The relationship between malaria and HIV

*SA Tswana, **L Nyström, *SR Mooy, *M Nzara, ***P Boone

Objective: To determine if there is an association between HIV and malaria infection

Design: A cross sectional survey.

Setting: Sanyati Rural District, a malarious endemic area of Zimbabwe.

Subjects: 338 volunteers aged 15 months to 76 years.

Main Outcome Measures: Prevalence of Malaria and HIV.

Results: The prevalence of malaria and HIV was 26.6% and 26.3% respectively. There was no association between prevalence of HIV and malaria.

Conclusion: There is no association between malaria and HIV.

Introduction

The marked immune suppression produced by human immunodeficiency virus (HIV) infection as a result of T cell dysfunction following loss of CD4+ lymphocytic activity results in infection and disease due to viruses, bacteria, fungi and parasites. The quantitative loss of CD4+ cells, the impairment of the clonal proliferation of CD4+ cells, and a decline in interferon-y markedly contribute to infection with organisms that require cell-mediated immunity to protect the host.1

Very early in the HIV epidemic, pneumonia due to pyogenic bacteria was reported in HIV infected individuals. Simberkoff et al2 noted that AIDS patients developed hospital-acquired pneumococcal pneumonia in spite of having received pneumococcal vaccine against the specific serotype of Streptococcus pneumoniae that caused illness. The literature is now full of documented cases of opportunistic organisms that are now reactivating due to the dysfunctioning of the immune system as a result of infection by HIV. Gram negative bacteraemia have also been frequently reported in patients with advanced HIV disease. Further, the association of Mycobacterium tuberculosis infection with HIV infection and AIDS was noted early in the AIDS epidemic.3 A study conducted in Harare, Zimbabwe at the Infectious Diseases Hospital showed that TB was on the increase. At least 40% of the TB inpatients were positive for HIV antibodies.

Several organisms are now known to associate with HIV infection.4 Of special attention are the sexually transmitted diseases. The correlation between STD and HIV is considered very high. Although correlation of bacterial, parasitic, fungal and viral infections with HIV has been noted, there are still some organisms which have not been established as whether they co-infect with HIV. There is no data to indicate malaria correlates with HIV infection, if that data is available it may be very scanty.

Our study was designed to determine if there is an association between HIV and malaria infection. The study was conducted in a malarious endemic area of Zimbabwe.

Materials and Methods

Study Area.

The study was conducted at Sanyati Baptist Mission Hospital. The hospital is about 90 km northwest of Kadoma in Sanyati tribal trust land under Kadoma district. Although the hospital is a mission institution with 70 beds it operates as a district hospital. This is due to the number of patients who attend the hospital. Several patients travel a distance of about 80 km. The other nearest district hospital (Gokwe Hospital) is about 85 km away, west of Sanyati Hospital. Most of the study subjects were from Gokwe, Chenjiri and surrounding areas of Sanyati Rural District. Local people around the hospital depend on subsistence farming. The area is malarious endemic zone, where malaria is one of the major diseases. Sanyati is one of the areas in Zimbabwe which records the highest mortality rate due to malaria.

Study Population.

The study population consisted of 338 volunteers. Of these 248 were females and 90 were males. The age ranged from 15 months to 76 years with a mean of 29 years. Most of the subjects were patients attending the hospital with malaria problems. More than 50% of the females were pregnant.

Specimen Collection.

Before blood specimens were collected all volunteers completed a questionnaire and signed a consent form. This was done after the research assistant nurse had clearly explained the objectives of the study to each study subject.

*Department of Medical Microbiology
University of Zimbabwe Medical School
P O Box A178, Avondale
Harare, Zimbabwe
Phone/Fax: 263-4-792245

**Department of Epidemiology and Public Health
Umeå University, Umeå
Sweden

***Baptist Hospital
Kadoma, Zimbabwe

Correspondence to:
Professor Sam Tswana
For subjects below 18 years of age parental consent was obtained. Before blood was taken each volunteer completed a brief questionnaire; 5mls of venous blood was then collected into plain tubes. For the two infants less than 24 months old blood was collected by heel pricking. Specimens were immediately taken to the laboratory for processing. In the laboratory thin and thick slides were prepared after which all specimens were centrifuged for three minutes at 2000xG and sera was separated and stored at -20°C.

Examination for Malaria Parasites.
Specimens were read by two microscopists. Results were recorded independently and where there were differences these slides were referred to the parasitologist for confirmation. Further, the parasitologist randomly examined the positive slides for further confirmation.

Examination for HIV Antibodies.
Detection of HIV antibodies was done using the enzyme linked immunosorbent assay (ELISA) Abbott Laboratory diagnostics, Chicago, and the Cambridge Biotech, Galway, Ireland and were read spectrophotometrically. Any sera positive for the presence of any border-line, indeterminants or those which disagreed on the two different ELISA were confirmed using the Western Blot.

Statistical Methods.
To test whether sex and age may confound the association between the prevalence of malaria and HIV, the chi squared test with Yates' correction and the Kruskal-Wallis (H) test were used respectively. Logistic regression models were fitted to the data in a step wise fashion. A result yielding a p value of less than 5% was considered statistically significant.

Results
Data was available on 338 persons of whom 93 (27.7%) were males. The prevalence of malaria was 26.6%. It was significantly (p<0.001) higher in females (41.9%) than males (20.6%). The prevalence of malaria among males was higher (x²=20.77; df=1; p<0.001) in those aged less than 30 years (28/40 or 70.0%) than in those of age 30 years or more (10/50 or 20.0%). Among females, the prevalence of malaria was significantly (x²=1.03; df=1; p=0.309) higher in males (36.6%) as compared with females (3.7% or 9/243). However, no association was observed between prevalence of both malaria and HIV and age (x²=0.88; df=1; p=0.831).

Examination for Malaria Parasites.
Smears were stained using the Giemsa stain technique and were read by two microscopists. Results were recorded independently and where there were differences these slides were referred to the parasitologist for confirmation. Further, the parasitologist randomly examined the positive slides for further confirmation.

Examination for HIV Antibodies.
Detection of HIV antibodies was done using the enzyme linked immunosorbent assay (ELISA) Abbott Laboratory diagnostic, Chicago, and the Cambridge Biotech, Galway, Ireland and were read spectrophotometrically. Any sera positive for the presence of any border-line, indeterminants or those which disagreed on the two different ELISA were confirmed using the Western Blot.

Table I: Prevalence of both malaria and HIV by age group among female subjects.

<table>
<thead>
<tr>
<th>Age Group (Years)</th>
<th>Total</th>
<th>Malaria n (%)</th>
<th>HIV n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>79</td>
<td>19 (24.5)</td>
<td>6 (7.8)</td>
</tr>
<tr>
<td>20-29</td>
<td>112</td>
<td>19 (20.2)</td>
<td>16 (27.7)</td>
</tr>
<tr>
<td>30-39</td>
<td>77</td>
<td>6 (9.6)</td>
<td>13 (21.3)</td>
</tr>
<tr>
<td>40+</td>
<td>35</td>
<td>6 (17.1)</td>
<td>8 (22.9)</td>
</tr>
</tbody>
</table>

The prevalence of HIV was 26.3% and was significantly (p<0.009) higher in males (36.6%) as compared with females (21.8%). Although among males the prevalence of HIV was higher in those of age 30 years or more (20/50 or 40.0%) than in those of less than 30 years (11/40 or 27.5%), this was not statistically significant (x²=1.03, df=1, p=0.309). Meanwhile, among female subjects, the prevalence of HIV was highest in the age group 20 to 29 years (27.7%) as shown in Table II.

Discussion
Malaria and HIV infection are probably the greatest challenges facing developing countries today. Because of the emerging of HIV, organisms which laid latent in the human host are now reactivating. There are several reporting cases of opportunistic organisms that are now reactivating due to the dysfunctioning of the immune system as a result of infection by HIV. There are ample evidences on the association of HIV infection with other micro-organisms. However, there is scanty data on the correlation between HIV and malaria.

Our study showed no interaction between malaria and HIV. This is in agreement with studies by Allen et al (1991) and Atozori et al (1993). However, it should be noted that the
study was cross sectional, not longitudinal and it was conducted during the malaria peak season.

Although the prevalence of HIV was higher (26.3%) than the national rate (20%), (personal communication with AIDS Co-ordinator Ministry of Health and Child Welfare, Harare, Zimbabwe), we would not find any association at all between Plasmodium falciparum and HIV. Even though malaria infection was more common in HIV seropositives than in seronegatives, the intensity of the Plasmodium falciparum infection was not associated with HIV infection.

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References


