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Prevalence of anaemia in paediatric patients with HIV infection in Kano

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Abstract: *Background:* HIV infection affects virtually all systems of the body including the haematological system.

Objective: To determine the prevalence of anaemia in HIV infected children and compare with apparently healthy HIV negative age-sex matched controls.

Design: Case control hospital-based study.

Methods: A total of 60 confirmed HIV infected antiretroviral naïve children and 60 HIV negative children were enrolled in a case control study of baseline haematological indices. In all cases, haemoglobin, total white blood cell count, neutrophils, lymphocytes and platelet counts were determined using SYSMEX XT- 2000i Haematologic auto-analyser. Children with HIV/AIDS were classified according to clinical disease stages using the 2006 World Health Organization (WHO) staging criteria. Data was analysed using MINITAB 12.21 Atlanta USA statistical software.

Result: Anaemia (<110 g/L) was

present in 88.0% of the HIV-infected children, compared to 15.0% of controls ($p = 0.001$). Mild anaemia (70 – 109 g/L) was observed in 85.0% of HIV-infected children, compared to 15.0% of controls. Moderate anaemia (50 – 69 g/L) was present in 3.3% of HIV-infected children, but in none of the control. Leucopenia ($<4 \times 10^9/L$) was seen in 11.6% of HIV-infected children and in 5.0% of controls. Neutropenia ($<1.5 \times 10^9/L$) affected 13% of infected children and 5% of controls. Lymphocytopenia ($<1.2 \times 10^9/L$) was observed in 3.3% of infected children but in none of controls. Corresponding figures for thrombocytopenia ($<100 \times 10^9/L$) were 6.7% of HIV infected children and 1.7% of controls.

Conclusion: All cells lines are reduced in HIV/AIDS and anaemia is the most frequent haematological manifestation seen in HIV/AIDS infection.

Key words: Prevalence, Anaemia; HIV, Paediatrics, Patients

Introduction

The HIV/AIDS scourge is a serious threat to the physical, social and economic development of affected countries, particularly the low resource, under developed countries. Virtually all systems are affected in HIV infection and the haematological system is one of the early systems affected, resulting in early death or impaired quality of life^{1,2}. Cytopenias in HIV infection are generally caused by inadequate production due to suppression of bone marrow by the HIV through abnormal expression of cytokines and alteration of the bone marrow microenvironment^{2,4}. Thrombocytopenia is caused by immune-mediated destruction of platelets, in addition to inadequate platelet production^{4,8}. Other causes of cytopenias include adverse effects of drug therapy and secondary effects of opportunistic infections and malignancies^{2,4,6}. Optimal management of the underlying HIV

infection is essential to correcting these cytopenias, in addition to identifying precipitating factors and providing supportive care. Supportive care based on the level of severity may include the use of haematinics, erythropoietin, myeloid growth factors (GM-CSF) in addition to the judicious use of red blood cell transfusions in severe cases⁸⁻¹¹. This study was undertaken to determine the prevalence of anaemia in children presenting with HIV infection in comparison with apparently healthy HIV negative children.

Subjects and Methods

The study was conducted between the months of November 2009 and April 2010. Sixty antiretroviral-naïve, HIV positive children between the ages of 3

months to 14 years referred to the Paediatric HIV clinic were enrolled, and sixty age-sex matched HIV negative children in apparently good health, without any clinically observed acute or chronic illness were enrolled as controls. Informed consent was secured from the parents/guardians of all the patients. Ethical clearance was obtained from the Research and Ethics Committee of Aminu Kano Teaching Hospital (AKTH) before the study was commenced.

Laboratory analyses were conducted at the Federal Ministry of Health (FMOH) approved specialist laboratory of AKTH. Specimens for full blood count was analysed using the haematology auto-analyser SYSMEX XT – 2000i. In an effort to exclude some common causes of anaemia, haemoglobin genotype, blood film for malaria and stool microscopy for hookworm were done to exclude subjects with sickle cell anaemia, malaria and hookworm infestation.

Demographic data, haemoglobin level, total white blood cell count, absolute neutrophil and lymphocyte count, platelet count were obtained. Children with HIV/AIDS were classified according to clinical disease stages using the 2006 World Health Organization (WHO) staging criteria. Anaemia was defined as haemoglobin (Hb) <110 g/L: 70 – 109g/L as mild anaemia, 50 – 69g/L as moderate and < 50 g/L as severe anaemia¹². Leucopenia defined as a total white blood cell count of < 4×10^9 /L¹³. Neutropenia defined as an absolute neutrophil count (ANC) of < 1.5×10^9 /L.¹³ Lymphocytopenia defined as an absolute lymphocyte count of < 1.2×10^9 /L.¹³ Thrombocytopenia defined as a platelet count of < 100×10^9 /L¹⁴.

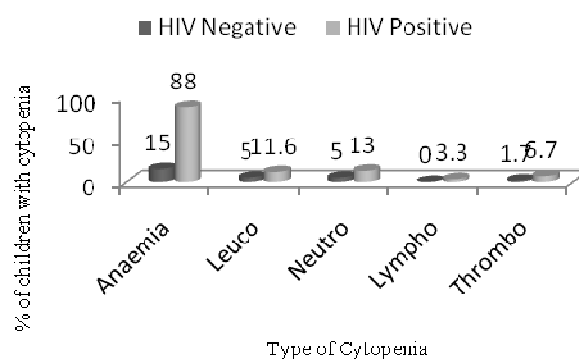
Statistical analysis

Data entry, analyses and validation were done using MINITAB 12.21 Atlanta USA statistical software. Quantitative variables were summarized using mean and standard deviation and means were compared using Student's – t-test. Chi-square test of statistical significance was used to compare categorical variables. Probability value (p-value) of less than 0.05 was considered as significant.

Results

There were 39 males and 21 females in each group of 60 HIV-infected and 60 controls, giving a male: female ratio of 1.9:1. The mean age of the males and the females were 39.9 (± 31.3) and 70.7 (± 46.7) months respectively. The mean weight in the HIV-infected group was 13.11 (± 7.40) kg and that of control group was 14.94 (± 6.70) kg ($p = 0.16$). The mean height of the HIV-infected group was also comparable to that of controls (90.5 ± 23.0 cm versus 91.2 ± 22.0 cm, $p = 0.85$). Based on WHO clinical staging, 35 (58.4%) of the HIV-infected children belonged to stages 1 and 2 while 25 (41.6%) belonged to stages 3 and 4. Anaemia was the commonest haematological abnormality observed

Fig 1: Frequency of cytopenias in HIV positive and control children



(Leuco= leucopenia, Neutro=neutropenia, Lympho= lymphocytopenia, Thrombo= thrombocytopenia)

The prevalence of anaemia was significantly higher in HIV-affected children than in controls [53 (88.3%) versus 9 (15.0%), $\chi^2 = 64.61$ $p = 0.001$].

In comparing the mean haemoglobin level between the HIV infected and controls, a significant difference was observed. Also the mean level of leucocytes, neutrophils, lymphocytes and platelets are lower in infected children than control (Table 2).

Table 2: Haematological indices of HIV infected compared with HIV uninfected children

Mean (SD) Hematological Indices	HIV-infected	Non-infected	t-test	p-value
Haemoglobin concentration(g/L)	93.8 (13.3)	119 (11.9)	10.95	0.001
Total WBC ($\times 10^9$ /L)	7.19 (2.09)	9.40 (4.86)	3.25	0.002
Neutrophils ($\times 10^9$ /L)	2.88 (1.08)	3.72 (2.83)	2.14	0.036
Lymphocytes($\times 10^9$ /L)	3.88 (1.72)	4.52 (2.58)	1.59	0.11
Platelets ($\times 10^9$ /L)	325(892.4)	336(162.3)	2.12	0.037

WBC = white blood cell
SD = standard deviation

Discussion

Anaemia was the most common identified haematological manifestation of HIV infection affecting 88% of HIV infected children and only 15% of controls. The high prevalence of anaemia observed is similar to that of Adetifa *et al* who reported 77.9% of anaemia in HIV infected children in Lagos¹⁵ and Ellaurie *et al* who reported 94% in infected infants in New York⁵. However, the findings in the current study are more likely reflective of myelosuppressive effects of HIV infection because other diseases were excluded, such as sickle cell disease, malaria and hookworm infestation. The HIV virus may impair the survival and proliferative capacity of haematopoietic progenitor cells that differentiate to produce the peripheral blood cells⁸, in addition to blunting production of erythropoietin in anaemic HIV-infected patients, similar to the suppression seen in other states of chronic infection or inflammation¹⁶. Mild and moderate anaemia were seen in infected chil-

dren in this study but only mild anaemia was observed in the controls. A similar observation was made in a systematic review from a global perspective involving fifteen studies, where mild and moderate anaemia were more prevalent with HIV infection in both western and tropical settings, constituting 73% to 100% of cases¹⁷.

There was no documented case of severe anaemia in this study probably because majority of the subjects were in WHO clinical stages 1 and 2. However, a study by Adetifa in Lagos, Nigeria¹⁵, reported severe anaemia of 5.9% in their study. This increase in severity of anaemia observed in their study could be due to the fact that significant numbers of the subjects involved in their study were those with Centers for Disease Control (CDC)-defined AIDS (stage C); anaemia severity tends to increase with advancing HIV disease¹⁸⁻²⁰.

Higher prevalence of leucopenia (12%) and neutropenia (13%) were observed in HIV-infected children than in controls, while lymphocytopenia was seen in 3.3% of infected but in none of the controls. Similarly, Angeli *et al* noted leucopenia in 32 of 74 (43%) and lymphocytopenia in 59 of 74 (78%) in children with advance HIV infection in New York.²¹ Also another study in US by Zon and Groopman reported 13% prevalence of neutropenia in asymptomatic HIV-seropositive patients and in 44% of those with frank CDC-defined AIDS⁷⁵. Therefore, decrease of all types of white blood cells can occur in children with HIV infection, especially in those with

advanced disease¹⁹. Because HIV causes decreased colony growth of the committed progenitor cell, CFU-GM, leading to decreased production of both granulocytes, monocytes and other types of white blood cells¹⁹.

Thrombocytopenia was observed more in infected children than the controls. Also previous studies in children demonstrated thrombocytopenia in those with HIV infection^{22, 23}. Possible aetiologies of thrombocytopenia in patients with HIV infection include immune-mediated destruction, thrombotic thrombocytopenic purpura, impaired haematopoiesis⁴⁻⁸.

Even though anaemia in HIV infection could be caused by a variety of pathophysiologic mechanisms, however, in tropical areas where malaria infection is endemic, and other co-morbidities like parasitic infestations, vitamins and micronutrient deficiencies are important considerations. Therefore, effective treatment and prevention of these common causes of anaemia should nevertheless not be overlooked. This can be achieved through health education, hygiene and sanitation, use of insecticide-impregnated bed nets, and discouraging children from walking barefoot outdoors. Parents should be advised to introduce vitamins and micronutrients rich food to their infected children.

Conflict of Interest: None

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