ABSTRACT

Objectives: To enhance the care and management of human immunodeficiency virus (HIV) and pulmonary tuberculosis (TB) positive patients, as part of an overall effort to reduce morbidity and mortality of HIV-related death in Nigeria.

Methods: Hematological investigations were carried out on 205 patients suspected of HIV and/or TB, and 100 apparently healthy control subjects in Kwale, Agbor, and Eku in parts of Delta State, Nigeria from February 2006 to February 2008. World Health Organization systems 2 for HIV-1&2 antibodies screening technique was used for the screening of the subject's HIV status, Ziehl Nelson technique for TB, hematocrit, and Leishman staining techniques were used for full blood count determination.

Results: Our results showed that the mean packed cell volume obtained for infected subjects was statistically significant (p=0.0000074) when compared to the control subject's value. The mean neutrophil and eosinophil counts obtained were of specific disease diagnostic relevance when compared to the control group. T e gender related distributions of hematological indices were compared with the control group.

Conclusion: T e study confirms the importance of full blood count in the monitoring and management of HIV and TB infections.
The reduction in the number of circulating cells is a common complication of infection with human immunodeficiency virus (HIV) and tuberculosis (TB), and in the course of the disease, more than 70% of the patients develop anemia that frequently require transfusion.\(^1\) The most commonly employed hematological indices include packed cell volume (PCV), thrombocytes, total and differential leucocytes counts.\(^2\) Neutropenia, lymphopenia, and thrombocytopenia are common features, indicating that more than one hematopoietic lineage may be impaired. Dysfunction of the bone marrow was suggested as a possible mechanism, and the degree of cytopenia often reflect severity of the disease.\(^3\) Reports also indicate that as HIV disease progresses, the prevalence and severity of anemia increase. Anemia was found to significantly enhance progression to HIV/AIDS, and lead to an increased risk of death in patients with HIV.\(^4\) Many researchers have reported the significance of hematological indices in TB as dependent on the type of disease, and extent of infection.\(^5\) However, TB may occur in some patients with hematological disease by coincidence, or more probably arise as a result of opportunistic infection due to debility, or to impaired immunological response to infection, which characterizes the disease of the reticuloendothelial system. However, due to the dearth of information on hematological indices in HIV and TB in Nigeria, this study was undertaken to enhance the care and management of HIV and TB positive patients, as part of an overall effort to reduce mortality and morbidity of HIV related deaths.

**Methods.** A prospective study was conducted in 3 foci of Delta State with voluntary testing and counseling facilities namely, Kwale Central Hospital, Agbor Central Hospital, Eku Tuberculosis and Leprosy Referral Center, in Delta State from February 2006 to February 2008. The study areas of Agbor, Eku, and Kwale lie approximately between longitude 5°00’ and 6°45’ East, and latitude 5°00’ and 6°30’ North. The study area has a population of: 109,204 (Agbor), 113,929 (Eku), and 114,117 (Kwale).\(^6\) After informed consent were obtained, venous blood and sputum samples were collected from 205 patients suspected with HIV and/or tuberculosis into ethylene diamine-tetraacetic acid (EDTA) containers, and from 100 apparently healthy subjects by random sampling into clean universal containers. Subjects less than 10 years were not included during the course of study. All samples were analyzed immediately after collection. Human immunodeficiency virus screening was carried out using 2 enzyme-linked immunosorbent assay (ELISA) rapid screening kits, based on WHO systems-2 for detecting antibodies of HIV-1&2.\(^7\) To determine rapid screening, kits of Abbott Laboratories (M inato-Ku, Tokyo, Japan), and ImmunoComb II Organics (Courbevoie, France) were used in this study. Test was carried out according to the manufacturer’s instruction, and sputum were examined for Mycobacterium tuberculosis using Ziehl Nelson staining method.\(^8\) Hematocrit method and Leishman staining technique was carried out on all blood samples collected for the estimation of PCV, leukocyte, and differential counts.\(^9\) Ethical approval was obtained from the ethical committee of the Delta State Ministry of Health, and the hospitals located in the 3 foci where the study was carried out.

All the data generated were presented in tables and subjected to statistical analysis using one-way analysis of variance (ANOVA) and Graph Pad Prism version 5.

**Results.** The results obtained in this study showed the mean PCV of infected subjects with HIV, TB, and HIV/TB were statistically significant \((p=0.0000074)\), when compared with the control values. The mean neutrophil values obtained for HIV, TB, HIV/TB were statistically higher \((p=0.0000074)\), when compared with the control group. The mean lymphocyte count for HIV, TB, HIV/TB were statistically different \((p=0.0000074)\), when compared with the control group. Also, the mean eosinophil value for tuberculosis was statistically elevated \((p=0.0000074)\), when compared with the control group (Table 1). Table 2 shows that the male subjects’ mean PCV obtained for HIV, TB, and HIV/TB were significantly different \((p=0.0000037)\), when compared with the control values for male subjects. Similarly, the values obtained for female infected subjects, and HIV/TB mixed infections were significantly different \((p=0.0000110), when compared to the control values for females (Table 3). The males’ total leukocyte count for TB infected subjects was significantly elevated \((p=0.0000037)\), when compared to both control. On the contrary the female infected subjects’ HIV and HIV/TB co-infections total leukocytes was significantly reduced \((p=0.0000110)\), when compared to control and TB infection values. The mean lymphocyte count was significantly reduced \((p=0.0000110)\) in HIV and TB infected females when compared to controls, while the mean neutrophil of TB infected females was significantly higher \((p=0.4266930)\) than controls (Table 3).

**Discussion.** Human immunodeficiency virus fuels the TB epidemic in several ways,\(^9\) and promotes progression to active TB, both in people with recently acquired,\(^10\) and with latent TB\(^11\) infections. It was reported that PCV, thrombocytes, and total differential...
leucocyte counts are essential hematological indices, and that neutropenia, lymphopenia, and trombocytopenia are regular features in the prognosis of TB infections.

In this study, Table 1 showed a statistically significant reduction (p=0.0000074) in the hematological indices among HIV, TB, and HIV/TB subjects when compared with controls, especially the PCV, neutrophil, lymphocyte, and eosinophil. T is findings agreed with the report by Jacobson et al., that in HIV and TB infections, there is a reduction in the number of circulating cells, and 70% of the patients develop anemia and requires transfusion. T e anemia may be attributed to some factors earlier reported by Odunukwe et al.22 such as chronic diseases, opportunistic infections, and certain nutritional deficiencies. In addition, we confirm that neutropenia and lymphopenia are common features as reported by Acria.2 It has also been reported by Belperio and Rhew4 that anemia is a statistically significant predictor of progression to AIDS, and is independently associated with increased risk of death in patient with HIV.4 T ese may be attributed to the impairment of more than one hematopoietic lineage, in addition to the dysfunction of the bone marrow, which had been suggested as the possible mechanism.3

As reported by other researcher's, the significance of hematological indices in TB is dependent on the type of disease, and extent of infection.5 T is may be due to hematological diseases, opportunistic infections, and/or impaired immunological response to infection.

Packed cell volume (for HIV), and total leucocyte count (white blood cells [for TB infections]) were found to be statistically significant indices among males. T e marked elevated total leucocytes counts among males with TB infections are thought to be secondary to both

<table>
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<th>Parameters</th>
<th>Control n=100</th>
<th>HIV positive n=109</th>
<th>TB positive n=101</th>
<th>HIV/TB positive n=33</th>
<th>F test values</th>
<th>P-value</th>
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<tbody>
<tr>
<td>PCV</td>
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<td>25.9±0.6</td>
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<td>WBC</td>
<td>4648.0±170.0</td>
<td>4164.0±234.1</td>
<td>5480.9±75.9</td>
<td>5080.4±18.7</td>
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<td>Neutrophils</td>
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<td>62.9±1.6</td>
<td>62.5±1.4</td>
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<td>Lymphocyte</td>
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<td>36.0±1.5</td>
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<td>Eosinophil</td>
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</tr>
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</table>

HIV - human immunodeficiency virus, TB - tuberculosis, PCV - packed cell volume, WBC - white blood cells

Table 2 - Hematological indices of HIV, TB, and HIV/TB infected male patients and control subjects (Mean ± SEM).
immunological, and cellular response to the debilitating disease. Hence, apoptosis is often the fatal end result of the prognosis of TB in a resource-constrained settings like Nigeria. T e differences in total leukocytes response to TB infections according to gender may be hormonal, but the end results are similar. Lymphocytes were statistically reduced in HIV and TB infections. O kogun et al13 confirms the report that the reduction in circulating lymphocytes is a good approximate index of CD4 co-receptor (CD4+) counts in monitoring HIV prognosis and management. T ese facts also agreed with the earlier report by Acria2 that lymphopenia is common in HIV and TB infection, but did not differentiate between males and females. O ur hematocrit controls show that females are more prone to blood loss, implying higher strain on their erythropoietic activities, secondary to regulate menstrual blood flow, and when this is considered against the backdrop of a relatively poor nutritional status, the debilitating effect of HIV and TB infections in Africa is better understood.

Resource constraints were a major limitation of this study, in addition to the ability to persuade the patients to accept testing and counseling. T is study therefore, emphasizes the need for routine hematological investigations such as PCV, leucocyte, and lymphocyte counts as a monitoring tool to enable proper care and management of HIV and TB patients. In addition to improving the social conditions, chemotherapeutic effect, case finding, and prophylaxis by Bacille Calmette-Guérin (BCG) vaccination as suggested by Nwankwo et al,5 are also recommended, since recovery from anemia has been linked to improved survival outcomes.14 T is will however, go a long way to reduce morbidity and mortality associated with HIV and TB infections. Correlation of hematological indices with immunological factors such as CD4, CD8, T-cell ratio and cytokines may provide a more reliable management tool in the prognosis and management of HIV and TB infections.

References


Related topics
