ABSTRACT

HIV/AIDS is associated with systemic immune dysfunction which makes the body susceptible to certain opportunistic infections and tumours. The advent of HAART has shown to provide some desired improvement leading to altered patterns of clinical finding which includes the ocular manifestations.

**Objective:** To determine the socio-demographic association, frequency and types of ocular manifestations of HIV/AIDS in adult HIV positive patients in Enugu.

**Methods:** This was a hospital-based cross-sectional descriptive study. It comprised 331 randomly selected and consenting adult HIV positive patients on Highly Active Anti-Retroviral Therapy (HAART) at the retroviral disease clinic of UNTH Enugu, Nigeria. They had slit lamp examination of the anterior and posterior segment. Data was obtained using an interviewer administered semi-structured questionnaire. Data analysis was with SPSS version 21. Their demographic data...

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frequ

cy and pattern of ocular manifestations were presented in frequency and percentages. A p-

value of < 0.05 was used to define statistical significance at 95% confidence interval.

**Results:** The hospital prevalence of HIV related ocular manifestations was 18.4%. HIV

microangiopathy was the commonest (18.8%). Posterior segment ocular manifestations were the

commonest (37.7%) observed class of HIV ocular manifestations. Of those with HIV related ocular

manifestations, only 33.3% had a previous history of eye problem. There was no statistically

significant association between the socio-demographic variables and the ocular findings.

**Conclusion:** Pharmacotherapy has altered the overall clinical course of HIV/AIDS. However, HIV

related ocular manifestations are still common, though no association was found between the

demographic variables of the population and the ocular findings. We recommend that all patients on

follow up in for HIV/AIDS should continue to adhere strictly to recommended HAART regimen.

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**Keywords:** Ocular manifestations; HIV/AIDS; Enugu Nigeria; HAART.

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1. **INTRODUCTION**

Acquired immunodeficiency syndrome (AIDS) is a multisystem disease characterized by
decreased body immunity with the onset of a number of opportunistic infections and tumors
[1,2]. The etiology is human immunodeficiency virus (HIV), a retrovirus with elective tropism for
the T-helper lymphocytes (CD4+) transmitted through blood and bodily fluids [1,2] via unsafe
sex, parenteral route, and perinatal route [3,4]. Since the first case of acquired immunodeficiency
syndrome (AIDS) was diagnosed in 1981, the cases of human immunodeficiency virus (HIV) infection have
been increasing worldwide [5,6]. The first cases of HIV/AIDS in Nigeria were reported in Lagos
and Enugu in 1986 among commercial sex workers [7]. The ocular manifestations of HIV/AIDS, first reported by Holland et al. [8] may be the primary presentation of the disease [9,10] and can range from a simple blepharitis to blindness [11].

These ocular manifestations can be classified pathologically or anatomically [12,13]. Pathologically, the categories include non - infectious retinopathy, opportunistic infections, unusual neoplasm and neuro-ophthalmic manifestations. Anatomically, the categories include orbital manifestations, adnexal manifestations, anterior segment manifestations, posterior segment manifestations and neuro – ophthalmic manifestations.

The spectrum and prevalence of ocular diseases in HIV-infected patients in developing countries differ from those in developed countries where most of the studies have been done [14,15]. Cytomegalovirus retinitis seems to be more prevalent in the developed countries, unlike in developing countries where herpes zoster ophthalmicus is more prevalent [16]. This study hopes to show the pattern in our location and this will be compared to what is known in previous literature.

The pattern of ocular manifestations also varies between the pre- HAART and HAART era. In the pre HAART era, the major battle was with opportunistic ocular infections, however with the introduction of HAART, conditions such as immune recovery uveitis (IRU) emerged [17,18]. This study is aimed at determining the ocular manifestations of HIV/AIDS and associated socioeconomic factors in Adults on HAART in Enugu state with a view to providing a database and making recommendations for improved ocular health for these patients.

2. **MATERIALS AND METHODS**

This was a descriptive cross-sectional study of HIV positive adults on HAART in Enugu state which is one of the 36 States of Nigeria. It is bounded on the north by Kogi and Benue States, on the east by Ebonyi State, on the west by Anambra State and on the south by Abia State. During the data collection period, about 120 to 150 patients were seen daily at the antiretroviral therapy (ART) clinic of the University of Nigeria Teaching Hospital, Enugu, which was the point of data collection. A systematic random sampling technique was used to select the participants. A total of 331 participants responded.

The sample size was calculated using the formula

\[
\text{n} = \frac{z^2 \cdot \text{P} \cdot \text{Q}}{d^2}
\]

where n= minimum sample size, z= confidence limits of survey results; 95% (Z=1.96), P= proportion of target population with the
characteristics, \( q = 1 - P, d = \text{precision} \); 5% Using a hospital prevalence of HIV ocular manifestation of 26.3%, [19] the minimum sample size was:

\[
(1.96)^2 \times 0.263 \times 0.737 \times 0.05^2 = 297.7 = 298.
\]

Correcting for an attrition rate of 10% = 29.8, the minimum sample size was 328; however, 331 participants were recruited for the study.

Consenting adult (≥18 years) HIV positive patients were included in the study. Patients who due to impaired mental and/or physical state could not be examined or were pregnant were excluded. Anterior and posterior segment examinations were conducted using ophthalmic equipment/accessories such as slit lamp biomicroscope, +90D lens. Pretested semi-structured interviewer based questionnaires were used for data collection. Information obtained from the interview (such as bio-data, duration on HAART, regimen) and the clinical examination were recorded in the questionnaire. The examinations conducted include visual acuity, pen torch external eye examination, slit lamp adnexal, anterior and posterior segment examination.

The demographic data of the participants, frequency and pattern of ocular manifestations were recorded and presented in frequency and percentages. Data analysis was with Statistical Package for Social Sciences (SPSS) version 21. Chi square and Fisher’s Exact test was used to test for association and a \( p \) value of < 0.05 was considered significant.

3. RESULTS

Out of 331 patients who participated in the study, 252 (76.1%) were females. The male to female ratio was 1:3.2. Participants were aged between 22 and 81 years with a mean of 43.6 ± 9.9 years. A total of 61 participants (18.4%) had ocular manifestation.

The mean CD4+ cell count of the study participants was 575.0 ± 512.56 cells/µl, while that of those with ocular manifestations was 315.2 ± 290.76 cells/µl.

Table 1 shows the relationship between socio-demographic factors and ocular manifestations of HIV. The mean age of those with ocular manifestations was 45.0 ± 11.6 years. A majority (80.3%) of those with ocular manifestations were within the age range of 25–54 years. Females constituted 41 (67.2%) of those with ocular manifestations and most (30) of whom were married (49.2%). There was no statistically significant difference between these factors and the ocular findings.

Blurred vision, difficulty with near work and itching were the most common presenting complaints (Fig. 1). Also, participants noted to be blind had presenting visual acuity ≤ 3/60 i.e. 1.30LogMAR. None had severe visual impairment (presenting visual acuity ≤ 6/60 ≥ 3/60 i.e. 1.01 – 1.30LogMAR). The prevalence of visual impairment (VI) and blindness of 19.7% and 4.9% respectively was observed. (Fig. 2) Of the 3 (4.9%) noted to be blind, 2 had optic atrophy while the other had CMVR.

The most common diagnosis among the participants were HIV microangiopathy (18.8%), conjunctival microvasculopathy and keratoconjunctivitis sicca (14.5%). The most common class of ocular manifestation was posterior segment ocular manifestation (37.7%) while the least was neuro ophthalmic (10.1%). Most of the participants (97.9%) had an ocular symptom at time of interview and a few (32.6%) had previous history of ocular symptoms prior to HIV diagnosis. All those without any current ocular symptoms also had no HIV related ocular manifestation. However, there was no statistically significant association between reported symptoms and HIV related ocular manifestations (\( p > 0.05 \)).

4. DISCUSSION

The prevalence of ocular manifestation in this study was low compared with the report of other studies [19–22]. This low prevalence of ocular manifestations may be due to the fact that all the participants recruited were on HAART and most (63.1%) had been on HAART for more than 5 years. Higher prevalence reported by some researchers [20–23] was attributed to most of the patients being at WHO clinical stages III and IV, [21,22] as well as having low CD4+ cell count of less than 200 cells/µl [22]. Though these clinical parameters were not reported in this particular report, which is part of a larger study which also reported a wide range of systemic clinical/laboratory parameter, [24] compared to what was earlier reported in Ethiopia and Tanzania by Assefa et al and Sahoo respectively [21,22]. Other researchers have on the other hand noted lower
prevalence of ocular manifestation, which was attributed to good medication coverage [2,24]. A study in Brazil reported that no ocular manifestation of HIV was noted among the study participants and this was attributed to small sample size (42 participants) and the fact that all but one of those studied were on HAART [25]. However, the sample size difference could have accounted for the different observations in our population and theirs.

Blurred vision and difficulty reading were the most prevalent presenting symptoms. This is not surprising, considering the mean age of the study population who are within the presbyopic range and the fact that about 1/5th of the participants had some degree of visual impairment. This is much lower than a report by Adeniyi in Markudi, Nigeria which reported a prevalence of 15% and 45% for blindness and visual impairment, respectively [5]. An adducible reason to this was the fact that the majority were yet to commence HAART unlike this study where all respondents were on therapy with about 2/3rd of the study population on HAART for about 5 years. Also, blurring of vision was the most common symptom as shown in Adeniyi's report, however, over 30% of the population in the study were less than 30 years [5].

Table 1. Relationship between socio-demographic factors and HIV Related Ocular Manifestations (HROM) (N=331)

<table>
<thead>
<tr>
<th>Socio demographics</th>
<th>Manifestation of HROM</th>
<th>Chi-square trend test (Linear by linear test)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absent</td>
<td>Present</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>&lt; 25</td>
<td>2(0.7)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td></td>
<td>25-34</td>
<td>37(13.7)</td>
<td>7(11.5)</td>
</tr>
<tr>
<td></td>
<td>35-44</td>
<td>125(46.3)</td>
<td>24(39.3)</td>
</tr>
<tr>
<td></td>
<td>45-54</td>
<td>78(28.9)</td>
<td>18(29.5)</td>
</tr>
<tr>
<td></td>
<td>55-64</td>
<td>19(7.0)</td>
<td>5(8.2)</td>
</tr>
<tr>
<td></td>
<td>&gt;65</td>
<td>9(3.3)</td>
<td>7(11.5)</td>
</tr>
<tr>
<td>Educational Status</td>
<td>None</td>
<td>9(3.3)</td>
<td>5(8.2)</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>73(27.0)</td>
<td>16(26.2)</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>106(39.3)</td>
<td>20(32.8)</td>
</tr>
<tr>
<td></td>
<td>Tertiary</td>
<td>82(30.4)</td>
<td>20(32.8)</td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>59 (21.9)</td>
<td>20 (32.8)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>211(78.1)</td>
<td>41(67.2)</td>
</tr>
<tr>
<td>Marital Status</td>
<td>Single</td>
<td>50 (18.5)</td>
<td>13(21.3)</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>122(45.2)</td>
<td>30 (49.2)</td>
</tr>
<tr>
<td></td>
<td>Divorced</td>
<td>8(3.0)</td>
<td>2(3.3)</td>
</tr>
<tr>
<td></td>
<td>Separated</td>
<td>3(1.1)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
<td>87 (32.2)</td>
<td>16 (26.2)</td>
</tr>
<tr>
<td>Occupation</td>
<td>Civil Servant</td>
<td>62(23.0)</td>
<td>14 (23.0)</td>
</tr>
<tr>
<td></td>
<td>Trader</td>
<td>95(35.2)</td>
<td>20(32.3)</td>
</tr>
<tr>
<td></td>
<td>farmer/Agricultural worker</td>
<td>29 (10.7)</td>
<td>8 (13.1)</td>
</tr>
<tr>
<td></td>
<td>Artisan</td>
<td>35 (13.0)</td>
<td>14 (23.0)</td>
</tr>
<tr>
<td></td>
<td>Unemployed</td>
<td>32(11.9)</td>
<td>3(4.9)</td>
</tr>
<tr>
<td></td>
<td>Driver/ cyclist</td>
<td>4(1.5)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td></td>
<td>Military/ Paramilitary</td>
<td>2(0.7)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td></td>
<td>Health worker</td>
<td>3(1.1)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td></td>
<td>Self employed</td>
<td>7(2.6)</td>
<td>1(1.6)</td>
</tr>
<tr>
<td></td>
<td>Clergy</td>
<td>1(0.4)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>0(0.0)</td>
<td>1(1.6)</td>
</tr>
</tbody>
</table>
Fig. 1. Chart showing current ocular compliant/ symptoms among participants at time of review

Fig. 2. Visual status of 61 participants with ocular manifestations. (Key VI = Visual impairment)

Table 2. Frequency of ocular manifestations of HIV among the participants

<table>
<thead>
<tr>
<th>HIV Related Ocular Manifestations</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adnexal Manifestations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conjunctival microvasculopathy</td>
<td>10</td>
<td>14.5</td>
</tr>
<tr>
<td>Active Herpes zoster ophthalmicus</td>
<td>4</td>
<td>5.8</td>
</tr>
<tr>
<td>Squamous cell carcinoma</td>
<td>3</td>
<td>4.4</td>
</tr>
<tr>
<td>Molluscum contagiosum</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Anterior Segment Manifestations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keratoconjunctivitis sicca</td>
<td>10</td>
<td>14.5</td>
</tr>
<tr>
<td>Anterior Uveitis</td>
<td>6</td>
<td>8.7</td>
</tr>
<tr>
<td>Keratitis</td>
<td>2</td>
<td>2.9</td>
</tr>
</tbody>
</table>
Table 3. Showing classes of ocular manifestations of HIV among participants

<table>
<thead>
<tr>
<th>Types of HIV Related Ocular Manifestations</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adnexal</td>
<td>18</td>
<td>26.1</td>
</tr>
<tr>
<td>Ant. segment</td>
<td>18</td>
<td>26.1</td>
</tr>
<tr>
<td>Post segment</td>
<td>26</td>
<td>37.7</td>
</tr>
<tr>
<td>Neurophthalmic</td>
<td>7</td>
<td>10.1</td>
</tr>
<tr>
<td>Orbital</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Listo et al. [26] in their study reported that about 26% and 26.5% of the HIV related ocular manifestations, were found in the adnexa and anterior segment respectively. This may be attributed to more than half of their study participants being on HAART and at earlier stages of the disease (stages I and II). However, Bekele et al. [27] in another report showed that adnexal manifestations constituted only 12.8% while 12.3% were in the anterior segment. This difference may be because a majority of their study participants were not on HAART compared to ours who were all on therapy. Anterior segment ocular manifestations are said to occur at a higher CD4+ cell level compared with posterior segment manifestations [10,28]. Conjunctival microvasculopathy was observed as the commonest adnexal presentation in this study. This agrees with existing literature where it was reported in about 80% of presentations [29]. However, studies in Nigeria have shown herpes zoster ophthalmicus to be a common presentation among HIV positive patients sometimes preceding the diagnosis of HIV/AIDS [30,31]. Also in keeping suggestions by Feroze and Wang above [29].

Posterior segment manifestations were the most common class of ocular manifestation reported in this study and this is consistent with earlier reports Makurdi and Nepal [5,32]. Posterior segment manifestations are said to occur more in patients with CD4+ cell level lower than 200 cells/µl especially when not on HAART [10,28]. In this study however, all the participants were on HAART and most had CD4 count > 200 cells/µl (The mean CD4+ cell count of the study participants was 575.0±512.56 cells/µl) [33]. Similar to the proposal by other researchers, [27,33] HAART is commenced at lower levels of CD4+ count and the patients possibly could have developed the ocular manifestations before the commencement of HAART; also the newly reconstituted CD4+ cells may not be associated with the functional maturity to offer the required protection to the patients. These observations may explain the higher prevalence of posterior segment manifestations with seemingly high CD4+ cell levels in this study. HIV microangiopathy has been noted to occur more at later stages of HIV infection [6]. This may account for the lower prevalence of HIV microangiopathy reported in this study compared to the study by Azonobi et al. [34] since most of the patients in their study were at later stage of HIV infection compared to the participants in this study.

With the advent of HAART, a new entity, immune reconstitution inflammatory syndrome, part of which is immune recovery uveitis, has been introduced into the spectrum of ocular features associated with HIV/AIDS. Sudharshan et al. [23] observed that 17.4% of those with HIV related ocular manifestations had immune recovery uveitis and 36.2% had cytomegalovirus retinitis; these are higher than the findings of this study. Gogri et al. [10] observed that only 5% of those with HIV related ocular manifestations had immune recovery uveitis and 12.5% had cytomegalovirus retinitis. The prevalence of cytomegalovirus retinitis observed in this study...
falls within the range (0.2% to 4.8%) reported by other researchers in Nigeria [35–37]. Immune recovery uveitis, though mainly associated with cytomegalovirus retinitis has been documented to occur in association with other opportunistic infections [23].

Previous studies have reported neuro-ophthalmic features as a rare manifestation of HIV/AIDS [18,21,22,38]. The 10.2% obtained from those study though the least among the different groups of ocular manifestations, it is not a negligible proportion. The orbit has been documented to be rarely involved in HIV disease [32]. Studies by other researchers also show that no orbital manifestation was observed just like was observed in this study [11,39].

Omolase et al. [40] in Nigeria also noted that 12.5% of their participants had a history of eye problems.

This study appears to have the largest sample size among studies in the region, this is a potential source of strength. However, the study protocol did not permit assessment of ocular manifestations in pre-HAART patients. It would have been nice to have such comparisons in a single study.

5. CONCLUSION

The frequency of HROM in this population was comparatively low with a 1:2 M: F ratio. There was also no statistical association with any sociodemographic variable. The clinical profile (stage of disease, CD4+ count) and use of HAART were important factors noted in this study. As part of comprehensive care, it is necessary to ensure that PLWHA get ophthalmic examinations irrespective of their demographic and HAART status. To achieve this, it is important to integrate eye care services into the existing retroviral disease care.

CONSENT

As per international standard or university standard, patients’ written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The tenets of the Helsinki declaration and the National code of Health research ethics of Nigeria were adhered to and ethical approval was obtained from Health Research Ethics Committee (HREC) of the University of Nigeria Teaching Hospital, (UNTH) Ituku-Ozalla, Enugu, Nigeria, before the commencement of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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