CLINICAL DIAGNOSIS OF UNCOMPLICATED MALARIA IN SRI LANKA

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Abstract. To assess the possibility of developing a protocol for the clinical diagnosis of malaria, a study was done at the regional laboratory of the Anti-Malaria Campaign in Puttalam, Sri Lanka. Of a group of 502 patients, who suspected they were suffering from malaria, 97 had a positive blood film for malaria parasites (71 *Plasmodium vivax* and 26 *P. falciparum*). There were no important differences in signs and symptoms between those with positive and those with negative blood films. It is argued that it is unlikely that health workers can improve on the diagnosis of malaria made by the patients themselves, if laboratory facilities are not available. For Sri Lanka the best option is to expand the number of facilities where microscopic examination for malaria parasites can take place.

INTRODUCTION

Malaria control strategies have changed considerably over the years from an eradication strategy to a more realistic control one today. Early diagnosis and prompt treatment has now become an important facet in the control strategy (WHO, 1993). As many rural areas in which malaria is endemic lack basic diagnostic laboratory facilities, treatment can only be prompt if it is provided after a presumptive diagnosis, which is based on clinical signs and symptoms. Results of studies that have investigated the process of clinical diagnosis have been inconsistent. In Nigeria, presumptive diagnosis of malaria in children by physicians at a university hospital was correct only 30% of the time (Sowunmi and Akindele, 1993). In Niger, almost half of the presumptive diagnoses made by clinic personnel were correct in the high transmission season, as compared to less than 5% in the low transmission season (Olivar *et al,* 1991). Another study in the same country showed that high fever of short duration and with no other obvious cause that occurred during the high transmission season was most likely to be due to malaria (Rougemont *et al,* 1991). In Zimbabwe, 10-30% of patients treated for malaria by health workers on the basis of clinical symptoms actually had malaria parasites on blood slide examination. No symptom or combination of symptoms could be found to improve the reliability of the clinical diagnosis (Bassett *et al,* 1991). In a highly malaria endemic area in the Philippines the combination of fever, chills and sweating were predictive of malaria (Gomes *et al,* 1994). All these studies were done in areas endemic for *Plasmodium falciparum,* where malaria is a cause of high childhood morbidity and mortality. Malaria transmission in Sri Lanka is unstable and mainly caused by *P. vivax.* Unlike the situation in Sub-Saharan Africa where there are many truly asymptomatic infections, the majority of patients in Sri Lanka who harbor the parasite will experience clinical disease. Although mortality due to malaria is relatively low, the morbidity is high with 363,197 infections being reported in 1993 (Ministry of Health and Women's Affairs, 1994), based on microscopic examination of blood films, in a population of aproximately 10 million living in endemic areas. A large number of health care facilities (both government and private) in the rural areas of Sri Lanka where malaria is endemic do not have laboratory facilities. It is estimated that 300,000 to 400,000 patients, additional to that reported by the Anti-Malaria Campaign (AMC) receive treatment for malaria based on a clinical diagnosis.

An important piece of information that is often neglected in the diagnostic procedure is the patient's opinion. It is likely that if a patient has had malaria before, he/she may be in better position to diagnose malaria as he/she has had first hand experience of the disease process. We report on a study in a group of patients who suspected themselves of having malaria. The study was undertaken to assess the possibility of developing a protocol for the clinical diagnosis of malaria under Sri Lankan conditions in the absence of laboratory facilities.

MATERIALS AND METHODS

The study was conducted at the regional laboratory of the AMC in the Puttalam District of Sri Lanka. The district had an estimated mid-year population of 615,000 in 1994. The AMC Directorate of the Ministry of Health maintains 7 diagnostic laboratories in the district, of which 6 are in government hospitals. The 7 laboratories in the district reported 23,225 malaria cases in 1994 of which 73% were due to *P. vivax* and 27% due to *P. falciparum*. The other 30 government hospitals and dispensaries in the district did not have laboratory facilities for blood film examination for malarial parasites. The regional laboratory of the AMC is the main diagnostic and treatment facility for malaria in Puttalam town, situated 130 km north of the capital Colombo. The regional laboratory is in a separate building and is not attached to any hospital. Other treatment facilities for malaria in Puttalam town are offered by the local government hospital (Base Hospital Puttalam) and by private clinics. There were four private laboratories in Puttalam town that perform microscopy. Chloroquine was readily available at local pharmacies, but unlike the situation in many other countries hardly any patients in Sri Lanka would opt for self-treatment of malaria. Diagnosis and treatment at the AMC facilities and at the government hospitals was free of charge. It is well known to the local population that the regional laboratory provides treatment only to malaria patients. For treatment of any other health problem one has to go to the out-patient department of the Base Hospital. The group of patients that visit the regional laboratory is therefore self selected in some sense as they suspect themselves of having malaria. All patients who visit the regional laboratory are bloodfilmed irrespective of the signs and symptoms they have. Thick blood films are stained with Giemsa and examined by a trained microscopist. Results are given as positive for *P. vivax* or positive for *P. falciparum*. A slide is classified as negative after examination of 100 microscopic fields. Positive cases receive radical treatment with chloroquine and primaquine for both parasite species. No treatment is given when the blood film is negative, and these patients have to find treatment or advice elsewhere.

For the study the above routine was maintained, and all patients attending the regional laboratory on 21 days between March and May 1995 were interviewed using a structured, pretested questionnaire. Information on basic demographic data and clinical signs and symptoms of the current illness was obtained through the questionnaire. Each sign and symptom was given a score depending on its severity with 0 corresponding to it being absent, 1 if it was mild, 2 if it was moderate and 3 if it was severe. The questions relating to clinical signs and symptoms have been validated and are widely used by the Malaria Research Unit, University of Colombo (Karunaweera, 1993). Axillary temperature was measured using a digital thermometer. No other physical examination was done. Interviews took place while the patient was waiting for the result of the blood film examination. For each clinical sign and symptom sensitivity, specificity, positive predictive value and odds ratios were calculated. In addition, logistic regression was used to identify which combination of clinical criteria were useful to predict malaria.

RESULTS

A total of 502 subjects were enrolled in the study. Average age was 18.1 years with an equal number of males and females. There were 97 patients with a positive blood film (71 *P. vivax*, 26 *P. falciparum*). Children below 15 years of age were more likely to have a positive blood film than adults [odds ratio (OR) 2.26, 95% confidence interval (CI) 1.39 -3.67]. No clear pattern emerged from the signs and symptoms that were considered in the study (Table 1). This did not change when severity of the signs and symptoms was considered rather than only their presence or absence. Only presence of vomiting and absence of back pain were significant predictors of malaria in the univariate analysis. In the multivariate analysis presence of severe shivering also emerged as a predictor of malaria (OR 2.74, CI 1.22 - 6.13). Absence of back pain was only of borderline significance in the multivariate analysis because the relation with malaria was confounded by age (back pain was generally not reported for children). All patients had a history of fever but only 27% of patients with malaria parasites had a temperature > 37.5°C at the time of diagnosis. The longer the duration of the fever the less likely that it was caused by malaria (chi-square test for trend, $p = 0.013$). Fever of more than a week duration was very unlikely to be caused by malaria.

Table 1

Symptoms and signs in a group of 502 patients with a history of fever, seeking diagnosis and treatment at the regional laboratory of the Anti-Malaria Campaign in Puttalam, Sri Lanka.

	Prevalence[1]	Sensitivity[2]	Specificity[3]	PPV[4]	OR[5]	95% CI for the OR
Headache	94	97	7	20	2.33	0.66-9.82
Muscle pain	70	64	28	18	0.69	0.42-1.14
Joint pains	72	67	26	18	0.73	0.44-1.21
Shivering	38	42	63	21	1.21	0.75-1.96
Feeling cold	78	81	22	20	1.27	0.70-2.32
Sweating	75	75	25	19	1.00	0.58-1.72
Anorexia	64	61	35	18	0.83	0.51-1.34
Nausea	42	50	60	23	1.52	0.95-2.43
Vomiting	30	39	72	25	1.68	1.03-2.74
Abdominal pain	34	30	66	17	0.83	0.50-1.37
Diarrhea	25	27	76	21	1.17	0.69-2.00
Fatigue	70	67	30	19	0.86	0.52-1.41
Breathlessness	43	36	55	16	0.70	0.43-1.13
Chest pain	40	34	59	17	0.74	0.45-1.21
Back pain	46	31	50	13	0.45	0.28-0.75
Cough	65	62	35	19	0.87	0.53-1.40
Earache	18	16	82	18	0.90	0.47-1.68
Temp > 37.5°C	22	27	79	24	1.40	0.81-2.40

[1] the percentage of patients who had the sign / symptom.
[2] the percentage of patients with malaria (positive blood slide) who had the sign / symptom.
[3] the percentage of patients without malaria (negative blood slide) who did not have the sign / symptom.
[4] positive predictive value: the percentage of those with the sign / symptom who had malaria.
[5] odds ratio: the odds of having the sign / symptom among the patients with malaria divided by the odds of having the sign / symptom among the patients without malaria.

DISCUSSION

Among patients presenting themselves with fever at a malaria diagnostic center, there was no difference in the severity of clinical disease between malarious and non-malarious patients. Vomiting, severe shivering and absence of back pain were significant predictors of malaria in this group of patients but the predictive values of these symptoms were low due to their low prevalence. Although it has been reported before that shivering (Gomes *et al,* 1994) and vomiting (Genton *et al,* 1994) are important symptoms of malaria, it is unlikely that these could be used as guidelines for a clinical diagnosis of malaria, based on a clinical fever protocol. The patients in the decision process to find treatment for malaria already use important symptoms such as history of fever and headache. These symptoms are therefore not useful anymore for health workers to discriminate between malaria and non-malaria. The criteria used in this study to diagnose malaria on clinical grounds did not include a physical examination. Splenomegaly and anemia were helpful in identifying children with malaria in Malawi (Redd *et al,* 1996). Health workers who have not had a formal training in performing physical examinations routinely carry out treatment for uncomplicated malaria, which is the commonest mode of presentation in Sri Lanka, on an outpatient basis. Therefore, as it would not be of practical importance we did not consider physical examinations in the criteria enumerated.

The regional laboratory and the government hospital are located at 3 km from each other and are

on the main bus routes of the area. Both provide free treatment and the selection of which facility to visit is at the sole discretion of the patient him/herself. As the local population is aware of the fact that the regional laboratory provides diagnosis and treatment only for malaria, it is reasonable to assume that the group of patients visiting the regional laboratory is a self-selected population wishing to confirm a self-diagnosis of malaria. The approach we have adopted in this study is a case-control approach in which a case was defined as a patient having a positive blood film for malarial parasites. Blood film results became available after the questionnaire data were obtained. Such a last-minute diagnosis is a way to avoid selection and information bias (Miettinen, 1985). There is however a possibility that some cases may have been misclassified as controls *ie,* having negative blood films, in instances where the parasitemia was low. All slides were examined by a senior microscopist of the AMC and 100 fields were examined thoroughly before classifying patients as negative. Therefore, we feel that if such a misclassification had occurred it would have been only of minor importance.

Given the presenting symptoms of malaria, their duration and severity, in Sri Lanka, we conclude that clinical diagnosis is not a reliable method for diagnosing malaria in Sri Lanka. If clinical diagnosis is used to diagnose malaria in Sri Lanka, then anti-malarials should be prescribed to all fever cases or patients who claim to have malaria. We do not recommend such an action given the level of endemicity, and morbidity and mortality patterns of malaria in Sri Lanka as it would lead to gross overtreatment as well as contribute to drug pressure and associated drug resistance. We suggest that diagnosis of malaria in Sri Lanka should be based on microscopy and that appropriate steps should be taken to provide such a facility even in the most remote areas of the country.

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