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Relationships Between Fever, Malaria and Hiv Infection in a Semi-Urban Community in Southwestern Nigeria

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Abstract: Malaria and HIV infection are two of the most important infectious diseases in the tropics. Both are associated with fever but there are conflicting reports about them. There are reports suggesting that fever in malaria endemic area is clinically over-diagnosed due to the prevalence of HIV infection. In order to determine the relationship between fever, malaria and HIV infection a cross-sectional study was carried out from November, 2005 to July, 2007 in Iwo community, Southwestern Nigeria on 1688 non-pregnant adult individuals. Out of these individuals, 1020 presented with fever or history of fever while 668 were apparently healthy. Both malaria parasite and HIV tests were performed on all the blood samples collected. Thick blood films stained with 3% Giemsa were examined microscopically for malaria parasite and HIV testing was done using Capillus, ELISA and Western blot methods. Chi-square test was used to determine associations and a p-value < 0.05 was considered significant. Six hundred and seventy-one (65.8%) and 18 (1.8%) of the fever patients were positive for malaria test and HIV test respectively while 141 (21.1%) and 7 (1.1%) of the control subjects had malaria infection and HIV infection respectively. There was a significant association between fever and malaria parasitaemia ($\chi^2 = 325$; df = 1; $p < 0.05$) but there was no significant association between fever and HIV infection ($\chi^2 = 1.52$; df = 1; $p > 0.05$). There was a significant association for co-infection with HIV and malaria parasitaemia ($\chi^2 = 5.86$; df = 1; $p < 0.05$). In this malaria endemic area, fever is highly predictive of malaria and co-infection with malaria parasites and HIV is significant.

Key words: Fever · Malaria parasitaemia · HIV infection · Co-infection

INTRODUCTION

Malaria and HIV are among the two most important global health problems of our time. It is estimated that about 40 million people are living with HIV globally [1] and there are 350-500 million clinical malaria episodes annually [2]. Together, they cause more than 4 million deaths a year. Malaria accounts for more than a million deaths each year, of which over 80% occur in tropical Africa, where malaria is the leading cause of mortality particularly in children under five years of age [3]. Constituting 10% of the overall disease burden, malaria places a substantial strain on health services and costs Africa about US$12 billion in lost production each year [3]. Sub-Saharan Africa is also home to an estimated 25 million adults and children living with HIV/AIDS [1]. In 2003, HIV claimed the lives of some 2.2 million people in Africa and over 600, 000 children were newly infected with the virus [4]. By taking its greatest toll on people in the prime of their working and parenting lives, HIV hinders sustainable development in Africa [3].

Owing to the overlapping distribution of HIV and malaria, interactions between them is likely. However, studies have shown conflicting reports [3, 5-8]. Fever or a recent history of fever has traditionally been considered sufficient evidence for prescribing antimalarial therapy [9]. The WHO and the UNICEF have incorporated this approach of presumptive diagnosis of malaria in children less than 5 years of age in their algorithms for the Integrated Management of Childhood Illness (IMCI) [10] but not in that of adults.

Some researchers are of the view that malaria is excessively misdiagnosed in some parts of sub-Saharan Africa due to much emphasis placed on clinical diagnosis

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[11]. Some reports in malaria endemic areas have suggested that fever or a recent history of fever is not highly predictive of malaria in adult patients [12, 13]. Infact, according to Nwanyanwu *et al.* [13], fever has been found to be more associated with HIV infection than with malaria parasitaemia.

Malaria is endemic in Nigeria and occurs throughout the year. According to Federal Ministry of Health Nigeria [14], there are over 100 million people at risk of malaria every year in Nigeria and indeed it is estimated that about 50% of the adult population experience at least one episode yearly while children less than 5 years have up to 2-4 attacks of malaria annually. Also, HIV has been reported across the country. UNAIDS [15] have estimated that in Nigeria about 3.9% of adults between ages 15-49 years are living with HIV/AIDS. In Nigeria, where laboratory facilities are limited, clinical approach is the most widely used diagnostic technique and fever or a recent history of fever is usually presumed to be due to malaria. However, the symptoms of malaria are non-specific and HIV is also associated with fever. Studies which evaluate the association between malaria and HIV are not well documented. Knowing the level of interaction between both diseases makes planning and prevention programme effective.

The objectives of this study were to find out the association between fever, malaria and HIV infection in adults living in a malaria endemic area and to determine if there was an association for co-infection with malaria and HIV.

MATERIALS AND METHODS

A cross-sectional study was carried out in Iwo, a semi-urban community about 45km from Ibadan in Southwest Nigeria. Non-pregnant adult subjects were recruited into the study which was carried out from November, 2005 to July, 2007. Two categories of subjects were studied. The first consisted of 1020 patients presenting with fever or a history of fever at some health facilities in Iwo. Fever was defined as axillary temperature greater than 37.5°C or a history of fever in the last 72 hours. The second category (control subjects) consisted of 668 apparently healthy individuals of the community with no clinical signs and symptoms of ill health as of the time of investigation. Subjects were recruited into the study after clinical examination and informed consent. Five ml of venous blood was collected once from each participant into ethylene diamine tetra-acetic acid (EDTA) bottle for laboratory investigations.

Thick blood films stained with 3% Giemsa were examined for 200 microscopic fields each under oil immersion. At least 200 microscopic fields were examined before declaring a smear as negative.

Antibodies to HIV were determined using Capillus rapid HIV 1/HIV 2 test kit (Trinity Biotech Plc, Ireland), enzyme linked immunosorbent assay (ELISA) (GenScreen plus HIV Ag-Ab test kit, Pasteur, Paris) and then confirmed with Western blot (WB) (New-LAV Blot 1, Bio-Rad, France). Differences between percentages were tested by chi-square test. A p-value of < 0.05 was considered significant.

RESULTS

Table 1 shows that 671 (65.8%) of the 1020 feverish patients and 141 (21.1%) of the 668 apparently healthy subjects were positive for malaria test. There was a significant relationship between fever and malaria parasitaemia ($\chi^2 = 325$; df = 1 $p < 0.05$). The odds ratio was 7.19. It can be said that a parasitaemic individual has 7.19 times the risk of a non-parasitaemic individual of developing fever.

Eighteen (1.8%) of the 1020 fever patients and 7 (1.0%) of the 668 controls were reactive to HIV test. There was no significant relationship between fever and HIV infection ($\chi^2 = 1.52$; df = 1 $p > 0.05$) (Table 2).

Table 3 shows that out of the 1688 subjects examined, 812 (48.1%) had malaria parasitaemia while 876 (51.9%) were negative for malaria parasites. Eighteen (2.2%) of the

Table 1: Association between Fever and Malaria Parasitaemia

Subjects	Positive for M. P	Negative for M. P	Total
Fever	671	349	1020
Control	141	527	668
Total	812	876	1688

$\chi^2 = 325.52$; df = 1; $p < 0.05$

M. P: Malaria Parasite

Table 2: Association between Fever and HIV Infection

Subjects	Positive for HIV	Negative for HIV	Total
Fever	18	1002	1020
Control	7	661	668
Total	25	1663	1688

$\chi^2 = 1.52$; df = 1; $p > 0.05$

Table 3: Association between HIV and Malaria Parasitaemia

Subjects	Positive for HIV	Negative for HIV	Total
Positive for M. P.	18	794	812
Negative for M. P.	7	869	876
Total	25	1663	1688

$\chi^2 = 5.86$ df = 1; $p < 0.05$

M. P: Malaria Parasite

812 malaria parasitaemic subjects and 7 (0.8%) of the 876 malaria aparasitaemic subjects had HIV infection. There was a significant association between HIV infection and malaria parasitaemia ($\chi^2 = 5.86$; df = 1; $p < 0.05$).

DISCUSSION

This study showed that fever or a recent history of fever was highly predictive of malaria infection and not HIV infection among adult patients in Iwo. This finding is different from a similar study carried out in Malawi which showed that fever or a recent history of fever was not highly predictive of malaria but much more likely to be associated with HIV infection [13]. Also, [7] found no significant association between fever and malaria or HIV infection. Association between fever and malaria or HIV in a locality depends on the prevalence of the infections within the locality. This study shows that malaria is much more prevalent in this locality than HIV.

Studies from various areas have failed to identify factors that can substantially improve upon current measures of diagnosing malaria. Malaria is based on fever in the presence of any parasitaemia [16]. The lack of specificity of malaria-associated signs and symptoms has led some researchers to conclude that only fever and history of fever have any real diagnostic value [17, 18]. A history of fever in the absence of another major symptom was the best predictor of malaria-positive blood slides in adults in Papua New Guinea [19] and a study in Zimbabwe concluded that only microscopy could improve diagnostic capabilities beyond those "unknown decision rules" used by health care workers [17]. In Ethiopia, fever, previous malaria and pallor were the measure with the best combined sensitivity and specificity [20].

Although majority (65.8%) of the fever patients had a positive malaria test, 34.2% of them were negative for malaria test. This emphasized the importance of laboratory confirmation of clinical diagnosis. A policy of screening of adults with fever suspected to be malaria should be considered before treatment of malaria is initiated. Treatment based on presumptive diagnosis alone is not proper and should be discouraged due to the several disadvantages including misdiagnosis, over treatment or misuse of antimalarial drugs, emergence of widespread resistance and waste of scare resources [12].

In this study, co-infection with HIV and malaria parasitaemia was higher than expected. Co-infections with HIV and malaria have also been reported in some other studies [7, 21]. This finding gives more credence to the susceptible nature of HIV patients to infections. Although some studies have not shown any interaction between malaria prevalence and HIV infected individuals [6, 22-24] others have shown that HIV infection increased the incidence and severity of clinical malaria [8, 25]. These recent studies have shown that in non-pregnant adults the underlying epidemiology and intensity of malaria transmission seem to be critical for determining the consequences of co-infection. In areas of stable malaria where transmission is intense and continuous HIV-related immunosuppression may increase rates of malaria infection and clinical malaria [3].

CONCLUSION

Although fever is highly predictive of malaria in adults in this area, there is no substitute for laboratory diagnosis of malaria. Effort should be made by Government to provide laboratory diagnostic facilities for malaria in every health centre in the country. In view of the fact that co-infection with malaria and HIV is higher than expected in the study area, any effective control measure should be one directed at both diseases simultaneously in order to reduce the probable lethal consequences of dual infection. The current campaign against HIV infection should be sustained so as to further bring down its prevalence. People living with HIV/AIDS should be protected with insecticide-treated nets.

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