

# POSTINJURY MALARIA: EXPERIENCES OF DOCTORS IN BATTAMBANG PROVINCE, CAMBODIA

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**Abstract.** Quantitative studies indicate that one-third of trauma victims in malaria endemic areas of Cambodia develop postinjury malaria. The main aim of this study was to assess the medical significance of the complication. All local doctors with trauma care surgical experience in the Battambang Province of Cambodia were interviewed regarding their experiences with postinjury malaria (n = 18). The qualitative data were processed according to the Editing Style Analysis method. In the study area, postinjury malaria has been a well-known complication to trauma doctors for years. Local doctors claim that the complication is more common in severe as compared to moderate trauma. The complication is reported to adversely affect the general condition of trauma patients, increasing the risk of wound infections, and delaying postoperative recovery. It was found that the informants draw exclusively on personal clinical experience regarding this clinical knowledge, asserting that postinjury malaria is not taught at local medical schools. The study indicated that post-injury malaria is a significant complication to trauma where falciparum malaria is endemic. The knowledge of postinjury malaria in the study area seemed to be non-institutional; the informants' assessments were exclusively based on their personal clinical experience.

## INTRODUCTION

Where malaria is endemic, it is possible that populations are also hit by "the epidemic of trauma" (Krug, 1999). In a recent retrospective study the authors reported that one third of trauma victims in Cambodia develop postinjury symptomatic malaria, mainly of the falciparum type (Husum *et al*, 2002). Rates of postoperative symptomatic malaria from 6% to 50% are also reported from Kenya (Gakuu, 1997), Burkina Faso (Diako *et al*, 1994), Cameroon (Takongmo *et al*, 1993), and Sudan (Alla *et al*, 1996). One may speculate that postinjury immunodepression-initiated by tissue injury, hemorrhage, and surgery-causes susceptibility to symptomatic malaria in carriers of the parasite. The problem therefore is most pronounced if the physiological capacity of the trauma victims is weaker. To the best of our knowledge, the problem of postinjury malaria is not discussed in textbooks, and there are few reports on the impact of symp-

tomatic postoperative malaria in trauma victims.

The study was conducted in Battambang Province, Cambodia, in districts where falciparum malaria is endemic, where the majority of the population suffers from poverty and malnutrition, and where land mine injuries are common and evacuation of trauma victims protracted. Medical documentation was not systematically filed at the district hospitals of the study area. In order to get at a better understanding of the complication, we therefore conducted a qualitative study based on local doctors' assessments. A second aim of the study was to find out if there is a "gap" between medical science and practice when it comes to the seemingly considerable problem of postinjury malaria: is this relevant knowledge part of the medical curriculum in Cambodia, or is the medical management of the problem based on the informal knowledge gathered in the grassroots network of health workers?

## MATERIALS AND METHODS

The study was conducted in Battambang Province in northwestern Cambodia. We interviewed all the surgeons (n = 18) working in the four surgical hospitals of the province. Some surgeons might have been temporarily absent

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and therefore not included, but these were few. The informants were local doctors, all of whom had more than ten years of experience in trauma care in various parts of the province. In the study area, the endemicity of multi-resistant falciparum malaria has remained high for years (National Malaria Center, Phnom Penh, personal communication). The majority of the informants ( $n = 11/18$ ) had been trained by Khmer Rouge surgeons, themselves also trained in the Chinese school of medicine. The other informants had been trained at Phnom Penh University in the French medical tradition.

The hospitals of Battambang Province follow the treatment standards of the National Malaria Center in Phnom Penh (National Malaria Center Phnom Penh, 1999). Postinjury malaria is defined as symptomatic malaria within ten days after injury, diagnosed either on clinical grounds by experienced doctors or by blood smear microscopy. Severe malaria is defined as symptomatic malaria plus one of following signs: disturbed consciousness, convulsions, fever higher than 39°C, anemia, icterus, vomiting/dehydration, or hemoglobinuria.

The data gathering was done at the informants' workplaces, starting with semi-structured interviews in which some questions were illustrated with cartoons. The translators were medically trained, but not certified translators. Data were also gathered from one focus group involving all doctors and medics at one of the district hospitals in the catchment area. The focus group discussion was conducted in Khmer language and later translated into English. The individual interviews lasted for 1-1.5 hours and were taped before being transcribed by the authors. During the in-field study period, the team, including translators, continuously discussed and roughly coded the transcripts to identify possible elements of meaning. Therefore, new elements were added to the questionnaire, and the informants were re-interviewed. For example, all informants initially gave their opinions regarding the impact of postinjury malaria on individual patients, most of them claiming that the complication protracted recovery. However, some informants held that the main reason for delayed healing was malaise, while others claimed that bacterial wound infections were the main problem. Therefore, malaise/nutrition and wound care/wound infec-

tion became themes for further interviews and focus group discussions until a "saturation" of information was achieved.

We used editing (database) analysis style to analyze the qualitative data (Malterud, 1996, 2001). Editing analysis is a method for reorganizing the study text to get a clearer view of the underlying meanings (Soederlund *et al*, 2000). Having identified the main elements of meaning during the in-field discussions, we used the computer program *Open Code* (Umeaa University, 2001) to process and reorganize the text according to the substantive themes: epidemiology, etiology, signs and symptoms, clinical impact, treatment, as well as the doctors' sources of knowledge about the matter. The codes were standardized in all files according to the element under analysis in order to ensure inter-code reliability. Then, abstracted meaning units, for example, "it's the poor people who get malaria," were compared again with the original transcripts to consider rival explanations and coding.

## RESULTS

### Epidemiology

The informants' estimates of the actual prevalence of postinjury falciparum malaria in the study hospitals ranged from 10% to 80%. All informants agreed that the risk of developing postinjury malaria depended on the pre-injury location of the patient; poor patients from high endemic areas were consistently said to carry higher risk for postinjury symptomatic malaria as compared to "city people." Informants from one district hospital, close to the Thai border, claimed that almost all of the trauma patients from "the forests" (meaning patients who live in makeshift villages inside the jungle) develop postinjury malaria as compared with those living in the local town: "It's the poor people who get malaria. The rich people don't go to the Thai-border." All informants agreed that the overall prevalence of postinjury malaria was higher some years ago. One reason for the decreasing prevalence was said to be the recent national campaigns that included distribution of repellent-impregnated mosquito nets for the population in high-risk areas. However, several informants claimed that poor people working and sleeping "in the forests" do not get mosquito nets.

### Symptoms and complications

Although symptomatic falciparum malaria was said to be common after trauma surgery, the informants agreed that postinjury malaria of the severe type was rare; most informants had seen only a few cases. They claimed that delayed diagnosis and treatment of symptomatic postoperative malaria could provoke severe malaria, such as cerebral malaria, icterus, or black-water fever-especially so if the patient is "weak." All informants said that postinjury malaria had adverse effect on the patients' general condition. Even with the non-severe type, the patients with the complication would suffer more from pain - general muscle pain, spasms, and headache - compared to patients without the complication. Several informants said that pain caused sleeplessness and depression: "They are more depressed because they can't move and eat because of fever and pain. With only one trauma, and no malaria, they can walk and eat". It was generally agreed that postinjury malaria, also in non-severe cases, caused anorexia. This nutritional problem was held to be a main cause of protracted recovery because many trauma victims were poor and suffered from pre-injury malnutrition. The main adverse effect of post-injury malaria was said to be increased risk of bacterial wound infections with delayed wound healing. This was particularly emphasized by the doctors in former Khmer Rouge areas close to the border, all of them with extensive hands-on trauma experience. Several informants speculated that anemia could be the main reason for infection, the malaria relapse causing hemolysis that aggravated the post-traumatic anemia. Almost all informants agreed that the trauma patients with malaria had to stay for a longer time in the hospital compared with patients without the complication. Since most trauma victims were young and middle-aged males from labor-intensive household economies, protracted recovery was said to have severe impact also on the actual families' income.

### Etiology

Most patients with postinjury malaria develop symptoms within one to five days after the injury. As the incubation time of the *Plasmodium falciparum* is 15 days, all informants held that the probable reason for the complication was

post-traumatic immunodepression in semi-immune parasite carriers: "The more severe injury, the higher is the risk". Reasons for the immunodepression were said to be the injury itself, and blood loss. The informants said that it could be difficult to differentiate, on purely clinical grounds, between fever from postoperative bacterial infection and from malaria. One informant said:

Previously we assumed that the postoperative fever came from the wound infection, so we treated them with antibiotics. But, despite this treatment, the patients still had fever and the wound did not heal. It took a long time to treat these patients because we didn't know this problem with malaria at that time.

### Treatment

Despite having seen few cases of severe postoperative malaria, all informants emphasized that it was important to start the treatment with antimalarials early. One doctor from a forest hospital said that even a delay of five hours could be crucial. If the diagnosis and treatment were delayed, simple symptomatic malaria could develop into severe and complicated malaria within hours. The informants from Khmer Rouge districts claimed that during wartime, without microscopes and short of antimalarial drugs, as many as 20-30% of trauma patients would die from severe postinjury malaria. All informants agreed that when malaria was diagnosed and treated early, a patient would probably survive postoperative complications and not develop severe postinjury malaria. Some informants recommended blood screening and the start of antimalarial treatment in all parasite carriers immediately after the injury.

### The source of knowledge

All informants said that their knowledge of postinjury malaria was based exclusively on personal clinical experience: "This knowledge don't come from the books, but from experience. In the university they teach about trauma and malaria separately." Also, the doctors who were trained "in the jungle" by Khmer Rouge surgeons during the war confirmed that their knowledge

had been acquired by hands-on clinical experience:

In the past, patients with malaria and wounds were very difficult to treat and we used to fail. We didn't think about the postinjury malaria then. We had no microscopes, and had to look for the signs and symptoms after the operation. We could not know if complications were due to malaria. Now we take a blood smear immediately when the trauma victims arrive in the clinic.

## DISCUSSION

The study strongly suggests that postinjury falciparum malaria in semi-immune parasite carriers is a significant medical problem in the study area, and this supports the results of previous quantitative studies conducted by our team (Husum *et al*, 2002; Sundet *et al*, 2004). However, the assessments of the clinical impact of the complication differ among the informants, depending on the location of their practices. All doctors agreed that the complication affects the general condition of trauma patients and delays recovery. However, the Khmer-Rouge-trained informants (KR group), more than the university-trained doctors, emphasized the correlation between postinjury malaria, anemia, and wound infections. This divergence of opinions may be due to differences in their medical backgrounds. The KR doctors had been trained by teachers belonging to the "barefoot doctor" tradition. During the wartime they worked in makeshift clinics in the rural area, now they ran district hospitals located in areas with high malaria endemicity. Unlike these KR doctors, the university-trained informants were all working in hospitals in Battambang City where falciparum malaria is not endemic.

Some methodological problems need to be addressed. First, this study builds on the experiences of two previous quantitative studies in Cambodia (Husum *et al*, 2002; Sundet *et al*, 2004). We are aware that preconceptions based on quantitative analysis may have colored our approach to gathering and analyzing qualitative data. On the other hand, the decision to carry out the qualitative study was a direct result of

the shortcomings in the quantitative analysis. We could document quantitatively that there was a link between trauma, trauma surgery and postoperative malaria, but we could not understand the nature of that link, other than to speculate that postinjury immunodepression might be the foundation. Also, there were few clues to be found in published experimental and clinical research reports on trauma/blood loss and malaria. Our explicit starting point, when we designed the actual study, was therefore to be wide open to any suggestions from colleagues who had hands-on experience in the study matter. We therefore hold that the combination of qualitative and quantitative methods—the triangulation of data—has been particularly useful in the exploration of a seemingly neglected medical problem. As a direct consequence of this study, we have launched a prospective clinical study on the early in-field introduction of antimalarials to trauma patients with falciparum parasitemia.

Second, the language barrier made it necessary to use interpreters during the individual interviews (focus group discussions ran without interruptions). Translation involves several problems, one is the "*entfremdungs* effect" when the informants do not relax and speak freely. We tried to compensate for this problem by doing all interviews in the informants' workplace. In addition, the translators (Heng and Rattana) knew all of the informants well. They were thus able to keep the communication at the "buddy level," creating an atmosphere of mutual trust and understanding where the informants openly shared their ideas and recounted the problems from their own medical practices. The expatriate members of the research team were both well acquainted with the informants through the previous studies, and had a reputation of being good listeners. All in all, we felt that the informants spoke freely during the one-to-one interviews as well as focus group discussions.

Third, the interpreters were medical teachers and supervisors of a local trauma system (Trauma Care Foundation Cambodia, TCF). Most of the informants were actually their staff members and had a close personal relation to the interpreters. This relation gave us ready access to data collection. On the other hand, did the informants know well that TCF and The National Malaria Center in Phnom Penh planned a post-

injury malaria program that included an upgrading of diagnostic tools at the local hospitals? It may have been the case that the informants, particularly those working at poorly equipped district hospitals, may have exaggerated the problems related to postinjury malaria in order to please their supervisors and gain benefit for their hospitals. However, the lively medical discussions during the focus group discussion, and the unanimous agreement on the reduced prevalence of postinjury malaria indicated that this bias did not seriously affect the reliability of the data.

Fourth, cross-cultural research always includes the risk of conceptual confusion. Terms like "fever", "pain" and "depression" do not necessarily carry the same meaning in the European and Khmer medical traditions. The translators were "village boys" themselves, knowing the local popular medical terms, and had later been trained by teachers belonging to the Western medical tradition. By continuous, careful discussions among the members of the research team ("what does this really mean?"), the risk of terminological misunderstanding in translation of questions and information was reduced to a minimum.

In conclusion, in the areas where falciparum malaria is endemic, postinjury malaria seems to be a common complication after trauma. The complication is normally not fatal if treated on early indications, but it is reported to increase the risk of wound infection and considerably delay recovery after surgery. Postinjury malaria thus seems to increase the burden of the trauma on the patient and the patient's family. Similar studies should be conducted to find out if our results are also valid for other countries and populations suffering from falciparum malaria. This study suggests that one should try to find ways of preventing the complication. Acting on this conclusion, in cooperation with the Cambodian National Malaria Center, the authors are currently conducting a prospective clinical study on the effects of early in-field antimalarial treatment for injured falciparum carriers. The results will be reported.

The study also suggests that the knowledge of postinjury malaria is non-institutional and seems neglected by the medical educational institutions. In a country so severely affected as Cambodia, the insight and quality of treatment

is so far seemingly based only on the rural doctor's personal experiences.

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