HIV/AIDS and malaria in pregnant women from Cameroon

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SUMMARY

A worrisome number of approximately one million pregnant women in sub-Saharan Africa are affected by malaria and HIV/AIDS annually. To assess the effects of co-infection with these diseases, clinical, parasitological and haematological data were obtained and analysed from 399 pregnant women from Douala and Muyuka. HIV/AIDS, malaria and co-infection prevalence rates were respectively 21.1% (84/399), 86.5% (345/399) and 17.3% (69/399). Co-infected pregnant women presented with higher geometric mean parasitaemia (8 135) per µl of blood (U=857.5, p=0.10) and a significantly lower mean haemoglobin (10.68 ±0.33) g/dL (χ2=7.87, p=0.04) when compared with women in the other disease categories. Generally, median CD4+ counts were lower in the co-infected (332) when compared with HIV/AIDS patients (454) (U=27.5, p=0.17). More co-infected patients had moderate and low CD4+ counts (χ2=10.16, p=0.12). Out of the 69 co-infected patients, 42 (60.9%) had anaemia and of these 30 (71.4%) had moderate to severe anaemia (χ2=14.37, p=0.03). The findings reported in this study are highly suggestive that dual infection with HIV/AIDS and malaria may have serious consequences on the health of pregnant women.


Introduction

Malaria and HIV/AIDS are two of the world’s greatest public health challenges with great geographical overlap especially in sub-Saharan Africa were more than 80% of the total global burden of both infections is felt [1]. About 90% of the 300-500 million annual acute episodes of malaria are reported in sub-Saharan Africa where there is also an estimated 30 million HIV-infected cases [2]. Both infections are estimated to account annually for over 4 million deaths worldwide. The burden of malaria is particularly severe in children under 5 years (who constitute more than 70% of the 1 million deaths due to malaria) and pregnant women. About 55% of HIV infected adults in sub-Saharan African are women of reproductive age and they account for over 80% of the world’s HIV infected women. In this region, the prevalence of maternal malaria is 65% and HIV/AIDS affects 40% of the pregnant population [3]. Any interaction between malaria parasites and HIV can be of additional health burden especially in pregnant women, with resulting poor birth outcomes and the imminent transmission of these intracellular pathogens from mother to child. Although some data exist on interactions between malaria and HIV/AIDS during pregnancy [3, 4, 5], information on this aspect is scanty in Cameroon.

Materials and methods

Study sites
The study was conducted in the Nylon Health District in Douala and the Muyuka Health District. Both
the Nylon and Muyuka settings are characterised by swampy lands, stagnant water and poor hygiene conditions. These factors provide favourable breeding sites for the vector of malaria. Also, these areas are characterised by sexual promiscuity and poor knowledge of the HIV/AIDS pandemic [6, 7, 8], conditions that favour the widespread of this infection.

**Study design/study population**
A hospital-based study was conducted from January through October 2006, involving pregnant women aged 15-49 years attending the antenatal care programmes of the Nylon district Hospital in Douala (Littoral Province) and the Calvary Hospital in Muyuka (South west Province). Malaria symptomatic and asymptomatic subjects willing to be tested for HIV were enrolled and counselled after signing the consent form and completing the questionnaire. Parental consent was sought for those less than 18 years. Subjects with clinical AIDS disease and those who had taken any malaria treatment or antipyretics within the last 72 hours of reporting to the hospital for consultation were excluded from the study.

**Ethical consideration**
The study was approved by the Delegations of Public Health in the Littoral and South West Provinces and by the National Ethical Review Board. CD4+ T cell counts were performed on HIV infected women who were followed up thereafter. Malaria positive patients received free treatment according to the present national guidelines. Treatment for pregnant women in the first trimester consisted of intermittent preventive treatment with sulfadoxine-pyrimethamine while the other malaria patients received artesunate/amodiaquine combination therapy.

**Clinical examination**
All clinical examinations were performed by Medical doctors on duty in the two hospitals. Symptoms such as fever, headache, body/joints pains, myalgia, chills, jaundice and convulsions were considered as presumptive diagnosis of malaria. All HIV seropositive (HIVSP) subjects were enrolled in the HIV control programmes in the South West Provincial Hospital, Limbe, and in the Nylon District Hospital of the Littoral Province.

**Malaria diagnosis and parasite load**
Thick and thin blood films were prepared on a microscope slide and observed microscopically [9]. A slide was declared negative only when no parasite was found after scanning at least 100 high power microscopy fields by two independent microscopists. In case of discrepant readings, a third microscopist read the slide and the mean parasitaemia was taken. Asexual parasitaemia was counted against 200 leukocytes. Parasite density per microlitre (µL) of blood was established assuming an average leucocyte count of 8 000 cells per µL/blood [10]. Asexual parasitaemia was categorised as low (<5 000/µL), moderate (5 000-10 000/µL) and high (>10 000/µL) [11].

**HIV Testing**
The HIV test was carried out following the HIV test algorithm established by the Ministry of Public Health in Cameroon. A rapid test to screen for the presence of HIV antibodies was performed using the Determine™ test kit [12]. All positive tests were confirmed with the ImmunoComb® II HIV 1&2 BiSpot kit [13].

**Haematological tests**
White blood cell and platelet counts were performed following established procedures [6]. Haemoglobin (Hb) concentration was measured using the STANBIO STAT-Site® MHgb Test Kit (STANBIO Laboratory, Boerne, Texas, USA) and values read using a haemoglobinometre [14]. CD4+ counts were obtained for HIVSP women using the Partec CyFlow® counter [15]. Counts were categorised as low or advanced stage (<200/µL), moderate or chronic stage (200-499/µL) and high or asymptomatic stage (≥500/µL) [11].

**Statistical analysis**
Data were analysed by the software package, SPSS for windows, version 11.0. Subjects were placed into the following study groups: HIV/AIDS/Malaria, HIV/AIDS, Malaria and Non-malaria/Non-HIV. Differences between group means were compared using Kruskall Wallis test (χ2) and using Mann-Whitney test (U). Categorical values were compared using Chi Square test. Statistical significance was set at p ≤0.05.

**Results**

**Descriptive statistics**
A total of 399 pregnant women (Muyuka: 225 and Douala: 174) with a median age of 24 years participated in the study. There were 23.3% (93), 49.6% (198) and 27.1% (108) in the first, second and third trimester of
pregnancy respectively. Distribution was as follows: 15-25 (n=213, 53.4%), 26-35 (n=168, 42.1%), 36-45 (n=15, 3.8%) and >45years (n=3, 0.8%). According to gravidity participants were distributed into 37.6% (n=150) nulligravid, 27.8% (n=111) primigravid, 24.1% (n=96) secundigravid and 34.6% (n=46) multigravid.

Prevalence of HIV, malaria and co-infection
The prevalence of HIV/AIDS and malaria co-infection was 82.1% (69/84) and 20.0% (69/345) in HIVSP and malaria patients respectively. The prevalence of HIV/AIDS, malaria and co-infection in the study population was 21.1%, 86.5% and 17.3% respectively.

A higher number of HIVSP patients were in the 26-35 year age range (60.7%) when compared with 14.1%, 20.0% and 0% in the 15-25, 36-45 and >45year age group respectively. The difference was however, not significant (χ²=5.26, p = 0.15).

Clinical, parasitological and haematological features
The most prevalent clinical feature in the study population was anaemia (50.4%, 201/399), followed by fever (43.6%, 174/399) while diarrhoea was the least prevalent (3.8%, 15/399). Fever was more prevalent in co-infections when compared with single infection. Although anaemia prevalence was higher in co-infected pregnant women (60.9% (42/69), it was not significantly different from that of women solely infected with malaria (51.1%, 141/276) and HIV/AIDS (60.0%, 9/15) (χ²=5.09, p=0.17). The mean Hb concentration was significantly lower in co-infection compared with the other disease categories (F=2.79, p=0.04) (Table 1). Hb concentrations ranged from 8.0-14.2, 10.7-15.0, 5.0-17.6 and 10.3-16.3 g/dL for those with co-infection, HIV/AIDS, malaria and none of the infections respectively.

A significantly higher percentage of co-infected patients (34.8%, 24/69) reported with high parasite density (PD) when compared with patients infected with malaria only (8.7%, 24/345) (χ²=10.74, p=0.005). The geometric mean parasite density (GMPD) in co-infection was 5 135 parasites/μL (range: 400-26 986) compared with 3 613 parasites/μL of blood (range: 320-37 600) for those infected with malaria only. However, this difference was not significant (F=1.58, p=0.19) (Table 1).

The median CD4+ count (range: 61-901) was lower in co-infection compared with that of patients solely infected with HIV/AIDS, but this difference was not significant (F=0.44, p=0.72) (Table 1). As shown in Table 2, there was a significant difference in the population of HIVSP patients in the chronic stage of HIV disease (51/84, 60.7%) compared with those in the advanced (9/84, 10.7%) and asymptomatic stages (21/84, 25.0%) (χ²=8.31, p=0.02). There were more co-infected women in each CD4+ count category compared with HIV/AIDS infected women. HIVSP patients in the advanced stage of disease also reported with higher GMPD (6 345) compared with those in the chronic (4 576) and asymptomatic (3 941) stages although the difference was not significant (F=0.11, p=0.89).

Table 1: Comparison of mean values of laboratory parameters between various infection categories of pregnant women under study

<table>
<thead>
<tr>
<th>Parameters</th>
<th>HIV/AIDS/Malaria (n=69)</th>
<th>HIV/AIDS (n=15)</th>
<th>Malaria (n=276)</th>
<th>Non-malaria /non-HIV (n=39)</th>
<th>Significance level</th>
</tr>
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<tbody>
<tr>
<td>Hb (g/dL)</td>
<td>10.58±(±0.32)</td>
<td>12.43±(±0.33)</td>
<td>11.10±(±0.20)</td>
<td>12.58±(±1.33)</td>
<td>**χ²= 7.86 p= 0.04</td>
</tr>
<tr>
<td>WBC count (x10⁹/L)</td>
<td>4.47±(±0.34)</td>
<td>5.12±(±0.58)</td>
<td>5.53±(±0.23)</td>
<td>5.58±(±0.39)</td>
<td>χ²= 7.07p =0.07</td>
</tr>
<tr>
<td>Platelet count (x10⁹/L)</td>
<td>210.1±(±16.5)</td>
<td>240.0±(±33.7)</td>
<td>192.3±(±6.3)</td>
<td>188.7±(±9.0)</td>
<td>χ²= 3.33p =0.34</td>
</tr>
<tr>
<td>GMPD (μL)</td>
<td>5 135</td>
<td>-</td>
<td>3 613</td>
<td>-</td>
<td>***U=857.5p =0.10</td>
</tr>
<tr>
<td>CD4+ count (μL)</td>
<td>332</td>
<td>454</td>
<td>-</td>
<td>-</td>
<td>U=27.50 p =0.18</td>
</tr>
</tbody>
</table>

*Values in brackets represent standard error of the mean
**Compares the mean of the parameter under study across the four disease categories
***Compares means between two disease categories
Discussion

Reports are contradictory on the frequency and severity of malaria in HIVSP patients. Evidence of an association between HIV/AIDS and malaria is scanty and it is just within the past decade that the picture of an association began to emerge [1]. In spite of the availability of some data on co-infection in pregnant women, information on its effect in pregnant women from Cameroon is scanty. In sub-Saharan Africa, pregnant women are at great risk of malaria and HIV/AIDS, with a co-infection rate of ≥10% [1]. The high prevalence of malaria (86.5%) and HIV/AIDS (21.1%) recorded in the present study indicates that malaria and HIV/AIDS are highly prevalent in the study sites as in other parts of sub-Saharan Africa [5]. The prevalence rates of malaria and HIV/AIDS reported here are much higher compared with that reported in other studies [3, 16, 17]. This difference in prevalence rates could be accounted for by the fact that the majority of participants in the present study (54.1%) had only primary education (data not shown) and this could have contributed to poor knowledge of both diseases. It has been previously reported that low level of education influences prevalence rates (8).

The prevalence of malaria and HIV/AIDS co-infection was 17.3% in our study population. This rate of co-infection corroborates with reports of a related study [18] conducted in Kumba and Bamenda, located in South West and North West Provinces of Cameroon respectively. These high prevalence rates could be attributed to the poor hygienic conditions and the poor knowledge, attitude and practices of both malaria and HIV/AIDS, as reported [7, 8]. Our study reported a higher parasite density in co-infected patients compared with their non-co-infected counterparts. A high prevalence of anaemia was recorded in co-infected (60.9%) and malaria patients (51.1%). A low haemoglobin concentration was recorded in the advanced and chronic HIV disease categories. Malaria infected pregnant women are highly susceptible to anaemia [13, 19], which is exacerbated with HIV/AIDS co-infection [1, 3]. The high prevalence of anaemia in co-infection, and the trend towards lower haemoglobin concentration with decreasing CD4+ counts could be attributed to the destructive effect of both HIV/AIDS and malaria parasite on haemoglobin and red cell production as reported by Gretchen et al [20] or to the higher parasite density reported in co-infected pregnant women [1]. Co-infected pregnant women had a higher prevalence of fever, indicating the burden of the co-existence of the two diseases on health.

Conclusion

Our study revealed that malaria and HIV/AIDS may have serious consequences on the health of pregnant women. A longitudinal study using a larger sample size in which the outcome of pregnancy is also investigated would give more conclusive results.

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References