OCULAR FINDINGS IN HIV-1 AND HIV-2 PATIENTS IN COTE D'IVOIRE; WEST AFRICA

BY

DR AGRE LOBAH JEREMIE (MD)

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DECLARATION

This dissertation is my original work and has not been presented for a degree in other university.

SIGNED..... **DATE.....**

DR AGRE LOBAH JEREMIE

APPROVAL

This dissertation has been submitted for the examination with our approval as university supervisors.

Signed.....Date.....9/9/08.....

PROF. M.S. MASINDE

MBCHB, M.MED (OPHTH) NBI, DCEH (LONDON)

ASSOCIATE PROFESSOR, DEPARTMENT OF OPHTHALMOLOGY

UNIVERSITY OF NAIROBI; KENYA

Signed.....Date.....

DR DUNERA ILAKO

MBCHB, M.MED (OPHTH) NBI, MBA-HEALTH (DURBAN), FEACO

SENIOR LECTURER, DEPARTMENT OF OPHTHALMOLOGY

UNIVERSITY OF NAIROBI; KENYA

Signed.....Date.....06/09/08.....

DR STEPHEN GICHUHI

MBCHB, M.MED (OPHTH) NBI, MBA, MSc (Epid.) LONDON, FEACO

LECTURER, DEPARTMENT OF OPHTHALMOLOGY

UNIVERSITY OF NAIROBI; KENYA

DEDICATION

To my beloved wife Marie Claire Rohon for encouragement and for sacrificing her career to allow me to carry out this postgraduate study.

To my daughters Monda Emmanuella, Jedidia Daniella and Lobah Ruth for the sacrifice of good moments.

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ABBREVIATIONS

1. AIDS- Acquired Immunodeficiency Syndrome
2. BCVA- Best Corrected visual acuity
3. CI-Cote D'Ivoire
4. DMH- Dabou Methodist Hospital
5. HAART- Highly Active Antiretroviral Treatment
6. HIV-1 Human Immunodeficiency Virus Type 1
7. HIV-2 Human Immunodeficiency Virus Type 2
8. HIV +ve - Human Immunodeficiency Virus-positive
9. HZO- Herpes Zoster Ophthalmicus
10. LE - Left Eye
11. NNRTI-Non nucleoside reverse transcriptase inhibitors
12. PVR-Proliferative vitreoretinopathy
13. RE - Right Eye
14. SPSS-Statistical Package for the Social Sciences
15. VA - Visual Acuity
16. WHO- World Health Organization

ABSTRACT

A cross sectional study was conducted to describe ocular findings in HIV-1 and HIV-2 patients attending the HIV clinic at Dabou Mission Hospital in Cote D'Ivoire (West Africa). The objective was to determine the prevalence and pattern of ocular findings among HIV-1, HIV-2 and dually infected patients.

METHOD:

All HIV positive patients more than 2 years old with a CD4 count, attending the HIV clinic during the study period were enrolled. The following clinical examinations were done; visual acuity, anterior segment and posterior segment with a slit lamp and fundus examination with dilated pupils. Data was collected using a questionnaire and analyzed using SPSS version 12.0. A significance level of 95% was used.

RESULT:

A total of 397 HIV positive patients were enrolled in the study; 279 females (70%) and 118 males (30%). The distribution of the study population by HIV type was as follows: HIV-1, 332 patients (84%); HIV-2, 17 (4%) and dually infected 48 (12%).

The prevalence of HIV related eye disease was 34.3% in HIV-1 group, 47.1% in HIV-2 group and 50% in the dually infected group. The difference was not statistically significant. The prevalence of ocular findings was 42.8% while the prevalence of HIV related eye disease was 36.8%. The mean absolute CD4 count was higher in HIV-2 patients (386 cells/mm3) followed by dually infected patients (295.9 cells/mm) and HIV-1 group (231.28 cells/mm3). There was more adnexal HIV related eye disease (29.5%) than anterior segment (1.8%) and posterior segment (11.1%). HIV retinopathy was more in HIV-2 (17.6%) than HIV-1 (5.7%) and HIV-1&2 (4.2%). However this was not statistically significant. CMV retinitis was seen only in HIV-1 (1.8%) and dual infection (4.2%).

CONCLUSION:

A relatively low prevalence of HIV related eye disease noted may be due to the fact that 75% of the study group was on HAART. The level of CD4 count plays a more important role in the development of ocular morbidity than the type of HIV.

1.0 INTRODUCTION AND LITERATURE REVIEW

In 1983 researchers working on HIV/AIDS discovered the primary causative agent HIV-1. Four years later a second type of virus HIV-2 was isolated from AIDS patients in West Africa **(1).** HIV-1 and HIV-2 share some similarities and differences **(2).**Both viruses can cause AIDS which in turn can affect the eye.

1.1 EPIDEMIOLOGY OF HIV

According to the UNAIDS report of 2006, about 39.5 million people worldwide are living with HIV and 2.9 million deaths occurred due to HIV **(3).** Most of these HIV infections occurred in Sub-Saharan Africa with 24.7 million cases (62%) reported and 2.1 million (72%) deaths **(3).** HIV infection in Africa is heterogeneous with four clusters; North Africa with a prevalence of less than 0.1%, West Africa with a prevalence ranging from 1 to 5 %, East Africa with a prevalence of about 7% and Southern Africa being the most affected with a prevalence ranging from 15 to 35% **(4).** HIV prevalence among pregnant women in Kenya has fallen from a peak of 13.4% in 2001 to 6.7% in 2004 **(4).** In Cote D'Ivoire a national survey done in 2005 revealed a national prevalence of 4.7 % with a female: male ratio of 2:1 **(5)**. A review of HIV tests done by HIV research projects (Projet Retroci) from 1987 to 1993 in Abidjan, Cote D'Ivoire revealed that HIV-1 was more predominant (86%) followed by the dual infection with HIV-1 & 2 (6%) and HIV-2 (4%) **(6)**. HIV-1 is sub classified into two genetic groups and the majority fall into the M (major) group. This M group has been further subdivided into several subtypes from A to J **(7)**. The second smaller group is classified as O (outlier). HIV-2 is sub classified into seven subtypes ranging from A to G. Only subtypes A and B are prevalent **(8).** Pieniazek et al in predominance of human immunodeficiency virus type 2 Subtype B in Abidjan, Cote D'Ivoire found that viruses of subtypes A and B have contributed to the HIV-2 epidemic in Cote D'Ivoire **(9).**

1.2 VIROLOGY AND PATHOGENESIS OF HIV

HIV is a spherical ribonucleic acid (RNA) virus particle with a diameter of 80-100 nm. The particle has an outer double lipid layer. The virus has a surface glycoprotein (gp120) and the trans-membrane protein (gp41). The later is the one which mediates the entry of the virus into the host cell. The core or capsid is made of several proteins: p24 (main protein), p17, p9 and p7. Within the capsid are two single strands of identical pieces of RNA. The virus contains a number of enzymes and the most important are: protease, integrase, reverse transcriptase. Reverse transcriptase converts viral single-strand RNA into double-strand DNA. The HIV life cycle in the host cell can be divided into several steps. The first step involves binding and interaction between glycoprotein envelope and the host cell receptors CD4. CD4 is an antigen found on T lymphocytes, macrophages, monocytes, glial cell of the brain and Langerhans cells. The major co-receptors are CCR5 and CXCR4. The receptors and co-receptors determine which cells the HIV virus will infect. The second step involves fusion between the HIV envelope and the host cell membrane. The third step involves the entry into the host cell and the release of the viral enzymes. The viral genetic material is then integrated into the host cell DNA and is used as a factory to produce more viral DNA. The basic effect on the immune system is CD4 cell depletion and dysfunction. Other immunological defects caused by HIV include lymphoid tissue destruction, CD8 cells dysfunction, B cell abnormalities, thymus dysfunction and autoimmune abnormalities **(10).**

The manifestations of opportunistic infections have a direct correlation with the absolute CD4 counts:

- CD4 count > 500-Asymptomatic
- CD4 count 250-500-tuberculosis and Candidosis
- CD4 count 150-250-Cryptococcal infection, Kaposi Sarcoma, Lymphoma
- CD4 count 75-125-Pneumocystis Carinii, Toxoplasmosis
- CD4 count < 50-Cytomegalovirus infections **(10).**

1.3 DIFFERENCES BETWEEN HIV-1 AND HIV-2

HIV-2 differs from HIV-1 by its geographical distribution, natural history, virology, and treatment modality **(1, 2).** HIV-2 infections are predominantly found in West African nations with a prevalence of more than 1% in the general population **(2).**

According to Grant et al, most people with HIV-2 infection have some epidemiological link to West Africa **(11).** The natural history of an HIV patient without treatment depends on the age and the type of virus. Without ARV, it takes approximately ten years from seroconversion to death **(10).** For patients aged 16 to 24 years at seroconversion, the median time to the onset of AIDS is 15 years, while for those aged more than 35 years it is 6 years **(10).**

HIV-1 and HIV-2 have the same modes of transmission and are associated with similar opportunistic infections at the stage of AIDS. Persons infected with HIV-1 are more infectious than those with HIV-2 early in the course of infection **(2).** Individuals infected with HIV-2 progress to AIDS and to death more slowly than those infected with HIV-1, but seem to experience the same spectrum of opportunistic infections when they reach the stage of advanced disease. The clinical spectrum is thus dependent more on the level of the CD4 count than the actual type of HIV virus involved **(12).** MacNeil et al studied the long-term intrapatient viral evolution during HIV-2 infection. He concluded that viral evolution occurs slowly in HIV-2 infection, which is consistent with the slow disease progression of HIV-2 **(13).**

A study done by Gody et al on the clinical manifestations of HIV1 and HIV-2 in Cote D'Ivoire found that the clinical symptoms of HIV/AIDS induced by HIV-1 and HIV-2 are indistinguishable **(14).** It appears that the proportion of AIDS cases induced by HIV-2 alone as well as the severity of the infection induced by this virus is lower than the proportion and severity of disease induced by HIV-1 alone. However patients with dual infection HIV-1 and HIV-2 exhibited a more progressive disease than those infected with HIV-1 or HIV-2 alone **(14).** In vitro study done by Kanki et al in interactions of HIV-1 and HIV-2 in West Africa postulated that the attenuated phenotype of HIV-2 is apparently capable of providing protection from subsequent infection with HIV-1 **(15).**

Nkengasong, in his prospective cohort study done on commercial sex workers dual infection with human immunodeficiency virus type 1 and type 2, concluded that dual infection does not appear to influence levels of HIV-1 viral load in vivo **(16).** Duval et al studied the delayed onset of AIDS in HIV-2-infected patients and concluded that HIV-2 patients have a well-preserved and functionally heterogeneous HIV-specific memory CD4+ T cell response that is associated with delayed disease progression in the majority of infected people **(17).** HIV-2 seems to be less transmissible from an infected mother to her child. It is estimated that without treatment, 1% of HIV-2 infected mothers transmit the infection on to their offspring compared to 42% of HIV-1 infected mothers **(1, 2).** In a retrospective study done by De Cock et al in maternal HIV-1 and HIV-2 infections and child survival in Abidjan, found that maternal HIV-2 infection has less influence on child survival than maternal infection with HIV-1 **(18).** HIV-2 is naturally resistant to non-nucleoside reverse transcriptase inhibitors **(1, 19).** In a study done in Abidjan by Adje et al on antiretroviral therapy, HIV-2 infected patients showed a reduced susceptibility to NNRT **(20).** Therefore NNRTI are not included in the treatment of HIV-2 infected patients.

1.4 OCULAR MANIFESTATIONS OF HIV

Cunningham et al in their review article on ocular manifestations of HIV noted that the common adnexal manifestations include herpes zoster ophthalmicus (HZO), Kaposi sarcoma, squamous cell carcinoma, molluscum contagiosum and conjunctival microvasculopathy. The anterior segment manifestations they cited include keratoconjunctivitis sicca, infectious keratitis and iridocyclitis. The notable posterior segment manifestations reported were retinal microvasculopathy, CMV retinitis, VZV retinitis, toxoplasmic choroido-retinitis, bacterial and fungal retinitis. Orbital manifestations of HIV include Orbital cellulitis, Orbital lymphoma and neuro-ophthalmic manifestations include papilledema, ocular motility disorders, cranial nerve palsies and visual field defects **(21).**

1.4.1 ADNEXAL AND ANTERIOR SEGMENT MANIFESTATIONS

Wilhelm et al analyzed the suspicious ocular lesions found in HIV seropositive outpatients in Cameroon. They found that the main ocular manifestations were uveitis (17.6%), squamous cell carcinoma of the conjunctiva (14.9%), herpes zoster ophthalmicus (14.9%), and corneal ulcers (11.0%) **(22).** Ndoye et al also studied ocular manifestations of HIV -1 and HIV -2 in Senegal and found a prevalence of 52.23%. They noted more findings in HIV -1 (77.14%) as compared to HIV-2. Patients with CD4 counts greater than 400 had conjunctivitis (one case, Kaposi sarcoma-related conjunctivitis), ophthalmic herpes zoster, and ocular dryness. The only ocular lesion in patients with CD4 counts between 200 and 400 was ophthalmic herpes zoster **(23)**.

In a case control study done by Porges et al on prevalence of HIV with conjunctival squamous cell neoplasia in an african provincial hospital among 23 patients, 52% had SCC, 18% had CIS and 22% had Kaposi sarcoma **(24).**

1.4.2 POSTERIOR SEGMENT MANIFESTATIONS

Ndoye et al in their study on ocular manifestations of HIV-1 and HIV-2 in Senegal noted that retinal pathology was by far the most frequently observed (63%). Patients with CD4 counts between 0 and 200 had macular edema, hyalitis, cotton-like nodules, retinal uveitis, and microangiopathy, while those with higher CD4 counts had none of these ocular lesions **(23)**.

Couchereau et al, studied the ocular manifestations of HIV/AIDS in 154 HIV-1 seropositive patients in Burundi, They found that 99% of their patients were seropositive for CMV and VZV. Ocular involvement comprised 16 cases of microangiopathy, six of opalescence of the anterior chamber, five of retinal perivasculitis, two of zoster ophthalmicus, two of viral retinitis, and one ofopalescence of the vitreous **(25).**

In a study done by Biswas et al, on ophthalmic and systemic manifestations of HIV infection in India in a series of 70 patients Thirty two (45.7%) had ocular lesions, the most common being cytomegalovirus retinitis (21.4%).

Other lesions included cotton-wool spots (12.8%), chorioretinitis (5.7%), endogenous endophthalmitis (8.5%), anterior uveitis (4.2%), and molluscum contagiosum (1.4%).
The most common systemic infection was pulmonary tuberculosis (50%). The others were oral candidiasis (41.4%), *Pneumocystitis carinii* pneumonia (11.4%), HIV enteropathy (12.8%) and toxoplasmosis (4.2%) **(26).** In a study done in Gambia, West Africa on retinal manifestations by Jaffar et al in 52 HIV-1 patients, 56 HIV-2 patients and 12 dually infected patients, they found cotton wool spot only in 3 patients with Hiv-1 and 1 dually infected. There was no retinal finding in patients with HIV-2 infection **(27).**

1.5 DIFFERING OCULAR MANIFESTATIONS IN DEVELOPED AND DEVELOPING COUNTRIES

Different prevalences and patterns of ocular manifestations have been reported in different parts of the world **(28).** Monteiro et al in Lisbon, Portugal noted a prevalence of ocular manifestations of 48% in HIV-1 patients and 19% of HIV-2 with **(36).**
A similar prevalence was reported in India by Biswas et al. They reported a prevalence of 45.7%, 21.4% of cytomegalovirus (CMV) retinitis. Other lesions included cotton-wool spots (12.8%), chorioretinitis (5.7%), endogenous endophthalmitis (8.5%), anterior uveitis (4.2%), and molluscum contagiosum (1.4%) **(26).**
In Brazil Muccioli et al in a study of 445 HIV/AIDS patients, found 52% of ocular lesions secondary to HIV in HIV infection at the initial examination. These lesions included CMV retinitis (25%), ocular toxoplasmosis (8.5%), herpes retinitis (3.6%), papilledema (2.2%), optic atrophy (1.6%), phthisis bulbi (1.5%), multifocal choroiditis (1.2%), retinal hemorrhages (0.9%), syphilitic uveitis (0.6%) and central retinal vein occlusion (0.2%) **(29).** In West Africa, Balo et al in a prospective study done in Togo, where they followed patients up to 20 months found a prevalence of 60.5% of ocular manifestations. The most frequent complications were cotton whool spots (25.5 %), cytomegalovirus (CMV) retinitis (21.5 %), retinal hemorrhage (6 %), papilloedema (3%), chorioretinal toxoplasmosis (3 %), peripheral retinal vascularitis (2.5 %), and herpes zoster ophthalmicus (2 %) **(30).**

Lewallen et al in a review article noted that while more than 25% of HIV-infected persons in developed countries have cytomegalovirus retinitis, this manifestation is uncommon in Africa. Instead, herpes zoster ophthalmicus and conjunctival squamous cell carcinoma predominates and is used as a marker for HIV infection in sub-Saharan Africa. They postulated that these differences result from different socioeconomic conditions and from different patterns of endemic disease present before the human immunodeficiency virus epidemic **(28).**

Grant et al in study done in Cote d'Ivoire among hospitalized HIV-infected adults in Abidjan, Cote d'Ivoire showed that, most HIV-infected individuals admitted to and dying in hospital in Abidjan were profoundly immunosuppressed **(31).**

2.0 RATIONALE FOR THE STUDY

The systemic manifestations of HIV-1 and HIV-2 have been extensively studied in Cote d'Ivoire and West Africa in general, but with few on ocular manifestations.

Not much is known about the ocular manifestations of HIV-1 and HIV-2 and dual infection. The ultimate ocular manifestations may be dependant on either the type of HIV or the ultimate CD4 count.

Therefore a study to explore this difference was considered.

3.0 OBJECTIVES

3.1 BROAD OBJECTIVE

The broad objective was to determine the prevalence and pattern of the ocular findings among HIV-1 and HIV-2 patients attending the HIV clinic at Dabou Methodist Hospital in Côte d'Ivoire, West Africa.

3.2 SPECIFIC OBJECTIVES

The specific objectives were:

1. To determine the prevalence of ocular findings among HIV-1, HIV-2 and dual infected patients attending the HIV clinic at Dabou Methodist Hospital.

2. To determine the pattern of ocular findings among HIV-1, HIV-2 and dual infected patients attending the HIV clinic at Dabou Methodist Hospital.

3. To correlate the ophthalmic lesions in these 3 populations HIV-1; HIV-2 and dual infection to the CD4 count.

4.0 METHODOLOGY

4.1 STUDY DESIGN

This was a cross sectional study in which HIV infected patients attending the HIV clinic were evaluated for ophthalmic disorders.

4.2 STUDY PERIOD

The study period was four weeks from 1st to 30 November 2007

4.3 STUDY SETTING

The study was conducted at Dabou Methodist Hospital, situated 50 Km from the capital city, Abidjan, and is equipped with a functional eye unit. The hospital provides follow up care for HIV patients and HAART.

4.4 STUDY POPULATION

The study population was comprised of HIV positive patients attending the HIV clinic.

4.5 INCLUSION CRITERIA

Patients diagnosed to have HIV-1, HIV-2 or dual infection with CD4 count attending the HIV clinic of Dabou Mission hospital and who also consented to participate in the study.

4.6 EXCLUSION CRITERIA

Patients who refused to give consent, those without CD4 count and children under the age of 2 years were excluded from the study.

4.7 SAMPLE SIZE

Ndoye et al in a study done in Dakar, Senegal on ocular manifestations of HIV-1 and HIV-2 found a prevalence of 52.23% **(22)**. This prevalence was used to calculate the sample size in the formula:

$n = [Z^2_{\alpha/2} * P * (1-P)]/\theta^2$

Where:

Z = the table value corresponding to 95% CI (1.96)

P = prevalence of HIV+ patients with ocular disorders (52%);

θ = preferred precision (0.05)

Substituting the above value in the formulae above we get;

$n = [1.96^2_{\alpha/2} * 52\% * (1-52\%)]/0.05^2$

$= [3.864 * 0.52 * 0.48]/0.0025 = 384.545 \approx 384$ patients

The total sample of 384 was apportioned to the 3 different HIV types according to their prevalence in the general population in Côte D'Ivoire.

HIV Type	Proportionate Sample allocation
HIV-1 (86%)	86% * 384 = 126.57 ≈ 330
HIV-2 (4%)	4% * 384 = 7.67 ≈ 14
HIV-1 + HIV- 2 (10%)	10% * 384 = 249.54 ≈ 38
Total	**384**

4.8 SAMPLING OF PATIENTS AT THE HOSPITAL

All patients who attended the HIV clinic during a period from 1st to 31st November 2007 were enrolled in the study. A questionnaire was used to register the ocular complaints, the history-taking and the clinical findings (Appendix 7). Visual acuity was taken with a Snellens' Chart and examination of the anterior segment was done with a Haag Streit slit lamp. A dilated pupil fundus examination was carried out in all patients with both indirect binocular ophthalmoscope and slit lamp with 90D loupe. The principal investigator did all the examination. Anterior and posterior segments pictures were taken for some patients with pertinent findings. Patients requiring treatment for allergy conjunctivitis, uveitis and CMV retinitis were treated. Those with dense cataracts requiring surgery were operated on at the same hospital at no cost. Those with systemic condition like Kaposi sarcoma were referred to physicians for evaluation and treatment.

4.9 MATERIALS

The materials used during the study were:

- A formulated questionnaire (appendix 7)
- Pens and notes book
- Coloured pencils
- Scheme for fundus drawing (appendix 8)
- Torches
- Snellen & Lea Chart
- Slit lamp with applanation tonometer
- Direct & indirect ophthalmoscope
- Loupes +20 & 90 DS
- Mydriatics
- Camera Topcon (Fundus camera)

4.10 DATA ANALYSIS

The data was collected using a structured questionnaire in English, administered by the principal investigator, and translated to French. The data collected was cleaned, stored and analyzed using SPSS version 12.0.1 (Statistical Package for Social scientists). Comparisons were done using appropriate statistical tests.

The proportions of various ocular findings were described, giving standard deviations and confidence intervals. A 95% level of significance was used.

The findings are presented in histograms, pie chart, tables and frequency tables.

4.11 ETHICAL CONSIDERATIONS

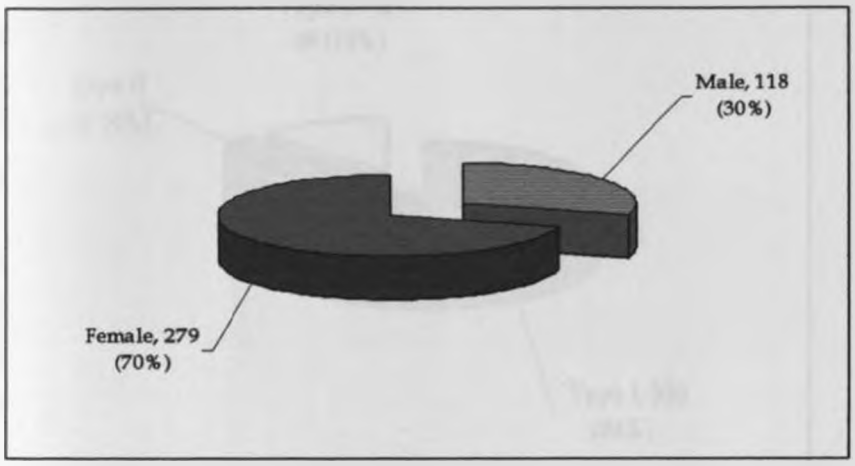
Informed written consent was obtained from all patients who were willing to be enrolled in this study. Ethical approval was obtained from the hospital board and Ivorian national ethical committee.

4.12 STUDY LIMITATIONS

The proportionate sampling based on the prevalence in the general population assigned few patients for the HIV-2 population and duo infected patients. This has made a comparison of prevalence and pattern less realistic.

RESULTS

Figure 1: Distribution by Sex (n = 397)



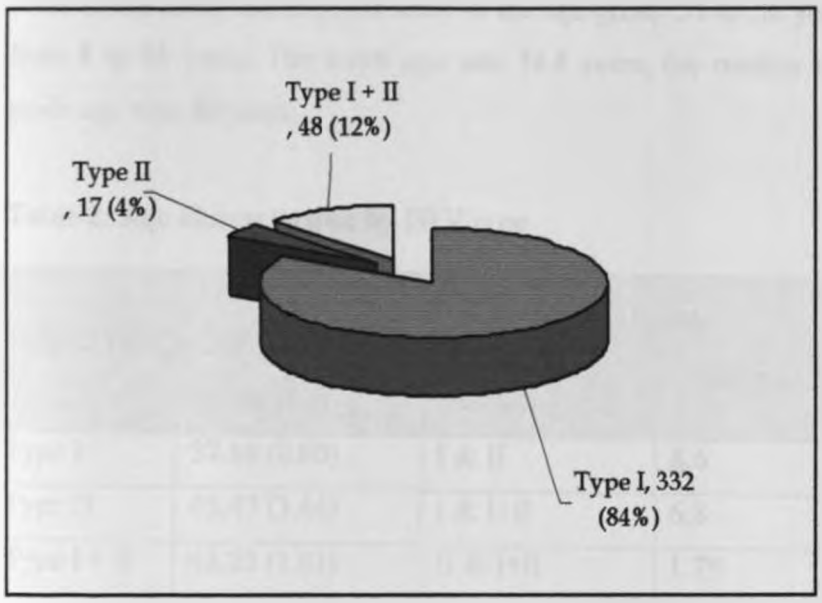
The study enrolled 397 HIV positive patients. Seventy percent 279 (70%) were females and 118 (30%) were males.

Table 1: Sex distribution by HIV type (n = 397)

Type of HIV	Sex		Total, n (%)
	Male, n (%)	Female, n (%)	
Type I	97 (29.2)	235 (70.8)	332 (100.0)
Type II	7 (41.2)	10 (58.8)	17 (100.0)
Type I + II	14 (29.2)	34 (70.8)	48 (100.00)
Total	118 (30)	279 (70)	397 (100.00)

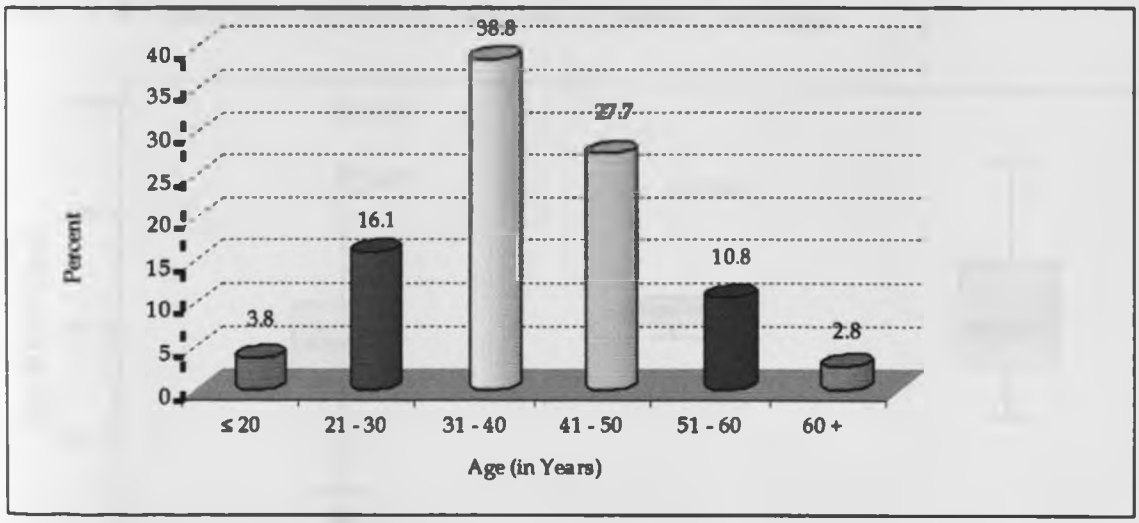
The HIV- 1 was the most predominant with 84% of the cases, HIV- 2 was the least with 4% and HIV-1 & 2 was 12%.

Figure 2: Classification of the study Patients by HIV type (n = 397)



The highest number of participants were HIV-1 representing 84% of the total population. This was predetermined by the proportionate sampling according to the repartition in the general population.

Figure 3: Distribution of the study participants by Age (n = 397)



Most of the study participants were in the age group 31 to 50 years of age. Age ranged from 8 to 65 years. The mean age was 38.8 years, the median was 38.0 years and the mode age was 40 years.

Table 2: Age characteristic by HIV type

Type of HIV	Age Characteristic Mean, (SE)	Mean Comparison Between	Mean Difference	95% CI	P-value
Type I	37.80 (0.60)	I & II	8.6	0.69-16.54	***0.033***
Type II	45.47 (3.44)	I & I+II	6.8	1.34-12.31	***0.015***
Type I + II	43.23 (1.63)	II & I+II	1.79	-8.18-11.76	0.714

To justify which means differ, an independent sample T-test was done as shown in the figure below;

The mean age differed significantly between I and II (p=0.033), between type I & dual infection (p=0.015), but mean not significant between types II & dual infection (p=0.714, 95%CI of (-8.18-11.76), this CI includes Zero values hence not significantly different.

Figure 4: Box plot showing the age variation of patient / HIV type

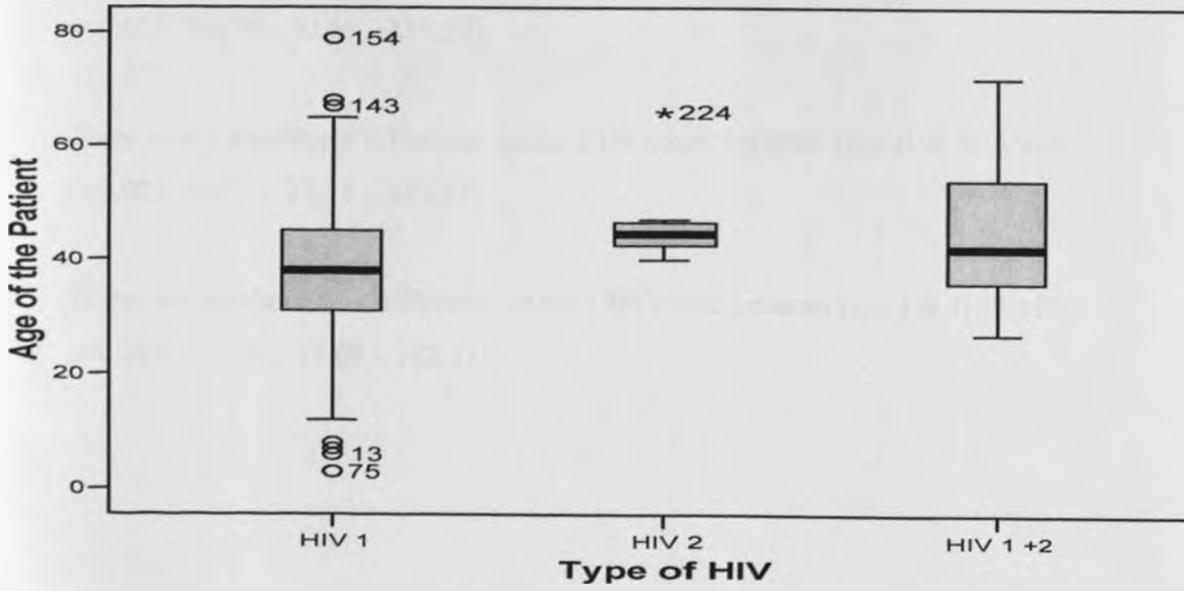


Table 3: Distribution of the initial CD4 Count by HIV type (n = 397)

Type of HIV	Statistic			
	Mean	Median	Maximum	Minimum
Type I	231.28	184.5	1,035	1
Type II	386	355	744	85
Type I + II	295.9	249.5	1,128	6
Total	224.07	202.0	1,134	1

Table 4: Comparison of the initial CD4 Count / HIV type (n = 397)

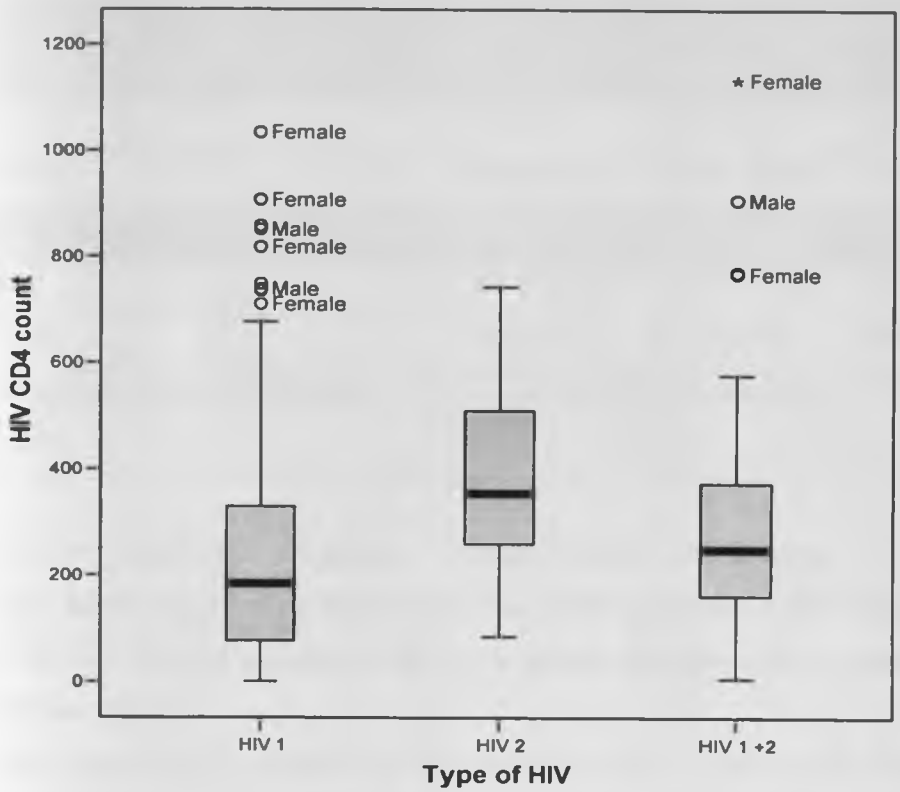
Type of HIV	Mean CD4 Count	Mean Comparison Between	Mean Difference	95% CI	P-value
Type I	231.28	I & II	170.0	30.56 – 310.39	***0.017***
Type II	386	I & I+II	10.72	**-81.69 – 103.13**	0.819
Type I + II	295.9	II & I+II	181.19	25.58 – 333.81	***0.022***

- There was a significant difference in the CD4 count between HIV-I and II with p=0.017 (95CI%; 30.56 – 310.39).

- There was a significant difference in the CD4 count between type II & II+I with p=0.022 (95CI% ,25.58 – 333.81)

- There was no significant difference in the CD4 count between type I & II +I with p=0.819 (95CI%, -81.69 – 103.13).

Figure 5: Box Plot of CD4 count by HIV type



The CD4 count of the HIV-2 was significantly higher than the other types.

Table 5: Distribution of the Last CD4 Count by HIV type (n = 244)

Type of HIV	Statistic			
	Mean	Median	Maximum	Minimum
Type I	450	401.0	2,000	4
Type II	494.50	474.50	783	163
Type I + II	418.67	424.50	914	101
Total	449.50	404.50	2,000	4

The mean initial CD4 count was 224.07 compared to the last CD4 count which was 449.50. There was a significant improvement in CD4 with a p-value < 0.001 and a 95% CI (191.28 to 259.57).

Table 6: Distribution of Hospital Admission and ARV/HIV type

Ever Admitted*		Type of HIV		
	Total	I	II	II + I
Yes	88 (22.2)	81 (24.4)	1 (5.0)	6 (12.5)
Never	309 (77.8)	251 (75.6)	16 (95.0)	42 (87.5)
On ARV status**				
Yes	301 (75.8)	257 (77.4)	9 (52.9)	35 (72.9)
Never	96 (24.2)	75 (22.6)	8 (47.1)	13 (27.1)
Mean duration of ARV (SE) in months	14.56 (0.62)	14.76 (0.67)	9.79 (3.67)	14.35 (1.86)

P-value = 0.046* (Ever Admitted) P-value = 0.063** (ARV status)

Three hundred and one patients (75.8%) out of 397 were on HAART. The mean duration of HAART was 14 months for HIV-1; 9 months for HIV-2 and 14 months for dually infected patients.

Eighty eight (22.2%) patients out of 397 had a history of at least one admission in the course of the disease. 81(24.4%) in HIV-1; 6(12.5%) in HIV-1 & 2 and 1(5.9%) in HIV-2 with a significant P value (p value= 0.046).

Table 7: Distribution of hospital admission and ARV/count CD4

Ever Admitted*	Type of HIV, Mean CD4 count		
	I	II	II + I
Yes	167.0	197.0	292.4
Never	252.0	398.1	320
P-value	<0.001	0.356	0.789
On ARV status**			
Yes	176.3	282.3	199.5
Never	419.7	503.1	555.5
p-value	<0.001	0.020	<0.001

Among the patients who had a last CD4 count done we noticed a significant increase of the absolute CD4 count in the three groups with a significant p value. The absolute CD4 count had increased from 224 to 449 after the use of HAART. In general the patients who are not on HAART had almost twice the number of absolute CD4 count of those who were on HAART. The mean CD4 count is higher in HIV-2 group (282.3) followed by HIV-1 & 2 (199.5) and HIV-1 (176.3).

Table 8: AIDS-defining events by HIV type (n = 397)

Opportunistic infections		Type of HIV			P-value
	Total	I	II	II + I	
Wasting	321 (80.9)	272(81.9)	11(64.7)	39(81.2)	0.223
Fever	306 (77.1)	256(77.1)	13(76.5)	37(77.0)	0.998
Diarrhea	189 (47.6)	158(47.6)	6(35.3)	25(52.0)	0.786
Herpes Zoster	160 (40.3)	135(40.6)	5(29.4)	20(41.6)	0.640
Oral thrush	102 (25.7)	95(28.6)	3(17.6)	7(14.6)	0.111
TB	81 (20.4)	71(21.4)	1(5.8)	9(18.7)	0.289
Toxoplasmosis	6 (1.5)	6(2.0)	-	-	-
Meningitis	1 (0.3)	1(0.3)	-	-	-

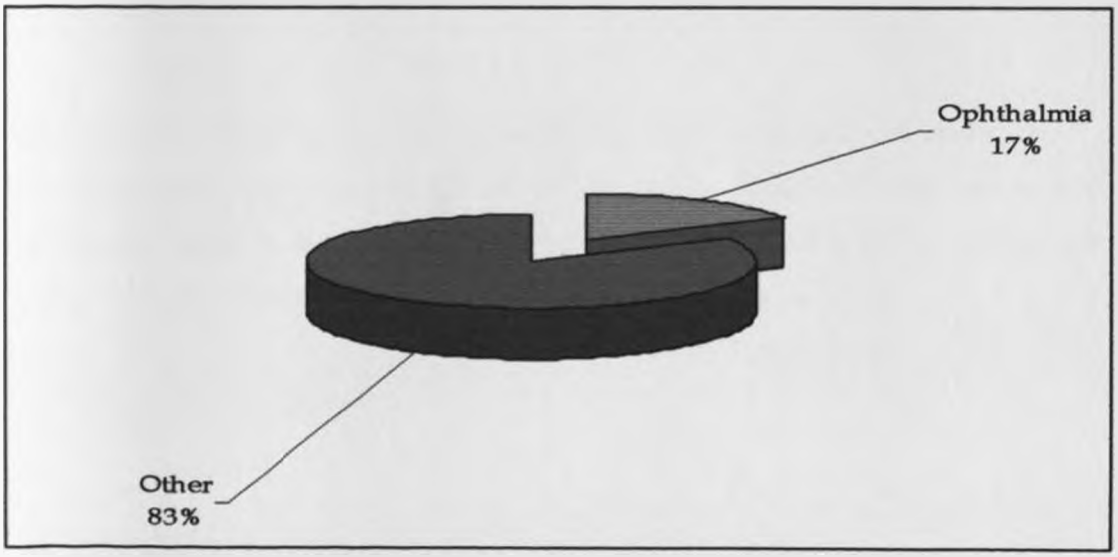
The predominant systemic features across all the HIV type were the triad wasting-fever and chronic diarrhea. Out of 81 patients who had TB, 78 had PTB (96.3%) and 3 abdominal TB (3.7%). TB was a predominant feature in patient with HIV-1 though this was not statistically significant.

Table 9: AIDS-defining events versus mean CD4 (n = 397)

Opportunistic infections	Type of HIV, Mean CD4			P-value
	I	II	II + I	
Wasting	223.2	322.9	224.4	<0.001
Fever	214.7	362.7	225.6	<0.001
Diarrhea	185.0	311.8	216.3	<0.001
HZO	197.9	351.0	233.4	0.002
Oral thrush	199.5	416.3	227.6	0.028
TB	215.2	260.0	355.7	0.475
Toxoplasmosis	125.2	-	-	-
Meningitis	69.0	-	-	-

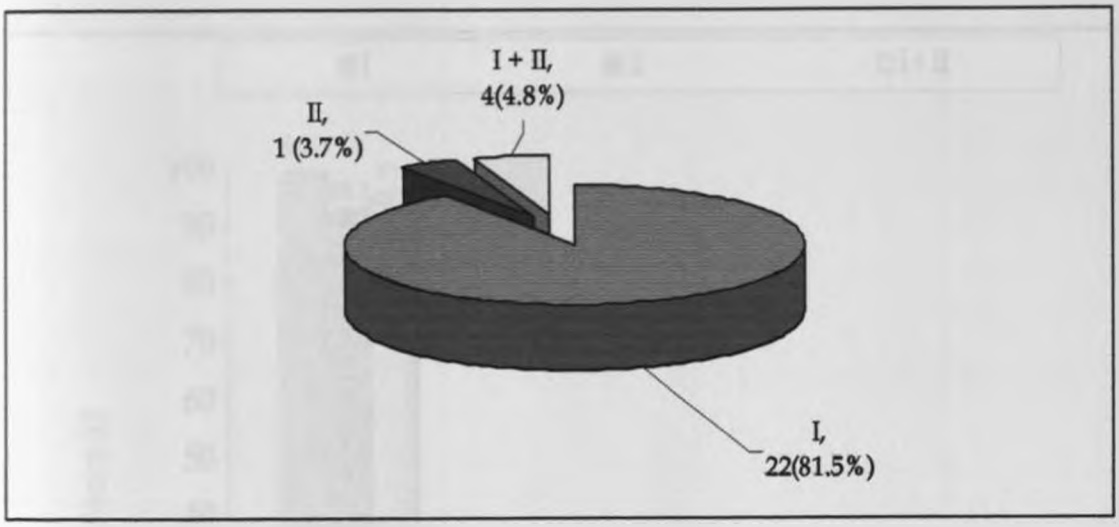
In general patients in HIV-1 group had the lower CD4 count follow by HIV-1 & 2 group and HIV-2 group. Diarrhea, Herpes zoster, oral candidosis, toxoplasmosis, and meningitis are noticed in patient with HIV-1 group at CD4 count below 200. In HIV-2 and dual infected groups all patients had a mean CD4 count above 200.

Figure 6: Distribution of Herpes Zoster (past medical history) (n = 160)



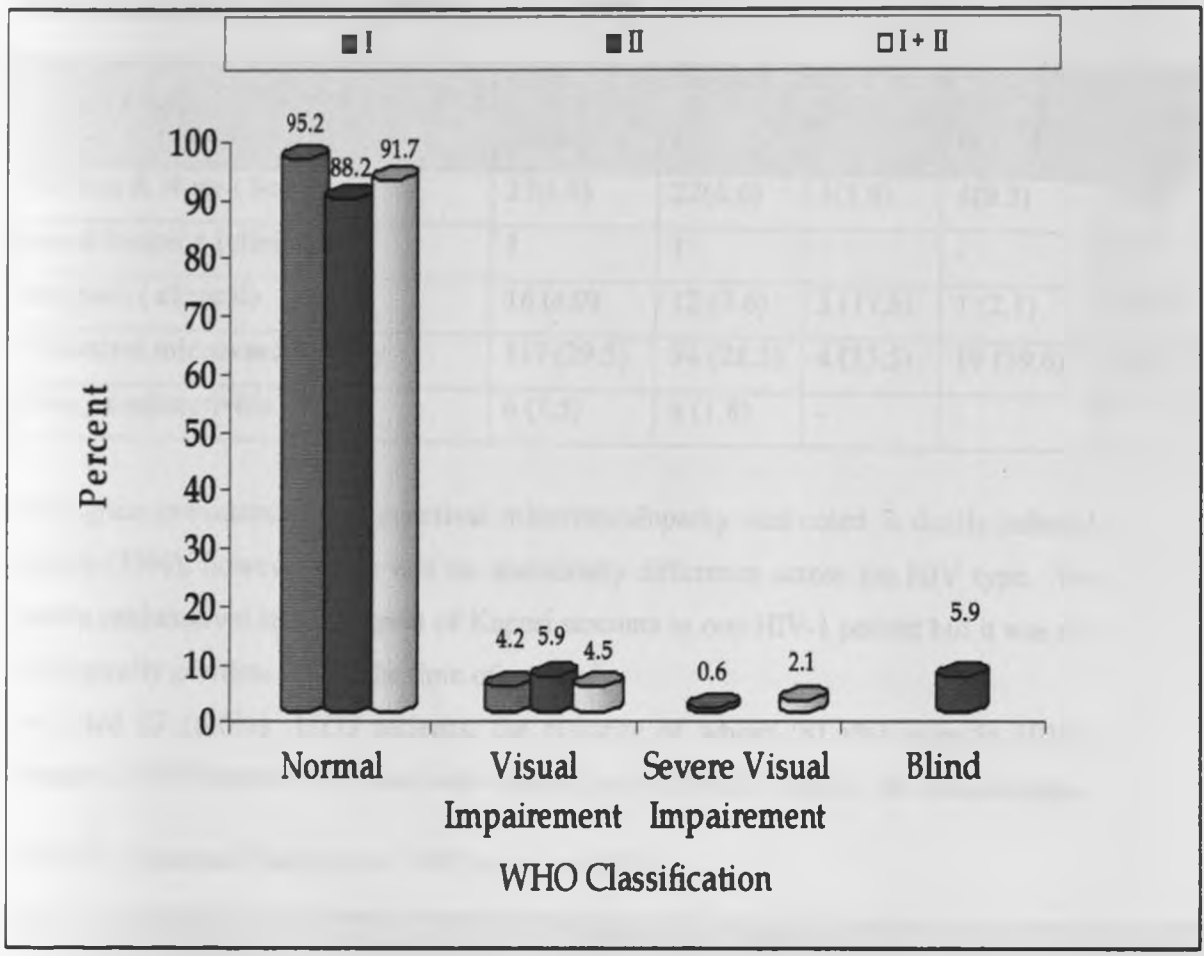
17% had Herpes Zoster Ophthalmia and 83% had other localization of Herpes Zoster (Thoracic-Lumbar-Sacrococcygeal)

Figure 7: Herpes Zoster Ophthalmicus scars versus HIV type (n=27)



22(81.5%) patients from HIV-1 group, 4(4.8%) from HIV-1 & 2 group and 1(3.7%) from HIV-2 group had HZO.

Figure 8: Distribution of VA according to WHO/HIV type (n=397)



There was no difference in VA between the HIV-1, HIV-2 and dually infected patients. The HIV related eye diseases found in our series were unilateral since WHO classification takes in account the better eye. One patient from HIV-2 group had a bilateral couching done by a traditional doctor and is classified as blind.

Table 10: Adnexal Findings / HIV type (n = 397)

Adnexal Findings		Type of HIV			p-value
	Total	I	II	II + I	
HZO lids & Nose (Scar)	27(6.8)	22(6.6)	1(5.8)	4(8.3)	0.897
Kaposi Sarcoma (clinical)	1	1	-	-	-
Pterygium (clinical)	16 (4.0)	12 (3.6)	3 (17.6)	1 (2.1)	*0.012*
Conjuctival microvasculopathy	117 (29.5)	94 (28.3)	4 (23.5)	19 (39.6)	0.239
Allergy conjunctivitis	6 (1.5)	6 (1.8)	-	-	-

The highest prevalence of conjunctival microvasculopathy was noted in dually infected patients (39%), however there was no statistically difference across the HIV type. We noted a conjunctival lesion suspect of Kaposi sarcoma in one HIV-1 patient but it was not histologically confirm during the time of our study.

We noted 27 (6.6%) HZO patients, the majority of whom (81.4%) were in HIV-1 category. Note however that, these were patients with old HZO scars of the lids and nose.

Table 11: Adnexal Findings vs. HIV type (n = 397)

Adnexal Findings	Type of HIV, mean CD4			p-value
	I	II	II + I	
HZO lids & Nose (Scar)	236.2	128.5	238.8	***0.675***
Kaposi Sarcoma (clinical)	90.0	-	-	-
Pterygium (clinical)	199.5	416.3	227.6	0.028
Conjuctival microvasculopathy	215.6	290.8	278.7	0.270
Allergy conjunctivitis	382.3	-	-	-

The mean CD4 counts for patients with adnexal findings were above 200 except for HZO in HIV-2 patients.

Table 12: Anterior Segment vs. HIV type (n = 397)

Anterior Findings		Type of HIV			p-value
	Total	I	II	II + I	
Dry Eye Sx (DES)	42 (10.6)	33 (9.9)	4 (23.5)	5 (10.4)	0.206
Keratitis (bacterial)	1 (0.3)	-	-	1 (2.1)	-
Anterior Uveitis	6 (1.5)	5 (1.5)	1 (5.9)	-	0.551
Cataract	21 (5.3)	15 (4.5)	2 (11.8)	4 (8.3)	0.259

The most common anterior segment findings were dry eye syndrome (10.6%) followed by cataract (5.3%). These anterior segment findings were not statistically significant across the different HIV types. The overall prevalence of anterior segment findings across all HIV types was 1.8%.

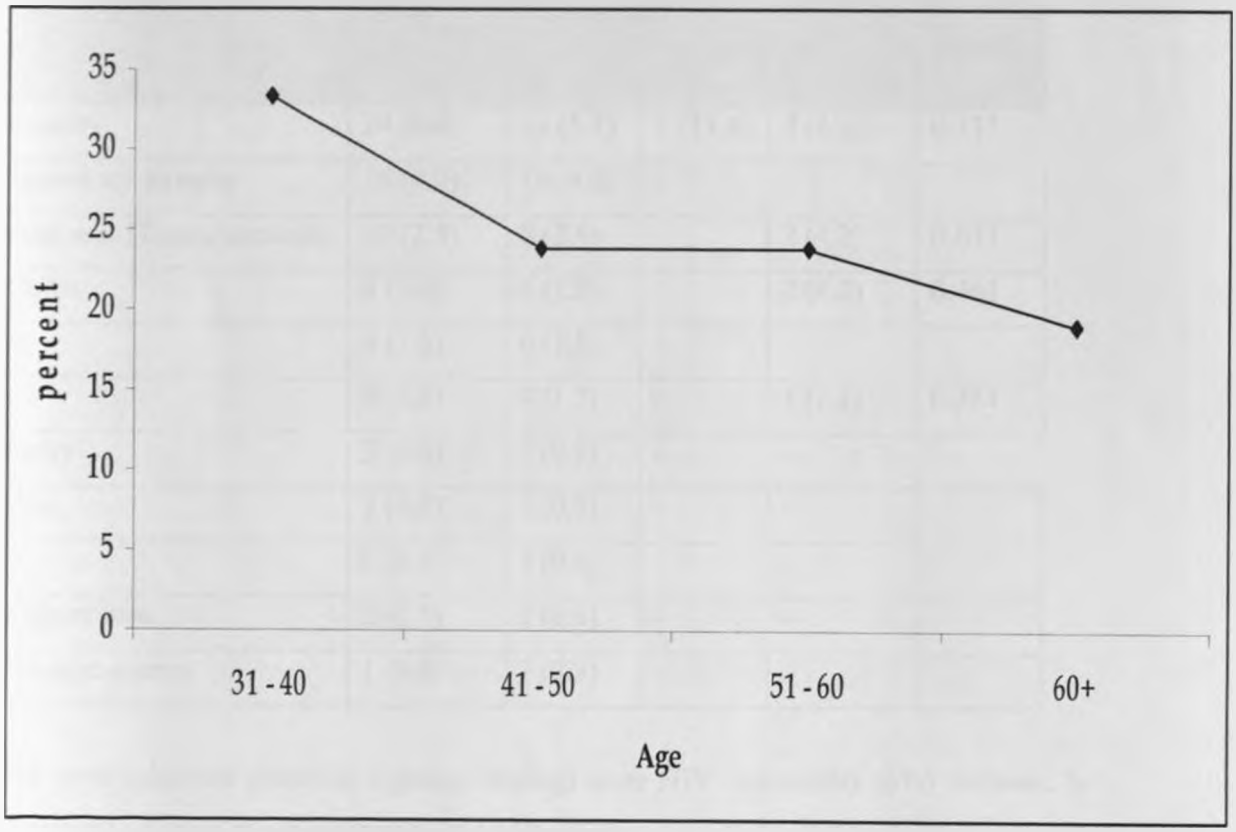
The mean age of those who had cataract was 50 years while those without was 38.18 years. The mean difference was 11.8, 95%CI of (6.9 – 16.7) with a p-value <0.001.

Table 13: Anterior Segment vs. HIV type (n = 397)

Anterior Findings	Type of HIV, mean CD4			p-value
	I	II	II + I	
Dry Eye Sx (DES)	189.6	422.3	234.0	0.332
Keratitis (bacterial)	-	-	85.0	-
Anterior Uveitis	107.7	280.0	-	0.427
Cataract	236.2	128.5	238.8	0.654

There is no statistically significant difference in the mean CD4 count across the HIV type.

Figure 9: Age distribution for the patients with cataracts (n = 21)



The mean age of those who had cataracts was 50 years while those without was 38.18 years. The mean difference was 11.8, 95%CI of (6.9 – 16.7) and p-value of <0.001.

Table 14: Posterior segment Findings/HIV type (n = 397)

Posterior Findings		Type of HIV			p-value
	Total	I	II	II + I	
HIV retinopathy	24 (6.0)	19 (5.7)	3 (17.6)	2 (4.2)	0.111
Retinal Pigmentary atrophy	16 (4.0)	16 (4.8)	-	-	
Chorioretinal scar (Toxoplasmosis)	10 (2.5)	8 (2.4)	-	2 (4.2)	0.611
CMV Retinitis	8 (2.0)	6 (1.8)	-	2 (4.2)	0.461
Glaucoma	6 (1.5)	6 (1.8)	-	-	
Vitritis	5 (1.3)	4 (1.2)	-	1 (1.2)	0.784
Optic Atrophy	3 (0.8)	3 (0.9)	-	-	
Papilledema	3 (0.8)	3 (0.9)	-	-	
PVR	2 (0.5)	2 (0.6)	-	-	
Retinitis Pigmentosa	2 (0.5)	2 (0.6)	-	-	
Cystoid Macular edema	1 (0.3)	1 (0.3)	-	-	

The most common posterior segment findings were HIV retinopathy (6%) followed by chorioretinal scar (toxoplasmosis) and CMV retinitis.

The only posterior segment finding in HIV-2 group was HIV retinopathy.

Despite the fact that HIV-1 patients had a higher prevalence of posterior segment findings compared to the dually infected patients, it was not statistically significant.

Table 15: Posterior Segment Findings /HIV type (n = 397)

Posterior Findings	Type of HIV, mean CD4			p-value
	I	II	II + I	
CMV Retinitis	74.9	-	74.8	0.765
Cystoid Macular edema	365.0	-	-	-
Glaucoma	151.2	-	-	-
HIV retinopathy	118.8	511.7	161.5	0.063
Optic Atrophy	325.7	-	-	-
Papilledema	277.7	-	-	-
PVR	177.0	-	-	-
Retinal Pigmentary atrophy	334.0	-	-	-
Retinitis Pigmentosa	226.0	-	-	-
Chorioretinal scar	234.4	-	324.5	0.324
Vitritis	434.6	-	342.6	0.645

PREVALENCES

Table 16: Ocular findings across HIV types

	Type of HIV, n (%)				
	I, II; I+II	**I**	**II**	**I+II**	**P-values**
Adnexal	**128 (29.5)**	101 (30.4)	7 (41.2)	20 (41.7)	0.215
Anterior Segment	**64 (1.8)**	48 (14.5)	7 (41.2)	9 (18.8)	***0.012***
Posterior Segment	**73 (11.1)**	62 (18.7)	4 (23.5)	7 (14.6)	0.677
Overall Prevalence	**203 (42.5)**	**163 (49.1)**	**10 (58.8)**	**30 (62.5)**	**0.179**

The prevalence of ocular findings is 42.5%.

There is no statistically significant difference in the prevalence of adnexal and posterior segment findings across the HIV type.

There are more anterior segment findings in HIV-2 as compare to HIV-1 and dual infection and this is statistically significant.

Table 17: Prevalence of HIV related eye diseases

	Type of HIV, n (%)				
	I, II; I+II	**I**	**II**	**I+II**	**P-values**
Adnexal	**117 (29.5)**	94 (28.3)	4 (23.5)	19(39.6)	0.239
Anterior Segment	**7 (1.8)**	5(1.5)	1(5.9)	1(2.1)	*0.402*
Posterior Segment	**44 (11.1)**	35(10.5)	3(17.6)	6(12.5)	0.625
Overall Prevalence	**146 (36.8)**	**114 (34.3%)**	**8 (47.1%)**	**24 (50%)**	**0.073**

The prevalence of HIV related eye diseases in this study population is 36.8%.

There is no statistically significant difference in the prevalence of HIV related eye disease across the HIV types.

This study found 30% of ocular conditions which are treatable or need follow up by an eye specialist.

6.0 DISCUSSIONS

This study was done from 1st to 30th November in the HIV clinic of Dabou Methodist hospital enrolled 397 patients. All the patients who visited the clinic and consented were seen. Only one patient refused to give consent and was excluded.

6.1 DISTRIBUTION BY SEX, AGE AND THE INITIAL CD4 COUNT BY HIV TYPE

The male : female ratio of this study population was 1 to 2.36 (figure 1). This distribution is similar to the result of the national survey on the indicators of HIV/AIDS with a prevalence of 6.4% among female while it is only 2.9% among Ivorian male **(5).** This pattern differs from the male-female ratio of Cote D'Ivoire which is 1.014 to 1 between the age of 15 and 65 **(32).** The higher prevalence may be attributed to the fact that female are more at risk of acquiring the HIV infection.

The most affected group was between 30 and 40 years. This finding is consistent with the results of the national survey which showed a peak infection between 30 and 40 years. Patients with HIV-2 were older (45.47 years) compared to HIV-1 patients (37.8 years) with a significant p value. Martinez in a study done in Gambia found a similar pattern **(33).** Studies done by Eholie et al and Ndoye et al also reported the same pattern **(12, 23).** The median age in HIV-1 patients was 34.2 years while it was 39 in HIV-2 population.

In general patients with HIV-2 had a higher initial absolute CD4 count with a mean of 386 and the median of 355 ranging from 85 to 744 while the mean and the median CD4 count in HIV-1 group was 231 and 184.5 respectively (1- 1,035). Martinez et al, Shabbar et al and Monteiro et al also found that HIV-2 patients had a higher CD4 count compared to the HIV-1 group. However their ranges for the CD4 count were less wide compared to our study **(27, 33)**. The wide variation in the absolute CD4 count noted in this study is due to the fact that there was no cut off point. Some participants had very low initial absolute CD4 counts. Grant et al in a hospital based study done in Cote D'Ivoire found that many HIV patients presented at the stage of profound immunosuppression **(31).**

6.2 AIDS-DEFINING EVENTS

The triad of fever, wasting, and diarrhea were the most common AIDS defining events followed by oral candidiasis and Tuberculosis (Table 8). Despite the fact that opportunistic infections were higher in the HIV-1 group than in dually infected patients and HIV-2, this was not statistically significant. This is consistent with the Eholie et al study on Epidemiological and clinical features of HIV-2 infection in Abidjan, Côte d'Ivoire where they found that at the AIDS stage the clinical spectrum of both viruses are the same **(12).**

6.3 ADNEXAL FINDINGS

The most common adnexal findings were conjunctival microvasculopathy in all HIV types (29.5%). Cunningham et al in a review article on ocular manifestations of HIV estimated it to be present in 80% of the HIV population (21). MBongo et al found in a study done on children found a prevalence of 14.4% (34). The higher prevalence of conjunctival microvasculopathy observed in our study compared to Mbongo's study may be due to the fact that 75% of our study population was on HAART. HAART prolongs survival hence more patients present with these ocular manifestation. So far the studies done on the different HIV types in West Africa have not reported on conjunctival microvasculopathy **(23, 27, 33).**

6.4-ANTERIOR SEGEMENT

The most common anterior segment findings were dry eye syndrome (10.6%) followed by cataract (5.3%). The high prevalence of cataracts across all the HIV types in younger age groups was noted in this study. This differs from the general population where the prevalence of cataract increases with age. Goldberg et al in their study on the long term visual outcome of patients with cytomegalovirus retinitis on HAART found that immune recovery was associated with increased frequencies of cataracts, epiretinal membrane, cystoid macular oedema and retinal detachment **(35).**

6.5 POSTERIOR SEGMENT

HIV retinopathy was the most common HIV related eye disease in this study (6%) with a higher prevalence in HIV-1 compared with HIV-2 and dually infected patients; however the difference is not statistically significant (Table 10a). This findings are similar to those of Monteiro et al in Portugal, Ndoye et al in Senegal, and Balo et al in Togo **(27, 30)**. However Shabbar et al in Gambia did not find any retinal lesions in HIV-2 patients **(27)**. Ndoye et al and Balo et al found HIV retinopathy across all the HIV types but the prevalence was lower HIV-2 group **(27, 30)**.

CMV retinitis was only noted in HIV-1 (1.8%) and dual infection (4.2%) (Table 14). This could be due to the fact that none of HIV-2 patients in this study had an initial CD4 count of less than 80. This study found a low prevalence of CMV retinitis (2%)
(Table 10a) compared to Balo's study done in Togo where the prevalence of CMV retinitis was 21.5%. This difference may be due to the fact that Balo et al did have a longer study period (20 months) **(30)**.

6.6 PREVALENCES

The prevalence of HIV related eye disease was 36.8%. This is much lower than Balo et al in Togo (60.5%), Ndoye et al in Senegal (52.23%) **(23, 30)**. This low prevalence is due to the fact that 75% the population in this study was on HAART .Rodriguez et al in Brazil found that with the use of HAART, there is a reduction in the frequency of ocular problems in HIV patients, especially intraocular infections and inflammations **(37)**.
The prevalence of HIV related eye disease was respectively 34.3% in HIV-1 group, 47.1% in HIV-2 group and 50% in dual infected group but the difference is not statistically significant. This is comparable to Ndoye et al where they did not find a significant difference in the prevalence of ocular manifestations between HIV-1 and HIV-2 **(23)**. Eholie et al and Martinez et al, studied the systemic manifestations of HIV-1 and HIV-2 and they concluded that at the AIDS stage the clinical spectrum of both viruses are indistinguishable **(12, 33)**.

Monteiro et al did the same study and found that the Ocular manifestations were present in both populations with a significant prevalence in HIV-1 (48%), compared to HIV-2 (19%) with a significant difference. In the HIV-2 group the most frequent lesion was noninfectious retinopathy **(36).**

In terms of HIV related eye disease in this study population a comparison of the findings with other studies done in East Africa is depicted in the table below:

Table 18: Ocular manifestations of HIV/AIDS patients in Cote D'Ivoire and other African countries

Findings	CI	Ethiopia(38)	Burundi (25)	Kenya (39)
HZO	**6.8%**	5.6%	1%	0%
Conj.microvascul.	**29.5%**	N/A	10%	N/A
Keratitis	**0.3%**	N/A	N/A	0%
Ant. Uveitis	**1.5%**	7.6%	4%	0%
HIV Retinopathy	**6%**	24%	16%	2.6%
Toxoplasmosis	**2.5%**	N/A	N/A	0%
CMV retinitis	**2%**	< 1%	1%	0%
Prevalence	**36.8%**	60%	21%	18.1%

N/A= Not Available

This study found 2 cases of vitreoretinal bands while Onyango et al found 1 case **(39).**

7.0 CONCLUSION

- The prevalence of ocular findings in our study population was 42.8%, while the prevalence of HIV related eye disease was 36.8%.

- There were more adnexal HIV related eye disease (29.5%) than anterior segment (1.8%) and posterior segment. (11.1%)

- The most common adnexal findings were conjunctival microvasculopathy.

- The most common posterior segment findings were HIV retinopathy.

- The patients in HIV-1 group had more ocular findings followed by dual infected patients and HIV-2; however the difference was not statistically significant.

- The level of the absolute CD4 count plays a more important role in the development of HIV related eye disease than the type of HIV at the stage of AIDS.

8.0 RECOMMENDATIONS

1. Routine eye checks are needed for HIV patients during follow up in HIV clinics (30% of our findings are treatable)

2. Ophthalmologists should be involved in the follow up of patients on HAART.

3. Another study comparing the three HIV group with a CD4 count cut off point of 200 with a same number of HIV-1, HIV-2 and dually infected patients would be worthwhile.

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10. APPENDIXES

APPENDIX 1: PLATES

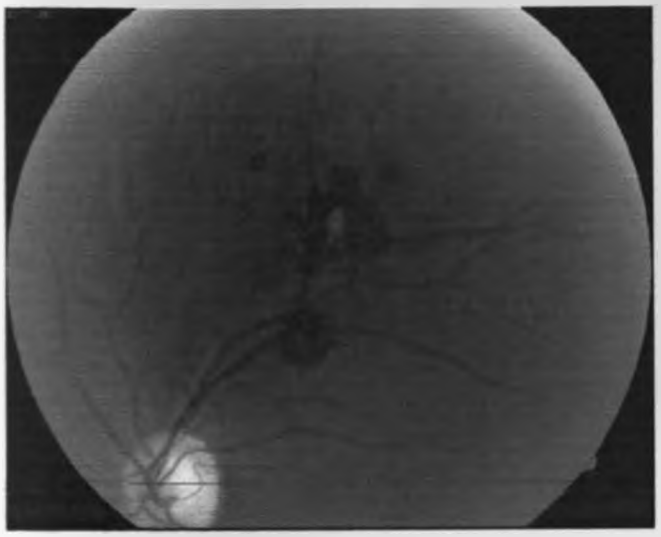


Plate 1: Chorioretinal scar

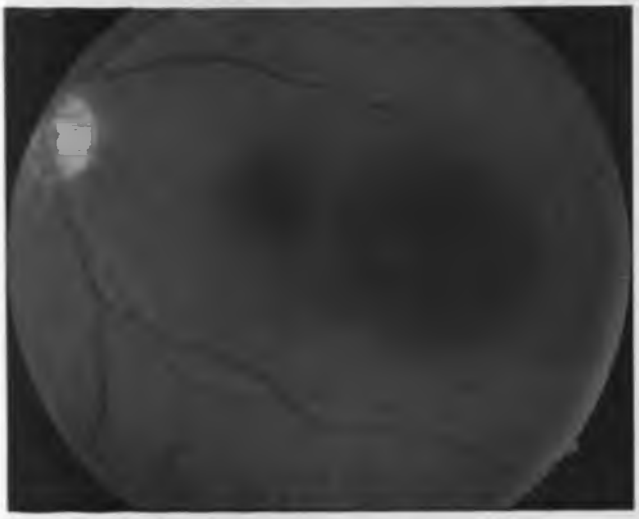


Plate 2: Paramacular chorioretinal scar

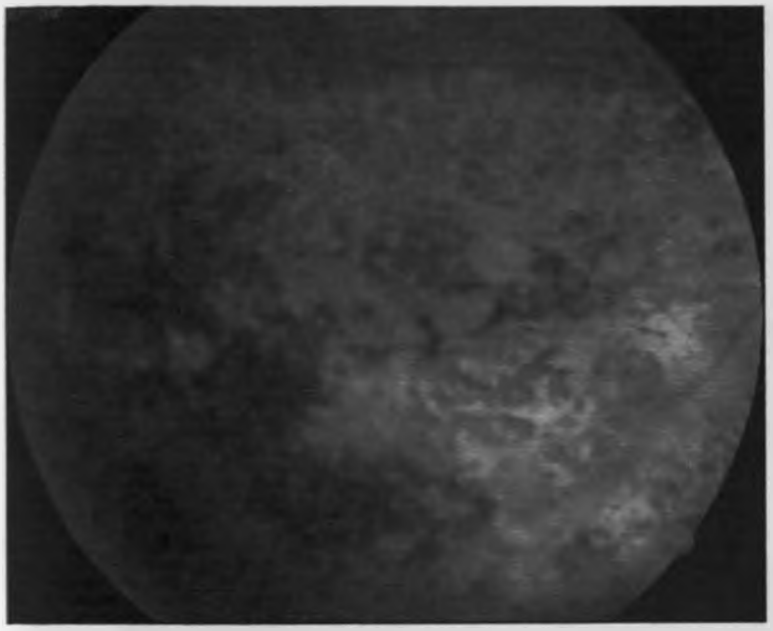


Plate 3: CMV retinitis

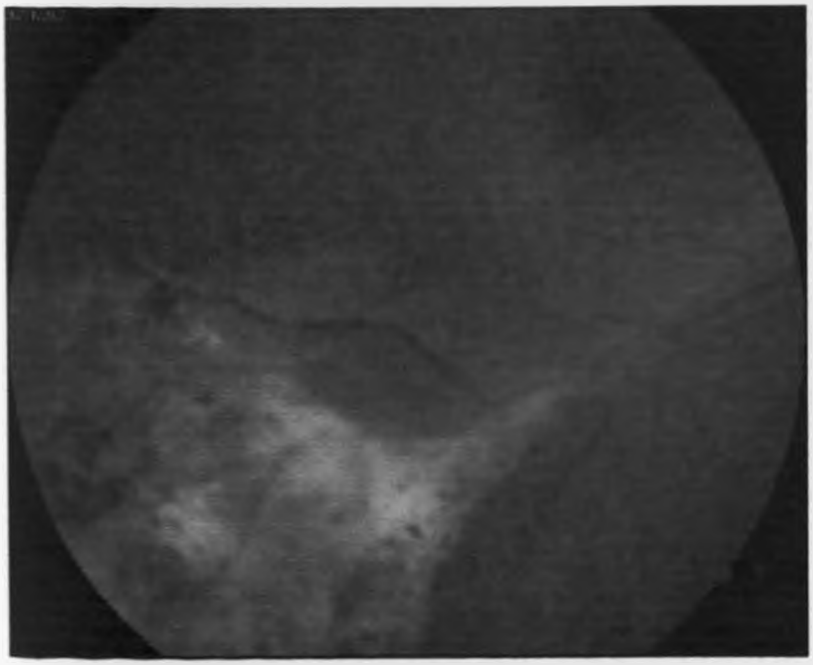


Plate 4: CMV retinitis

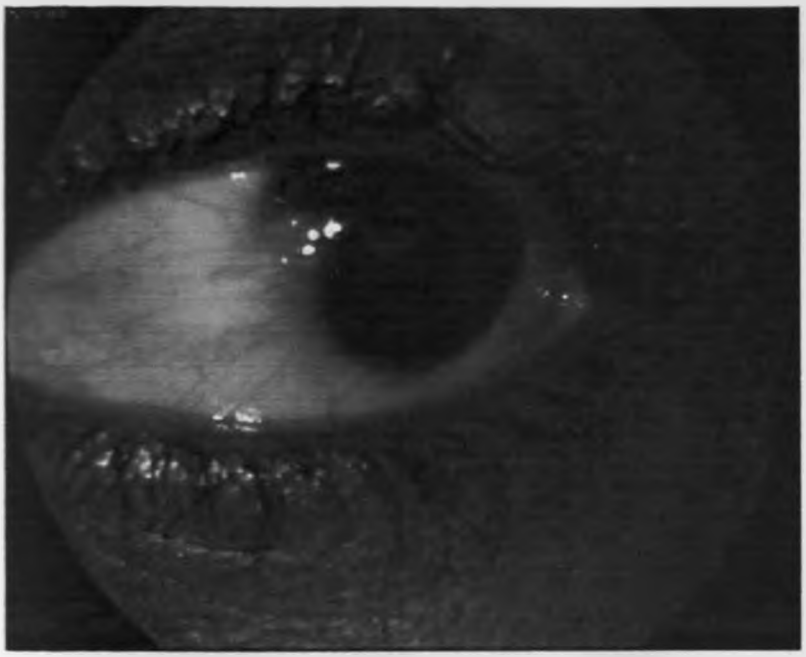
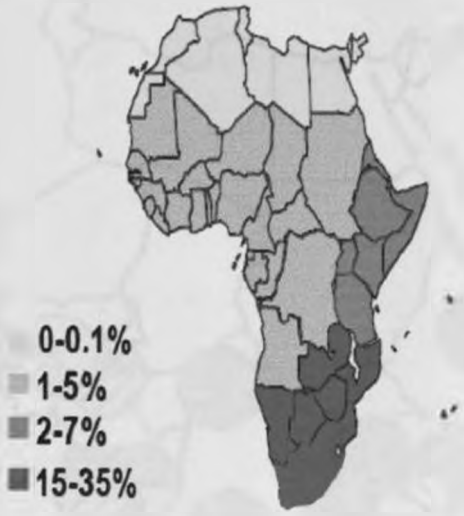


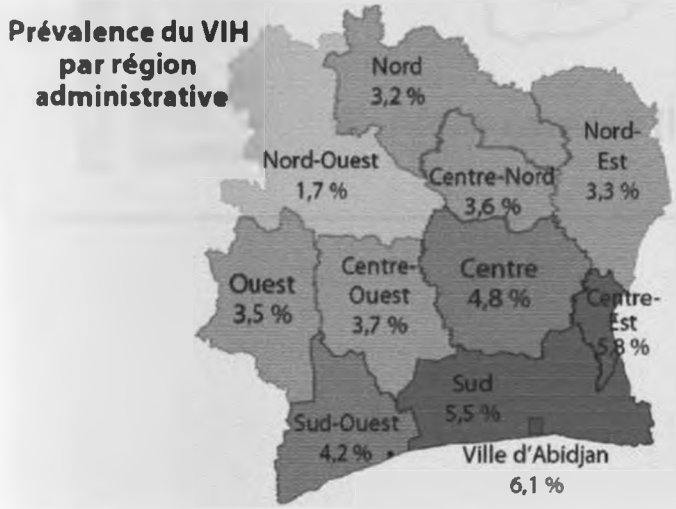
Plate 4: Pterygium

APPENDIX 2: MAP SHOWING HETEROGENEITY OF HIV INFECTION IN AFRICA



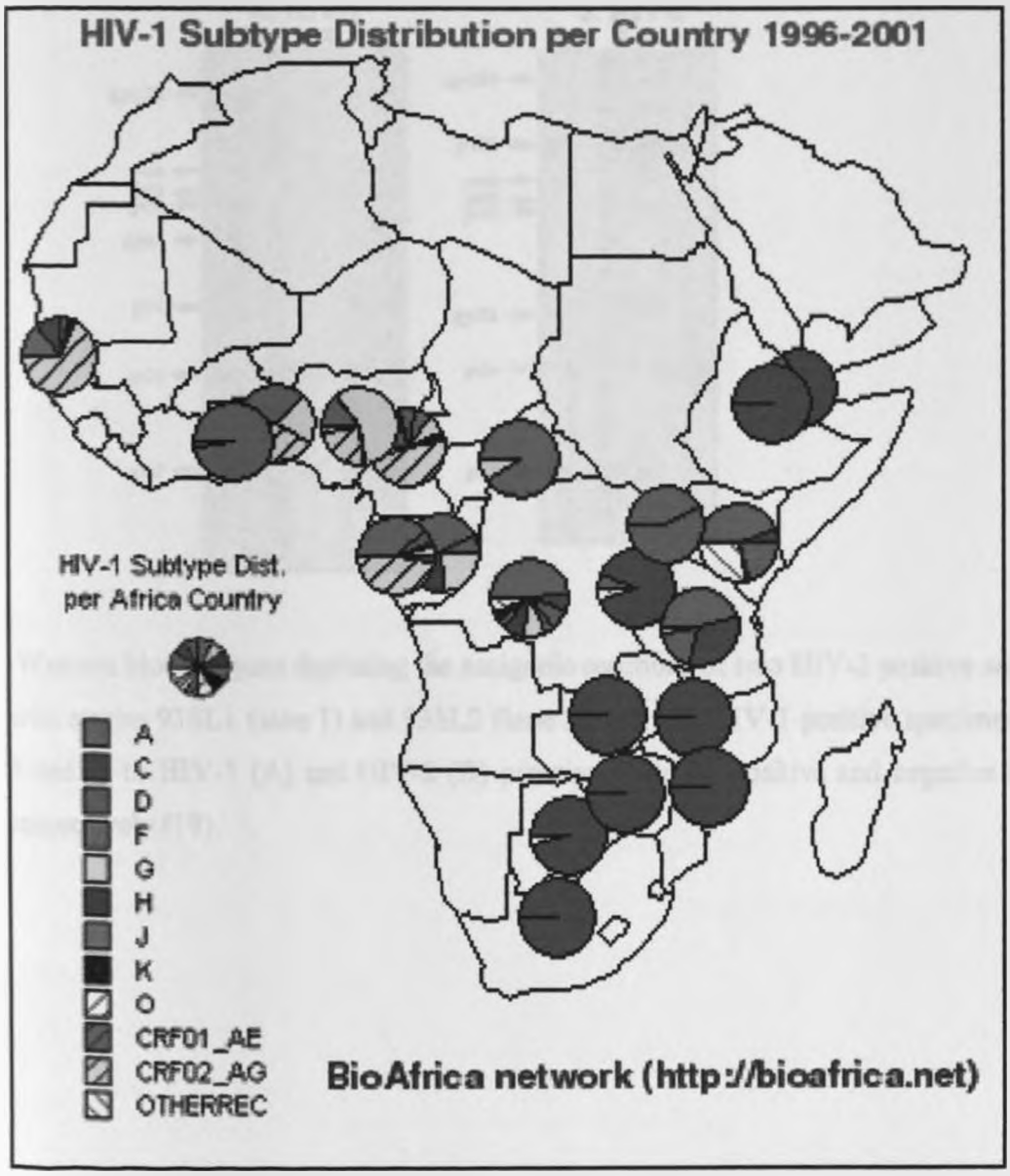
(David Wilson et al, Global HIV/AIDS program; the World Bank-HIV epidemiology: A Review of recent trends and lessons, 13th September 2006. P3-12)

APPENDIX 3: MAP SHOWING PREVALENCE OF HIV INFECTION BY REGIONS IN COTE D'IVOIRE

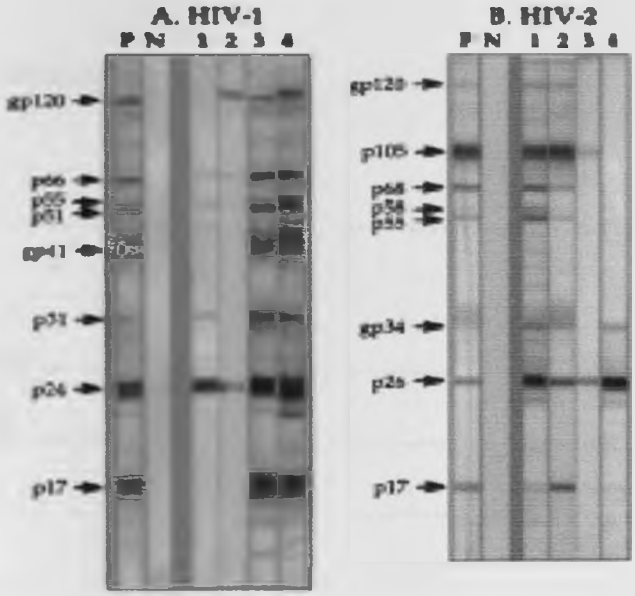


(Result of the national survey on HIV indicators in Cote d'Ivoire 2005, P1-2)

APPENDIX 4: MAP SHOWING SUBTYPES DISTRIBUTION OF HIV-1 IN AFRICA



APPENDIX 5: WESTERN BLOT TEST RESULT OF HIV-1 AND HIV-2



Western blot analyses depicting the antigenic reactions of two HIV-2 positive sera, those with strains 93SL1 (lane 1) and 93SL2 (lane 2), and two HIV-1-positive specimens (lanes 3 and 4) to HIV-1 (A) and HIV-2 (B) proteins.P and N, positive and negative controls, respectively (18).

APPENDIX 6: CONSENT FORM

Name of Participant: .....

Age: .....

Residence: .....

P.O.BOX.....

Tel.....

Date: .....

Dr. Agre L. Jeremie of the University of Nairobi (KENYA) has requested me to participate in the study on eye assessment. This study is non-invasive and poses no risk to participant.

Having understood how the study will be done and what it involves;

I ..... Agree to take part in the study.

Participant: ....

Signature: .....

Date: .....

APPENDIX 7: QUESTIONNAIRE

SECTION A: - Socio-Demographic Data **Study No.** ☐☐☐☐☐

1. File Number (OP) ☐☐☐☐☐

2. Age of the Patient ☐☐☐

3. Gender ☐ Male ☐ Female

4. Weight (in KGs) ☐☐☐

5. Nationality _____

SECTION B: - Complaints

_____

_____

_____

SECTION C: - History

6. Date of initial HIV diagnosis (**dd/mm/yy**) ☐☐/☐☐/☐☐

7. Type of HIV ☐ HIV 1 ☐ HIV 2 ☐ HIV 1+2

8a. CD4 count (At diagnosis) ☐☐☐ Date: ☐☐/☐☐/☐☐

8b. CD4 count (Last) ☐☐☐ Date: ☐☐/☐☐/☐☐

9. Occurrence of opportunistic infections

	Yes	No
a). Kaposi sarcoma	☐	☐
b). HZO	☐	☐
c). Tuberculosis	☐	☐
d). Oral thrush	☐	☐
e). Squamous cell carcinoma	☐	☐
f). Meningitis	☐	☐
h). Toxoplasmosis	☐	☐

10. Hospital admission (dd/mm/yy) ☐☐/☐☐/☐☐

11. Date of initial ARV (dd/mm/yy) ☐☐/☐☐/☐☐

12. Type of ARV ☐ HIV 1 ☐ HIV 2 ☐ HIV 1+2

13. Duration of ARV _____

14. Others treatments received _____

15. Family history

a). Number of children ☐ HIV status _____

b). Number of partners ☐ HIV status _____

c). Residence _____

16. Physical examination

	Yes	No	Impression
a). General condition	☐	☐	_____
b). Skin	☐	☐	_____
c). Buccal	☐	☐	_____
d). Chest	☐	☐	_____
e). Neuralgic	☐	☐	_____
f). Abdominal	☐	☐	_____
g). Cardiovascular	☐	☐	_____

SECTION D: - OCULAR EXAMINATION

17. VA RE _____ LE _____

18. VA SC N ☐

CC N ☐

SECTION E :- ADNEXA MANIFESTATIONS

	Yes	No
a).HZO lid	☐	☐
b).Lid & nose	☐	☐
c).Kaposi sarcoma	☐	☐
d).Molluscom	☐	☐
e).Conjunctival microvasculopathy	☐	☐
f).Conjunctival growth	☐	☐
g).Papillae	☐	☐
h).Follicules	☐	☐
i). Impression I	_____	

SECTION F: - ANTERIOR SEGMENT FINDINGS

		Yes	No
a). Dry eyes	RE	☐	☐
	LE	☐	☐
b).Keratitis	Presumed bacterial	☐	☐

	Presumed fungal	☐	☐
	Presumed HZO	☐	☐
	Presumed HSV	☐	☐
c).Uveitis		☐	☐
	KPS	☐	☐
	Cellules	☐	☐
	Flare	☐	☐
	Hypopion	☐	☐

d).Impression 2 _____

SECTION G: - POSTERIOR SEGEMENT MANIFESTATIONS

	Yes	No
a).Blots haemorrhages	☐	☐
b).Dots haemorrahges	☐	☐
c).Cotton wool spot	☐	☐
d).Vitreous cells	☐	☐
e).Vitritis	☐	☐
f).Vitreous haemorrhage	☐	☐

g).Perivasculitis ☐ ☐

h).Peripheral retinal necrosis ☐ ☐

i).Retinal pigmentary atrophy ☐ ☐

j).Retinal pigmentary hyperplasia ☐ ☐

k).Optic Nerve neoascularization (NVD) ☐ ☐

l).Neovascularization elsewhere (NVE) ☐ ☐

m).Macular edema ☐ ☐

n).Cystoid macular edema ☐ ☐

o).Pigmented chorioretinal scar ☐ ☐

p).Retinal opacity in the posterior pole ☐ ☐

q).Periphlebitis ☐ ☐

r).Others (specify) _____

s). Impression 3 _____

SECTION H: - GENERAL IMPRESSION

_____

APPENDIX 8: QUESTIONNAIRE IN FRENCH

SECTION A: Renseignements Socio-Demographiques Etude No. ☐☐☐☐

1. Numero du dossier (ND) ☐☐☐☐☐

2. Age du Patient ☐☐☐

3. Sexe Male ☐ Female ☐

4. Poids (KG) ☐☐☐

5. Nationalite _____

SECTION B: - Complaintes

_____

_____

_____

SECTION C: - Histoire

6. Date initiale du diagnosis VIH (j/m/an) ☐☐/☐☐/☐☐

7. Type of VIH ☐ VIH 1 ☐ VIH 2 ☐ VIH 1+2

8a. Taux CD4 (Initial) ☐☐☐ Date: ☐☐/☐☐/☐☐

8b. Taux CD4 (Dernier) ☐☐☐ Date: ☐☐/☐☐/☐☐

9. Maladies opportunistes

	Yes	No
a). Sarcome de Kaposi	☐	☐
b). Zona	☐	☐
c). Tuberculose	☐	☐
d). Plaies orales	☐	☐
e). Carcinome des Cell. squameuses	☐	☐
f). Meningite	☐	☐
h). Toxoplasmose	☐	☐

10. Hospitalisation **(j/m/an)** ☐☐/☐☐/☐☐

11. Debut de prise des ARV **(j/m/an)** ☐☐/☐☐/☐☐

12. Type d' ARV ☐ VIH 1 ☐ VIH 2 ☐ VIH 1+2

13. Duree _____

14. Autres traitements recus _____

15. Histoire familiale

a). Numbre d'enfants ☐ VIH _____

b). Numbre de partenaires ☐ VIH _____

c). Residence _____

16. Examen physique

	Oui	Non	Conclusion
a). Etat General	☐	☐	_____
b). Peau	☐	☐	_____
c). Bouche	☐	☐	_____
d). Thorax	☐	☐	_____
e). Neurologie	☐	☐	_____
f). Abdomen	☐	☐	_____
g). Cardiovasculaire	☐	☐	_____

SECTION D: - EXAMEN OCULAIRE

17. AV RE _____ LE _____

18. AV SC Pres ☐

AC Pres ☐

SECTION E :- ANNEXES

	Oui	Non
a).Zona paupieres	☐	☐
b).Paupieres et nez	☐	☐
c).Sarcome de Kaposi	☐	☐
d).Molluscom	☐	☐
e).Microvasculopathie conjunctivale	☐	☐
f).Excroissance Conjunctivale	☐	☐
g).Papille	☐	☐
h).Follicules	☐	☐
i). Conclusion 1	_____	

SECTION F: - SEGMENT ANTERIOR

		Oui	Non
a). Syndrome sec	RE	☐	☐
	LE	☐	☐
b).Keratite	Bacterienne	☐	☐

	Fungique	☐	☐
	Zona	☐	☐
	VHS	☐	☐
c).Uveite			
	KPS	☐	☐
	Cellules	☐	☐
	Proteines	☐	☐
	Hypopion	☐	☐

d).Conclusion 2 _____

SECTION G: - SEGMENT POSTERIEUR

	Oui	Non
a).Bloc hemorragique	☐	☐
b).Point hemorragique	☐	☐
c).Nodules cotonnier	☐	☐
d).Cellules vitre	☐	☐
e). Hyalite	☐	☐
f).Hemorragie du vitre	☐	☐
	☐	☐

g).Perivasculite

h).Necrose retinal peripherique ☐ ☐

i).Atrophie retinal pigmentaire ☐ ☐

j).Hyperplasie retinal pigmentaire ☐ ☐

k).Neoascularisation de la papille ☐ ☐

l).Neovascularisation ailleurs ☐ ☐

m).Edeme maculaire ☐ ☐

n).Edeme cystoide maculaire ☐ ☐

o).Escarre chorioretinale ☐ ☐

p).Opacities du pole posterior ☐ ☐

q).Periphlebite ☐ ☐

r).Autres (preciser) _____

s). Conclusion 3 _____

SECTION H: - CONCLUSION GENERALE

_____