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High Prevalence of Co-infection of Human Immunodeficiency Virus-1 (HIV-1) and Onchocerciasis in Cameroon

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Both Onchocerciasis (river blindness) and HIV/AIDS are now significant public health problems in many countries of Africa. The aim of this study was to determine the prevalence of co-infection of Onchocerciasis and HIV as well as to assess and compare the levels of humoral antibodies among subjects in Cameroon. This was a community-based study in Balamba, an Onchocerciasis endemic region in Cameroon. Both skin snip and blood samples were collected from all consented inhabitants for diagnosis of Onchocerciasis, HIV as well as estimate serum antibody levels. Of a total of 162 subjects recruited, 54 were diagnosed positive for Onchocerciasis by skin snip, giving a prevalence of 33.3% (54/162). Also, the prevalence of HIV among these subjects was 12.9% (21/162). This infection was 17.8% among women (13/73) and 8.9% among men (8/89). Six of the 54 subjects positive for Onchocerciasis were also positive for HIV giving a prevalence of co-infection of 11.1% (6/54). Mean serum antibody levels of Onch+ve/HIV+ve, Onch+ve/HIV-ve and Onch-ve/HIV+ve subjects, were significantly higher ($p < 0.001$, Student's t-test) when compared to that of Onch-ve/HIV-ve subjects. The present study demonstrates a high prevalence of co-infection of Onchocerciasis and HIV. It further shows significantly high antibody levels, reflecting raised humoral immune responses with co-infected subjects showing the highest response. Hence the integration of HIV/AIDS care and prevention activities into currently ongoing treatment program for Onchocerciasis will save time and scarce resources in Africa with tremendous public health impact.

Key words: HIV, onchocerciasis, co-infection, prevalence, immunity cameroon

INTRODUCTION

Onchocerciasis affects about 18 million people in 37 countries: 30 in tropical Africa, 6 in the Americas and 1 Southwest of Saudi Arabia. Some 750,000 persons are blind or have severely impaired vision because of the disease (Molineur and Davies, 1997).

Cameroon has been identified as an Onchocerciasis endemic zone with a disease prevalence of 31.9%. The most devastating pathologic consequences of Onchocerciasis that have been documented in Cameroon are blindness and immune complex glomerulopathy which at the moment are among the diseases of great concern to the Cameroon Ministry of Health (Ngu *et al.*, 1985; Somomoyo *et al.*, 1993; Cameroon Ministry, 2002).

The Africa Program for Onchocerciasis Control (APOC) together with other international collaborators are currently instituting mass Ivermectin treatment programs for the control of this parasite particularly in the endemic regions of Africa. This program has adapted what is known as Community-Directed Treatment with Ivermectin (CDTI), using the Community-Directed Distributors (CDDs), which has resulted in successful coverage of between 50-79% of the infected populations (Sama *et al.*, 2003).

Serosurveillance studies in Cameroon in 1992 showed that the prevalence of co-infection of HIV and parasitic infections including Onchocerciasis ranged between 1 and 3% (Ndumbe *et al.*, 1992).

Cameroon currently registers HIV-1 and Onchocerciasis prevalence of 5.5% (National Statistical Institute, 2004, Cameroon national 2002) and 31.9% (Cameroon Ministry AIDS Control Committee, 2002), respectively. Thus, it is likely that a significant percentage of Cameroonians are currently infected with both HIV and Onchocerciasis.

The international community and in particular research institutions and governments particularly in Africa are at the moment either implementing or building capacities for implementation of mass programs for HIV/AIDS prevention and care of populations. The use of peer-educators through Information Education and Communication (IEC) programs for prevention and of antiretroviral and related drugs against opportunistic infections for treatment of those already infected is being greatly encouraged.

The impact of these co-infections on the immune system of patients is not yet clear. This may lead to more profound immune degradation, which may greatly compromise efficacy of treatment with Ivermectin and/or

antiretroviral and other drugs against opportunistic infections. Hence the prevalence of co-infection of HIV and Onchocerciasis in this endemic environment and their initial immune status are very important for care and prevention program implementation. This study is meant to provide this information in Cameroon, a country with high prevalence of both Onchocerciasis and HIV in Africa.

MATERIALS AND METHODS

Study area and population: This was a community-based study conducted between the period of June and December, 2004 in the village of Balamba, a rural area in Cameroon, located at about 80 km from Yaounde, the capital city of the country. This village is along the banks of river Sanaga. It is a road junction with a lot of commercial activities taking place. Balamba was specifically chosen for this study based on these characteristics.

Sampling: After obtaining permission from the ministry of public health, the village head and district medical officer, a health campaign was carried out in this village. After this, inhabitants were advised to come up for free screening. All consented inhabitants were interviewed using structured questionnaires, which solicited information on sexual history, age, sex, frequency of use of Ivermectin and duration of stay in the locality. Both skin snip and blood samples were taken from them. Diagnosis of Onchocerciasis was done by skin snip technique while the presence of antibodies to HIV-1 and 2 were confirmed by combination of one rapid test (Oraquick, Orasure Technologies, USA) and one ELISA test (BIO-RAD, Redmond, WA 98052, USA). Total serum antibody levels in different categories were determined by sandwich ELISA. Briefly, antibodies to human polyvalent immunoglobulins GAM (Sigma, 18758) were coated onto microtiter plates at $2 \mu\text{g mL}^{-1}$ concentrations in 0.1 M sodium carbonate buffer pH 9.8. After an overnight incubation at 4°C , the plates were washed three times at 5 minute intervals with 0.1 M phosphate buffered saline (PBS), pH 7.2 containing 0.5% tween-20 and blocked for 30 min at Room Temperature (RT) with the PBS containing 0.4% Bovine Serum Albumin (Type III, Sigma). Serum samples were then added in duplicate wells at a dilution of 1:100 and further incubated for 2 h at RT. Upon recovery, the plates were washed as above and incubated with goat anti-human IgG peroxidase conjugate (Sigma, A-6029) for 1 h 30 min at RT. Plates were again

washed and incubated with the colorimetric substrate, o-Phenylenediamine dihydrochloride/H₂O₂ for 10 min. The color reactions in the wells were stopped by adding 50 µL of 4 MH₂SO₄ per well and the optical density values read at 492 nm.

The Epi-info version 2003 programme was used for data entry, editing and calculation. A probability value less than 0.05 was considered significant.

RESULTS

A total of 162 subjects were recruited into the study. Fifty four of them were diagnosed positive for Onchocerciasis by skin snip, giving a prevalence of 33.3% (54/162). The prevalence of HIV among these subjects was 12.9% (21/162). This infection was 17.8% among women (13/73) and 8.9% among men (8/89). Six of the 54 patients positive for Onchocerciasis were also positive for HIV giving a prevalence of co-infection of Onchocerciasis and HIV of 11.1% (6/54). In all, antibody levels of Onch+ve/HIV+ve subjects were highest, followed by those of subjects infected with Onch+ve/HIV-ve only, Onch-ve/HIV+ve only and lastly, Onch-ve/HIV-ve respectively (Table 1). Serum antibodies levels were significantly (p<0.001) higher among subjects co-infected with HIV and Onchocerciasis (Onch+ve/HIV+ve), subjects infected with HIV only (Onch-ve/HIV+ve) and subjects infected with Onchocerciasis only (Onch+ve/HIV-ve) when compared with the negative controls (Onch-ve/HIV-ve) (Table 2).

Table 1: Mean serum antibody levels of different categories of subjects

Infections	Serum antibody levels (optical densities)
Oncho+ve/HIV+ve	0.621
Oncho+ve/HIV-ve	0.523
Oncho-ve/HIV+ve	0.500
Oncho-ve/HIV-ve	0.141

Table 2: Comparison of mean serum antibody levels in different categories of subjects

Categories of subjects	Number of subjects	Mean serum antibody levels	p-value	Significance or not
Oncho+ve/HIV+ve VS Oncho-ve/HIV-ve	6/108	0.621/0.141	<0.001	S
Oncho+ve/HIV+ve VS Oncho-ve/HIV-ve	6/48	0.621/0.523	>0.05	NS
Oncho+ve/HIV+ve VS Oncho-ve/HIV+ve	6/21	0.621/0.500	>0.05	NS
Oncho+ve/HIV+ve VS Oncho-ve/HIV+ve	48/21	0.523/0.500	>0.05	NS
Oncho+ve/HIV-ve VS Oncho-ve/HIV-ve	108/48	0.141/0.523	<0.001	S
Oncho+ve/HIV-ve VS Oncho-ve/HIV-ve	108/21	0.141/0.500	<0.001	S

DISCUSSION

The present study reports a high prevalence of Onchocerciasis of 33.3% in Balamba, a rural village in Cameroon. This figure closely marches the national prevalence of 31.9% reported earlier by the ministry of public health (Cameroon Ministry, 2002). This implies that Balamba is an Onchocerciasis endemic region of Cameroon. This village presents with typical characteristics for high infection of Onchocerciasis. It is located along the banks of river Sanaga, a river visited by about 80% of the population of this village either for fishing activities or for removal of sand meant for construction work or for farming activities along the river banks. Thus, they are greatly exposed to infection by Onchocerciasis.

A high HIV seroprevalence of 12.9% was also recorded among inhabitants of this rural area. A recent survey in Cameroon showed that HIV seroprevalence in the rural areas of the country is between 5.1 and 6.6% (Nyambi *et al.*, 2002). Though a rural area, Balamba is a road junction where vehicles carry passengers from Yaounde and heavy trucks to the North West and Western parts of the country regularly stop for various reasons with a lot of interaction between the villagers and passengers. It has a young and mobile population. A lot of daily interaction also takes place between inhabitants of this village and traders from the capital city, Yaounde and other urban areas, who come to buy fish and sand from the river Sanaga. Other studies have identified these indicators as high risk factors for transmission of HIV, particularly in Africa (Buve *et al.*, 2001; Morison *et al.*, 2001; Nyambi *et al.*, 2002).

A prevalence of co-infection of HIV and Onchocerciasis of 11.1% reported in this study is very high, when compared with the prevalence of 1 to 3% reported in 1992 by Ndumbe *et al.* (1992). This is probably due to the high prevalence of HIV and Onchocerciasis that has been documented in this village in the present study. This has serious implication for Cameroon and other African countries with high prevalence of HIV and Onchocerciasis. A lot of programs are now being put in place by governments of these countries to eradicate these pandemics. HIV care and prevention activities are being intensified through use of antiretroviral drugs and IEC materials; Onchocerciasis control by the African Program for Onchocerciasis Control (APOC) by massive treatment with ivermectin is also being implemented. All these activities take place within the same communities but by different health personnel without

any coordination. The present study which shows that there is high co-infection of these pathogens among people in the same community provides evidence based justification for various governments and bodies involve in these programmes to harmonise their activities to make sure that an integrated package of care and prevention material incorporating the two infections is prepared and jointly used for intervention.

Serum antibodies levels in patients negative for both HIV and Onchocerciasis (controls) were significantly ($p < 0.001$) lower when compared with the other categories of patients in the present study. Generally, infection with HIV and other parasitic infections results in chronic illnesses initially characterized by raised antibodies in recognition of the foreign organism with subsequent or progressive decrease in immune functions due to profound immunosuppression (Jaffar *et al.*, 2005; Shalani *et al.*, 2002). The present study that demonstrates raised serum humoral antibodies level is consistent with immune responses that follow parasitic infections. The implications of this in patients co-infected with these pathogens that are on treatment with Ivermectin and antiretroviral drugs is not yet known.

The present study demonstrates a high prevalence of co-infection of Onchocerciasis and HIV. It further shows significantly high antibody levels, reflecting raised humoral immune responses with co-infected subjects showing the highest response. Hence the integration of HIV/AIDS care and prevention activities into currently ongoing treatment program for Onchocerciasis will save time and scarce resources in Africa with tremendous public health impact.

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