justified when malaria incidence is low (VERLE *et al.*, 1996a). However dipsticks do have a potential to quickly detect a *P. falciparum* epidemic in the field.

When malaria cannot be excluded, treatment of fever cases with antimalarial drugs is justified. Some over treatment cannot be avoided, but 21990 treatments compared to 59 positive slides in 1997 was still extremely high. The majority of these antimalaria treatments (64%) was given to individuals without symptoms, mostly by mobile teams during the 6-monthly vector control campaigns (55% in 1997). With current low transmission, these preventive treatments cannot be justified anymore. However the overall number of treatments is decreasing rapidly (see Table 1).

In the present strategy, radical cure of all patients with parasitaemia is the objective.

However, high levels of resistance of over 50% of *P. falciparum* infections to both chloroquine and sulfadoxine-pyrimethamine, the first-line drugs, have been reported in northern Vietnam (AM, 1993; SY, 1995). Whether and when chloroquine and sulfadoxine-pyrimethamine should be abandoned is a pending question. However, the low cost of the drugs (US \$ 0,1 to US \$ 0,15) is an important asset considering that more than 99% of treated subjects in Hoa Binh province are not infected with malaria and that there are indications that treatment with these drugs, even of resistant malaria, can avoid mortality (HOFFMANN *et al.*, 1984; VERLE *et*

Field	issues studied or followed up
Population	improved identification of population currently at risk behaviour and habits of population
Vector	classification of sibling species of <i>A. minimus</i> behaviour of sibling species of <i>A. minimus</i> <i>Anopheles</i> species responsible for transmission
Diagnosis	suitable diagnostic tools or criteria for CHC level
Treatment	levels of drug resistance follow-up of treatment failure how to limit unnecessary drug use
Prevention	cost-effectiveness of spraying and impregnation resistance of mosquitoes to insecticides development of an evaluation tool for vector control
Epidemics	insight into causes of epidemics
Health System	rationalisation of programme at provincial level involvement of private sector in control activities suitable health education activities

Table 2.— Overview of the most pertinent issues studied which could influence malaria control activities in northern Vietnam.

al., 1996b). In Vietnam *P. vivax*, amounting to half of the confirmed cases, has never been reported to be resistant to chloroquine. Disadvantages of artemisinin and its derivatives are their relatively high cost (US \$ 1,0 for a 5 day treatment), bad compliance and early recrudescence (HIEN & WHITE, 1993; LUXEMBURGER *et al.*, 1994).

Prevention

Criteria used to define the population at risk have been based on previous occurrence of malaria in the commune, previous epidemics and the presence of potential vectors. This explains why the population considered at risk is increasing over the years while prevalence of malaria is decreasing.

Theoretically the number of persons using bednets is very high. However nets are rarely taken outside the village. The amount of available insecticides in recent years was sufficient to protect the total population considered at risk. If the amount of insecticides is reduced, it would seem sensible to reserve vector control to more remote areas. In those areas, surveillance is usually less developed, but even if surveillance were excellent, some delay between the beginning of a malaria outbreak and an adequate reaction is unavoidable in those areas. Sustained vector control in these remote areas could compensate this risk.

Currently, monitoring of impregnated bednets and the number of people protected is limited to reports of health staff and questioning bednet users. A field test for measuring insecticide concentrations on impregnated bednets is not presently available. A modified Beilstein method for detecting pyrethroids on bednets is under evaluation (MULLER *et al.*, 1994; VERLE *et al.*, 1998).

A. minimus bite preferably at night when people are presumed to be under the nets (HINH *et al.*, 1997), but human behaviour and environment are changing rapidly. With increasing night activities (e.g. watching television), it could well be that the efficacy of bednets will decrease. Development of resistance to permethrin may also impair the efficiency of this control activity.

Recently it was shown that in the area two sibling species of *A. minimus* occur in sympatry. Their dissimilar resting and biting behaviours in relation to vector control should be further investigated (VAN BORTEL *et al.*, 1999).

Health Education

Considering reintroduction of malaria as a permanent threat, a first objective is to sustain vigilance. Health education should be adapted to different target groups (including migrants) and to the present situation of low transmission. Health education in schools should also be ensured, in particular because the new generation will not be familiar with malaria if present results can be maintained.

Evaluation of the control programme

In recent years, cross-sectional studies were regularly organised to measure traditional indicators of the programme, such as the proportion of positive slides (PSR) and prevalence of splenomegaly. These activities require considerable effort but provide limited information. In 1995, 9 (0,2%) subjects had positive slides and spleens were palpable in only 22 (0,5%) subjects out of 4000 subjects examined during 2 surveys. It is obvious that in current circumstances other indicators are needed to evaluate results of the malaria control programme.

Health system

Adequate surveillance by CHCs should assure quick detection of a changing situation. However the PHC network does not operate to its potential, in particular in remote areas where malaria is most likely to reappear. The number of contacts/person/year in the PHC system rose from 0,24 in 1994 to 0,5 in 1997, but remains low. Accessibility (limited roads in bad condition, CHC health staff not always available) and quality of care are poor. Improving the overall quality of the health services and consequently surveillance should be the priority.

CONCLUSION

Undoubtedly, malaria control in Hoa Binh province has been successful in recent years. Prevention of mortality and reduction of morbidity were achieved. The exact incidence of infection is unknown but is definitely low. With the funds foreseen for the following years, there are reasons to believe that the downward trend can continue in the following years up to the point that malaria is no longer a public health problem.

Currently, the malaria situation in Hoa Binh Province is better than in most other provinces. However a similar scenario is expected everywhere in northern Vietnam. For the next years several big foreign aid projects will contribute to a much more important budget for malaria control than ever before, justifying high expectations. Improved case management and surveillance by the basic health structure and extension of vector control should result in a continuous decrease of malaria in the region. However it will be impossible to sustain the obtained results if no suitable strategies are available when means become more limited.

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