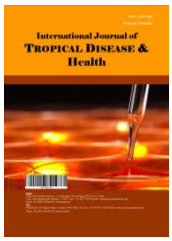

International Journal of TROPICAL DISEASE & Health

41(19): 11-21, 2020; Article no.IJTDH.62957
ISSN: 2278–1005, NLM ID: 101632866

Pattern of Ocular Manifestations among People Living with HIV/AIDS on Highly Active Anti Retroviral Therapy

Catherine U. Ukponmwan[1*], Evaristus Oseiwe Oboh[2], Odarosa M. Uhumwangho[1] and Benson U. Okwara[3]

[1]Department of Ophthalmology, School of Medicine, University of Benin Teaching Hospital, Benin City, Nigeria.
[2]Department of Radiotherapy and Clinical Oncology, University of Benin Teaching Hospital, Benin City Nigeria.
[3]Department of Internal Medicine, University of Benin Teaching Hospital, Benin City, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All the authors contributed to all the stages of the research which including writing the proposal, the field work, data analysis and preparation of the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2020/v41i1930383
Editor(s):
(1) Dr. Cihad Dundar, Ondokuz Mayıs University, Turkey.
Reviewers:
(1) Srinivasan Sanjay, India.
(2) K. Pradeep, Kerala University of Health Sciences, India.
(3) Arvind K. Morya, All India Institute of Medical Sciences, India.
Complete Peer review History: http://www.sdiarticle4.com/review-history/62957

Original Research Article

Received 16 September 2020
Accepted 23 November 2020
Published 11 December 2020

ABSTRACT

Aim: To determine the pattern of ocular manifestations in people living with HIV/AIDS on highly active retroviral therapy (HAART).
Study Design: A descriptive hospital based cross sectional study.
Place and Duration of Study: Presidential Emergency Plan for AIDS Relief (PEPFAR) clinics of the University of Benin Teaching Hospital and Central Hospital, Benin City, Edo State, Nigeria. Between 1st July 2018 and 31st October 2019.
Methodology: Four hundred and fifty one (451) patients living with HIV/AIDS on HAART were the subjects of this study. An interviewer administered questionnaire was used. They all had a comprehensive eye examination done. General examination including their height, weight and blood pressure were done.

**Corresponding author: Email: kateuk12@aol.com;*

Results: There were 451 patients (104 males and 347 females with a male to female ratio of 0.3:1), the age range was 14 to 75 years with a mean age of 46.55 ± 10.77 years. Most of them, 305 (67.6%) were married. A Majority 210 (46.6%) of them had a CD4 count of 500 cells /microliter and more. Ocular morbidity was present in 385 (85.1%) respondents. The most common ocular morbidity was an uncorrected refractive error in 262 patients with presbyopia being the most common type. Other morbidities seen were cataract followed by allergic conjunctivitis and glaucoma. Ocular manifestations of HIV/AIDS occurred in 32 patients (7.1%). The most common was dry eyes in 15 (46.9%) of these patients followed by posterior uveitis secondary to presumed Toxoplasmosis in 9 (28.1%) patients. Other types of HIV associated ocular morbidities seen were conjunctival squamous cell carcinoma, retinal detachment, optic neuritis and Herpes Zoster ophthalmicus.

Conclusion: There is a reduction in the prevalence and a change in the type of ocular manifestations in people living with HIV/AIDS on HAART. They are more prone to developing other ocular morbidities due to their increased lifespan. Eye health care programs should be established for people living with HIV/AIDS.

Keywords: Prevalence; pattern; ocular; morbidity; HIV; AIDS; HAART; refractive error.

1. INTRODUCTION

There were 38.0 million people living with HIV globally in 2019 [1]. Sub-Saharan Africa accounts for more than 70% of the global burden of HIV infection [2]. Nigeria is one of those countries that is significantly affected by HIV/AIDS in the subcontinent, with 3.4% of it's population of more than 150 million infected with the virus [3]. The recent national survey reported in March 2019 found Nigeria's national HIV prevalence to be 1.4% among adults aged 15 to 49 years with1.9 million people living with HIV/AIDS [4]. The south - south zone of the country which includes Edo State has the highest prevalence at 3.1% among adults aged 15-49 years [4]. There is a wide array of diseases affecting the eyes of patients living with HIV/AIDS [5-7]. The spectrum of ocular diseases in HIV infected patients in developing countries is different from that in developed countries [5,6].

Ocular manifestations affecting only the eye such as Herpes Zoster Ophthamicus and conjunctiva squamous cell carcinoma are relatively common in developing countries [7-9]. The prevalence of Cytomegalovirus is less than 5% in HIV/AIDS patients in developing countries [10,11]. The reason for such variation in distribution is presumed to be the early and high mortality rate in patients living with HIV/AIDS in developing countries and possibly differences in HIV subtype, race and the influence of co-morbid disease [12].

Human immunodeficiency virus (HIV) is a lentivirus (a member of the retrovirus family) that causes acquired immunodeficiency syndrome (AIDS) a condition in humans in which progressive failure of the immune system allows life-threatening opportunistic infections and cancers to thrive [13,14]. Human immunodeficiency virus infection (HIV) and the advanced form of the disease, Acquired Immune Deficiency Syndrome (AIDS) have become a worldwide pandemic, since it was first reported in the United States of America in 1981 [15].

The eye is affected in 50 -75% of adult patients [6]. Regular screening of HIV positive patients is warranted to allow early identification of potential vision and life threatening diseases [16].

The ocular manifestations of HIV/AIDS almost invariably reflect systemic disease and may be the first sign of disseminated infection in many cases [17].

Several publications have described the ocular manifestations of the HIV/AIDS [18,19]. Most of the studies on the prevalence of ocular complications in HIV/AIDS have been carried out in industrialized countries [20].

Ocular manifestations of HIV positive and AIDS patients range from simple blepharitis to severe blinding conditions like Cytomegalovirus retinitis. HIV is an illness that interferes with the immune system, making people with AIDS much more likely to get infections, including opportunistic infections and tumors that do not affect people with working immune systems. HIV selectively infects T Lymphocytes, especially helper T (CD4+) lymphocytes leading to their depletion with HIV replication and thus immunodeficiency and AIDS.

The aim of this study was to determine the pattern of ocular manifestations in people living with HIV/AIDS attending the PEPFAR (Presidential Emergency Plan for AIDS Relief) clinics of the University of Benin Teaching Hospital and the Central Hospital, Benin City, Edo State, Nigeria. Determining the pattern of ocular manifestations will help in early detection and proper management of ocular complications to prevent or minimize potential visual damage. It will also help to reduce the overall burden of late presentation and its' attendant morbidity and mortality.

2. MATERIALS AND METHODS

This is a cross sectional multicenter (2 centers) study which was carried out at the University of Benin Teaching Hospital and Central Hospital, Benin City, Edo State, Nigeria during a 16 month study period from 1st July 2018 to 31st October 2019. The study population consisted of all consecutive patients confirmed to have HIV/AIDS who attended the Presidential Emergency Plan for AIDS Relief (PEPFAR) clinics in these two centers during the study period (1st July 2018 to 31st August 2018 at the University of Benin Teaching Hospital and 2nd October 2019 to 31st October 2019 at Central Hospital, Benin City). The respondents were all patients who consented to be involved in the study. The consent was a written consent signed by the respondents. There were no non responders in this study population.

All the patients were on highly active anti retroviral therapy (HAART). Anti-retroviral therapy is usually commenced immediately a patient is diagnosed with HIV. Patients are commenced on Tenofovir + Lamivudine +Dolutegravir combination which is a fixed dose combination taken once daily. This is the first line treatment.

A semi structured interviewer administered questionnaire designed for this study was used. Respondents attending the clinics during the study period were identified and interviewed. Demographic data and other relevant questions related to the disease were recorded in the questionnaire. The eye examination included their visual acuity using the Snellen's chart. The visual acuity was carried out by the optometrist at a distance of 6 meters in a well lit room using the Snellen's chart. The illiterate E chart was used for respondents who could not read. The visual acuity was carried out on each eye with the other eye occluded. Patients who could not read the chart at a distance of 6 meters were examined at 3 meters. The distance was gradually reduced to 2meters, then 1meter until the patient can read. They were asked to count the fingers of the examiner at various distances if they could not read the chart at 1 meter. They were then asked if they could see the examiners hand movement, if they could not count fingers. then the ability to perceive light, if they could not see the hand moving was tested. The adnexae and anterior segments were examined with a pen torch, slit lamp and an ophthalmoscope. The posterior segment was examined using either a direct or indirect ophthalmoscope. The eyes were dilated with tropicamide 1% eye drops when necessary. The intraocular pressure was measured in patients suspected to have glaucoma using the Goldmann tonometer or the I - care tonometer. Their blood pressure, weight, height and body mass index were also noted. The team was made up of all the researchers comprising 2 consultant Ophthalmologists, 1 consultant Radiotherapist, I consultant dermatologist, ophthalmology registrars and senior registrars, Optometrists and other research assistants. The questionnaire was pretested before the commencement of the study on patients at the Medical Outpatient Clinic for Retroviral disease (MOPR) of another teaching hospital in the state and validated. The most recent CD4 count and viral load were retrieved from the case notes of the patients and recorded in the questionnaire.

3. DATA MANAGEMENT AND ANALYSIS

IBM Statistical package for social science (SSPS) version 21 was used for data analysis.

Descriptive inferential statistics was done and the level of significance set at $p<0.05$.

4. RESULTS

The total number of participants in this study was 451 comprising 104 (23.1%) males and 347 (76.9%) females with a male to female ratio of 0.3:1. The age range of the patients was 14-75 years with a mean age of 46.55 $\pm$ 0.773 (SD)). Majority of the respondents, 173 (38.4%) were within the age group 40-49 years. Most of the respondent 305 (67.6%) were married while 52 (11.5%) of them were single, 62 (13.7%) were widowed while 27(6.0) and 5(1.1%) were separated and divorced respectively.. Most of the respondents, 380 (84.3%) resided in an urban area. Table 1 shows the age distribution of the respondents.

One hundred and forty-six (32.4%) respondents have been living with HIV/AIDS for the period of 1 to 5 years followed by 130 (28.8%) who have been living with it for a duration of 6 to 10 years while only one (0.2%) had been living with HIV/AIDS for a period of 21 – 25 years. The range of HIV duration was 1 month -23 years with a mean of 7.68±4.9 years. Majority 400 (88.7%) of the respondents have never been admitted due to complications arising from HIV/AIDS while 32 (7.1%) have been admitted at least once. Most 210 (46.6%) of the respondents had a CD4 count of ≥500 cells/microliter (Table 2).

More than half of the respondents, 254 (56.3%) had ocular complaints and the most frequent ocular symptom among the respondent 112 (44.1%) was itching followed by occasional eye redness, 86 (33.9%), sandy sensation 84 (33.1%), pain 64(25.2%), burning sensation, 34 (13.4%) while 11 (4.3%) had growth in the eyes.

Most of the respondents with ocular symptoms fell within the age group 40-59 years, with a proportion of 165 (65.0%). The association between age of respondents and the presence of ocular symptoms was statistically significant *P*=0.003. Most of the female respondents, 194 (76.4%) had ocular symptoms. This association was not statistically significant. A higher proportion of the respondents who had an ocular symptom, 95 (37.4%) had primary level of education, while few respondents with an ocular symptom, 18 (7.1%) had tertiary level of education. The association between level of education and the ocular symptom was statistically significant *P=0.001*. Majority of the respondents, 99 (39.0%) who have been RVD positive for 10-14 years had ocular symptoms. This association was statistically significant *P*=0.001. Table 3 shows the association between sociodemographic characteristics of the respondents and the presence of ocular symptoms.

Ocular morbidity was present in 385 (85.1%) respondents. Sixty seven respondents (14.9%) had normal ocular findings. Ocular morbidity was present in 385(85.1%) respondents. Many of them had more than one ocular pathology. Uncorrected refractive error was the most common type of ocular morbidity occurring in 262 (58.1%) of respondents with presbyopia being the most common type in 168 (37.3%) of patients. This was followed by cataract in 71 (15.7%), allergic conjunctivitis 57 (12.6%) and glaucoma 57 (12.6%). Other morbidities seen were maculopathy including age related macula degeneration, pterygium, dry eyes and others. HIV associated ocular morbidities were present in 32 (7.1%) of the patients. These included dry eyes in 15(46.9%) of these respondents followed by resolved posterior uveitis secondary to presumed Toxoplasmosis in 9 (28.1%) respondents, conjunctival squamous cell carcinoma in 3 (9.4%) respondents, retinal detachment and optic neuritis in 2 (6.3%) respondents respectively. Resolved Herpes Zoster Ophthalmicus was seen in 1 (3.1%) patient (Table 4).

There were 7 males and 25 females. Twenty four of the patients were aged 40 years and above. There was no association between age and the presence of ocular manifestations of HIV/AIDS.*P*=0.50. The association between the socio-demographic characteristics of respondents and the prevalence of HIV associated ocular morbidity is shown in Table 5.

Patients with a CD4 count of 0-199 are 2.600 (95% C.I = 0.870 – 7.770,*P* = 0.087) times more likely to have an HIV-associated ocular morbidity present while those with a CD4 count of 200 – 499 are 1.701 (95% C.I = 0.198 – 1.745, *P* = 0.338) times less likely to have an HIV-associated ocular morbidity present when compared to the reference population, however these were not significant.

Table 1. Age distribution of respondents (n = 451)

Variable	Frequency	Percent (%)
Age (years)		
< 20	1	0.2
20 – 29	26	5.8
30 – 39	89	19.7
40 – 49	173	38.4
50 – 59	102	22.6
≥ 60	60	13.3

Table 2. Medical history of respondents

Variable	Frequency (n=451)	Percent (%)
Duration of living with HIV/AIDS (years)		
< 1	33	7.3
1 – 5	146	32.4
6 – 10	130	28.8
11 – 15	116	25.7
16 – 20	25	5.5
21 – 25	1	0.2
Number of previous admissions		
None	400	88.7
1	32	7.1
2	13	2.9
>3	6	1.3
Recent CD4 count		
0 – 199	43	9.5
200 – 499	120	26.6
≥ 500	210	46.6

Table 3. Association between socio-demographic characteristics of respondents and occurrence of ocular symptom

Variable	Ocular symptoms		Test statistics	P-value
	Yes (n=254) Freq (%)	No (n=197) Freq (%)		
Age group (years)				
< 20	0 (0.0)	2 (1.0)	Fishers'	0.003
20-39	57 (22.4)	70 (35.5)	Exact =	
40-59	165 (65.0)	111 (56.3)	13.958	
≥ 60	32 (12.6)	14 (7.1)		
Sex				
Male	60 (23.6)	44 (22.3)	χ^2= 1.104	0.748
Female	194 (76.4)	153 (77.7)	194 (98.5)	
Religion				
Christian	247 (97.2)	194 (98.5)	Fishers'	0.553
Islam	6 (2.4)	2 (1.0)	Exact =	
ATR	1 (0.4)	1 (0.5)	1.185	
Level of education				
NFE	65 (25.6)	53 (26.9)	χ^2= 2.783	0.001
Primary	95 (37.4)	55 (27.9)		
Secondary	76 (29.9)	42 (21.3)		
Tertiary	18 (7.1)	47 (23.9)		
Residence				
Urbanc	206 (81.1)	174 (88.3)	χ^2= 4.363	0.037
Rural	48 (18.9)	23 (11.7)		
Illness duration (years)				
< 1	17 (6.7)	12 (6.1)	Fishers'	0.001
1-4	55 (21.5)	66 (33.5)	Exact =	
5-9	69 (27.2)	51 (25.9)	8.178	
10-14	99 (39.0)	45 (22.8)		
15-19	12 (4.7)	19 (9.6)		
≥ 20	2 (0.8)	4 (2.0)		

Married patients are 13.158 (95% C.I = 0.010 – 0.589, *P* = 0.014) times less likely to have an HIV-associated ocular morbidity present when compared to the reference population and this was significant.

Seven out of the 15 respondents with dry eyes were in the age group 60 and above. Optic neuritis and conjunctival malignancy occurred mostly among respondents in the age group of 20 – 29 years of age (1/33.3% and 2/66.7% respectively) while all of the respondents within the age group of 30 -39 years had posterior uveitis secondary to Toxoplasmosis.

5. DISCUSSION

Human Immunodeficiency Virus (HIV) was first reported in Los Angeles in 1981 [17]. Maclean et al. [21] described the ocular manifestations commonly seen in HIV patients.

The age range of patients in this study was 14 - 75 years with a mean age of 46.55 (SD ±10.773). This mean age is higher than the mean age reported in similar studies in Nigeria and it is probably a reflection of the fact that HIV patients on HAART are surviving longer than in the past [22-24]. Azonobi et al. [22] reported a mean age of 36.88 years ± 10.36 (SD) which was similar to that of 36.9 years reported by Arowolo et al. [23].

Majority of the participants 335 (74.3%) were aged 40 years and above and there were more females than males in this study with a ratio of 1:0.3. This is similar to the report of the Nigeria National HIV/AIDS Indicator and Impact Survey (NAIIS) released in 2019 that women aged 15-49 years are more than twice likely to be living with HIV than men and this increases to more than three times in the younger age group of 20-24 years [4]. Other studies in Nigeria on ocular manifestations of HIV/AIDS have also shown an increased preponderance of females compared to males [22,23]. Females have better health seeking behaviour and are more likely to assess treatment and make use of existing health facilities when compared with males.

Majority of the patients (67.6%) were married while 11.5% were single and this is similar to the study by Nwosu [24] in which the majority of the patients living with HIV were married. It also agrees with the finding in Nigeria that the most common mode of transmission of HIV is through heterosexual transmission [1,4]. This study showed that married patients were 13.158 less likely to have an HIV associated ocular morbidity present and this was statistically significant.

The transmission rate may still be unabated as reflected in the duration of the illness for those less than one year and 1-5 years. There is a need for sustained public awareness enlightenment among youths on protection and modes of transmission so that there will a downward reversal.

A large number of the participants 272 (60.3%) have been retroviral positive for more than five years indicating the general trend of survival in patients with RVD. This shows that many patients having the disease who are on HAART are relatively stable as reflected in the good number of patients 210 (46.6%) with an adequate CD4 count of 500 and more. The disease being under control is also reflected in the low percentage of patients 32 (7.1%) with ocular conditions associated with HIV such as squamous cell carcinoma, Herpes Zoster ophthalmicus, uveitis and ocular tuberculosis. This is again an indication that HIV is now a chronic disease in which people living with the virus can lead a relatively normal life when they are compliant with treatment and follow up clinic appointments. The new NAIIS findings showed that Nigeria is able to effectively provide anti retroviral treatment for people living with HIV/AIDS and there has been progression in increasing access to treatment for people living with HIV with the adoption of a test and treat policy in 2016 [4]. The number of people living with HIV/AIDS having access to antiretroviral therapy increased from 360000 people in 2010 to more than 1 million people in 2018 [1,4].

The prevalence of people living with HIV in Nigeria in 2018 among adults (15-49 years) was 1.5% and the number of new HIV infections among the uninfected population over one-year period was 0.65. 1.9 million people were living with HIV [1,4]. New survey results in March 2019 showed a reduction in the national HIV prevalence in Nigeria to 1.4% (UNAIDS.org) in adults aged 15 -49 years [1,4].

The current standard of care in which anti – retroviral therapy is commenced immediately a patient is diagnosed with HIV and not waiting for a downturn of the CD4 count may be responsible for improved health conditions in people living with HIV/AIDS. Normal CD4 count is greater than 500 cells/microliter. If the CD4 count is less than 200 cells/mm3, it is considered to be Aids-

defining. CD4 count is no longer used for commencement of anti-retroviral drugs. The drugs are commenced immediately a patient is diagnosed with HIV. Patients are commenced on Tenofovir+ Lamivudine + Dolutegravir combination which is a fixed dose combination taken once daily. It is the first line treatment. If a patient has renal disease, he is given Abacavir + Lamivudine + Dolutegravir fixed combination once daily. HIV patients with tuberculosis are given Tenofovir+ Lamivudine + Efavirenz fixed dose combination once daily in addition to anti-TB drugs. Tenofovir + Lamivudine + Efavirenz is given for post exposure prophylaxis. CD4 count and viral load should be done before initiating anti- retroviral treatment. The CD4 count of 500 cells/microliter or more in a large number of patients in this study is an indication of their positive response to the drugs and their immune recovery status. Majority of the patients 384 (85.1%) had ocular morbidity while there was no morbidity in 67(14.9%) of them. Uncorrected Refractive error was the most common type of ocular morbidity in 260 (57.6%) of the patients and 168 of them had uncorrected presbyopia. Majority of the respondents 335 (74.3%) were aged 40 years and above and were presbyopic, thus it is not surprising that 168 of them had uncorrected presbyopia. Presbyopia is an ocular morbidity and not a manifestation of HIV. An Uncorrected refractive error has been reported as the most common type of ocular morbidity in the general population in many studies in Nigeria and other countries [25-27] Emina et al. [28] also found refractive error to be the most common type of ocular morbidity in a study on HIV patients in the same environment. An Uncorrected refractive error has been reported as the most common cause of visual impairment globally [29]. Cataract, allergic conjunctivitis and glaucoma which were common causes of ocular morbidity in these patients have been reported in other studies [25-27]. Allergic conjunctivitis was the second common cause of ocular morbidity followed by cataract and glaucoma in patients seen at outreach in Benin City [25]. HIV/AIDS related ocular manifestations were seen in 32 (7.1%) of the patients in this study. The prevalence of HIV associated morbidities was 7.1%. This is lower than that of 60% reported by Asefa et al. [30] in North West Ethiopia, 14.2% by Anteneh et al. [31] and 12.3% by Kehinde et al. [32] in northern Nigeria, but higher than that of 4% which was earlier reported in the same environment [33]. Herpes Zoster Ophthalmicus affects about 5-15% of patients who are infected with HIV [34]. Herpes Zoster Ophthalmicus was the most common ocular manifestation in these studies in Nigeria by Kehinde et al. [32] who reported that 69.6% of the complications were due to Herpes Zoster Ophthalmicus and Osahon et al. [33] who found a prevalence of 2.7%. This is in contrast to findings in this study in which only 1 patient (3.1%) of the 32 patients with ocular manifestations of HIV/AIDS had resolved Herpes Zoster Ophthalmicus. Nwosu [24] also reported that 48% of their patients had Herpes Zoster Ophthalmicus while a prevalence of 14.1% was reported by Azonobi et al. [22] at the Niger Delta Teaching Hospital in Bayelsa State. Seborrheic blepharitis (5%) was the most common ocular manifestation followed by squamoid conjunctival growth (3.8%) in the study by Antenah et al. [31]. The most common ocular manifestations of HIV/AIDS seen in the patients in our present study was dry eyes (keratoconjunctivitis Sicca) which was present in 15 (46.9%) of the 32 patients and 3.3% of all the patients followed by posterior uveitis due to presumed toxoplasmosis. Dry eyes are usually seen in 10-20% of HIV positive patients. HIV mediated inflammation and damage to the accessory and major lacrimal glands are thought to be the cause [34,35]. Dry eyes seen in these respondents could also be an existing co-morbidity due to other causes. Ocular symptoms were present in 56.3% of the patients and the most common ocular symptom was itching followed by occasional redness of the eyes and sandy sensation which are symptoms usually associated with dry eyes and allergic conjunctivitis. Toxoplasmosis is the most

Table 4. HIV-associated ocular diagnosis among respondents

Morbidity	Frequency	Percentage
Dry Eyes	15	46.9
Posterior Uveitis Toxoplasmosis	9	28.1
Conjunctival Squamous cell carcinoma	3	9.4
Retinal Detachment	2	6.3
Optic Neuritis	2	6.3
Resolved Herpes Zoster	1	3.1
Total	32	100.0

Table 5. Association between socio-demographic characteristics of respondents and prevalence of HIV-associated morbidity

Variable	Prevalence of HIV-associated morbidity		Test statistics	p - value
	Present (n = 32)	Absent (n = 419)		
Age (years)				
< 20	0 (0.0)	1 (100.0)	4.551**	0.502
20 – 29	3 (11.5)	23 (88.5)		
30 - 39	5 (5.6)	84 (94.4)		
40 – 49	11 (6.4)	162 (93.6)		
50 – 59	6 (5.9)	96 (94.1)		
≥ 60	7 (11.7)	53 (88.3)		
Sex				
Female	25 (7.2)	322 (92.8)	0.027*	0.869
Male	7 (6.7)	97 (93.3)		
Marital status				
Married	23 (7.5)	96 (88.5)	11.962**	0.012***
Single	6 (11.5)	282 (92.5)		
Widowed	1 (1.6)	61 (98.4)		
Separated	0 (0.0)	27 (100.0)		
Divorced	2 (40.0)	3 (60.0)		
Religion				
Christian	30 (6.8)	411 (93.2)	4.106**	0.222
Islam	2 (25.0)	6 (75.0)		
ATR	0 (0.0)	2 (100.0)		
Level of education				
NFE	5 (7.8)	59 (92.2)	1.346*	0.718
Primary	10 (7.1)	131 (92.9)		
Secondary	12 (8.5)	129 (91.5)		
Tertiary	5 (4.8)	100 (95.2)		
ILO classification of Occupation				
Skill level 1	9 (5.9)	143 (94.1)	2.986*	0.394
Skill level 2	0 (0.0)	25 (100.0)		
Skill level 3	12 (8.1)	137 (91.9)		
Skill level 4	11 (8.8)	114 (91.2)		
Residence				
Urban	31 (8.2)	349 (91.8)	4.134*	0.042***
Rural	1 (1.4)	70 (98.6)		
Duration of living with HIV/AIDS (years)				
< 1	2 (6.1)	31 (93.9)	3.774**	0.627
1 – 5	14 (9.6)	132 (90.4)		
6 – 10	6 (4.6)	124 (95.4)		
11 – 15	8 (6.9)	108 (93.1)		
16 – 20	2 (8.0)	23 (92.0)		
21 – 25	0 (0.0)	1 (100.0)		
Recent $CD4^+$ count (n = 373)				
0 – 199	6 (14.0)	37 (86.0)	5.084*	0.074
200 – 499	5 (4.2)	115 (95.8)		
≥ 500	13 (6.2)	197 (93.8)		
Body mass index				
Underweight	2 (6.9)	27 (93.1)	0.449*	0.930
Normal weight	14 (7.4)	175 (92.6)		
Overweight	7 (5.8)	113 (94.2)		
obesity	9 (8.0)	104 (92.0)		

**chi-square test **fisher's exact test ***level of significance (p < 0.05)*

common cause of retinochoroiditis in HIV patients as seen in this study. It usually accounts for 30-50% of all uveitis cases [36] Ocular involvement in HIV patients could be caused by opportunistic infections, vascular abnormalities, neoplasms, neuro-ophthalmic conditions and adverse effects of medications. In the study by Antenah et al. [31] refractive error was the commonest morbidity accounting for 34.6% and the rate of ocular manifestation was significantly higher among study participants who had CD4 count less than 200cells/ microliter. Prevalence of visual impairment and blindness was 10.9% and 5.8% respectively [31]. HAART was the main reason for the decline in the prevalence of ocular manifestation as was also seen in our study. Ocular manifestation is very common and broad from a wide variety of complications in patients suffering from HIV/AIDS [34,36]. It involves any part of the eye from the adnexa and anterior segment to the posterior segment, including orbital and optic nerve [34,36]. The causes of HIV related ocular disorders may be opportunistic infections, vascular abnormalities, neoplasms, drug induced and neuro-ophthalmic lesions. Opportunistic infections are major causes of morbidity and the most devastating ocular disorders in people with AIDS [34]. A study conducted in the South Western part of Nigeria revealed that 32.1% of the respondents were aware of eye complications that relate to HIV/AIDS and most patients (55.6%) had been enlightened by health workers, 14.3% had HIV/AIDS ocular manifestations [37]. Squamous cell carcinoma was the most common manifestation in contrast to this present study where squamous cell carcinoma of the conjunctiva was present in 3 patients [37]. The low prevalence of HIV /AIDS related ocular manifestations in this study could be due to the high percentage of patients 46.6% with CD4 count equal to or greater than 500cells /microliter and the fact that they were all on HAART. There was no case of cytomegalovirus retinitis seen in these patients. This is in agreement with previous reports that cytomegalovirus retinitis is not common in HIV/AIDS patients in developing countries compared to developed countries [7]. The retinal detachment seen in 3 patients is a complication of retinitis due to causes of retinitis in PLWHIV (People living with HIV) such as retinal microangiopathy, Cytomegalovirus retinitis, VZV (Varicella Zoster Virus) retinitis, toxoplasma retinochoroiditis, bacterial and fungal chorioretinitis.

There was no case of immune reaction uveitis seen in this study. Ocular side effects of HAART like ocular syphilis, hypotony and Iritis were not seen in this study.

These findings suggest that patients living with HIV/AIDS now present with ocular conditions similar to the general population without RVD (Retroviral disease), thus reflecting the good management of their conditions with the current standard of care in which all HIV positive patients are started on HAART irrespective of their CD4 count. The demystification and destigmatization of the disease with various public enlightenment messages in the media, accessibility to treatment centres, affordable and free drug supplies may have a role to play in this changing pattern in the presentation and pattern of ocular manifestations of HIV/AIDS seen in this study. Relevant authorities and stakeholders should formulate policies and programs that will ensure early detection and treatment of ocular morbidity in these patients. The importance of adequate collaboration between the physician who provides care for HIV infected patients and the Ophthalmologists for the proper management of patients with HIV/AIDS with ocular manifestations cannot be over emphasized.

6. CONCLUSION

The prevalence and pattern of ocular manifestations of people with HIV/AIDS are changing with the widespread implementation of HAART. There is a reduction in the prevalence and type of ocular manifestations especially the opportunistic infections such as Herpes Zoster Ophthalmicus. The lifespan of patients with HIV/AIDS is increasing, thus they are more prone to developing other types of ocular morbidities such as presbyopia, cataract, glaucoma and allergic conjunctivitis as seen in our present study and have an increased risk of visual loss from these morbidities.

7. RECOMMENDATIONS

There is a need for a regular eye examination by the Ophthalmologists. Eye health care programs should be established by the government and other non governmental organizations and integrated into other programs involved in the care of people living with HIV/AIDS. It is highly recommended that HIV patients be referred to an ophthalmologist when they present with any visual complaint. This will help in early detection, as well as the initiation of definitive treatment.

Health education regarding the ocular manifestations and complications of HIV/AIDS will increase awareness and reduce morbidity.

DISCLAIMER

The products used for this research are commonly and predominantly used products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company.

CONSENT

All authors declare that informed verbal and written consent was obtained from each participant. Participation was voluntary and they were not coerced or induced to participate in the study.

ETHICAL APPROVAL

Ethical clearance to conduct the study was sought and granted from the ethical review committees of the University of Benin Teaching Hospital (UBTH). Benin City and Central Hospital, Benin. Permission was also sought from the Medical Directors of the hospitals and heads of PEPFAR in the hospitals. The study was carried out in accordance with the declaration of Helsinki on research on human subjects.

ACKNOWLEDGEMENT

We wish to thank and acknowledge the following institutions and people who contributed in making the study a success.

1. TETFUND for the award of the grant and financial support
2. The management of the University of Benin, Benin City for approving the grant for the study.
3. The management of the University of Benin Teaching Hospital and Central Hospital, Benin City for giving us permission to carry out the study in the Hospital.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Global HIV Statistics.1st October 2020. Available:https://www.unaids.org.
2. Kharsany ABM, Karim QA. HIV infection and AIDS in Sub-Saharan Africa: Current status, challenges and opportunities open. AIDS J. 2016;10:34-48).
3. National Agency for Control of AIDS (NACA), Federal Republic of Nigeria, Global AIDS Response Progress Report (GARPR). 2014;13
4. UNAIDS org. Press release of survey results; March 2019.
5. Cunningham ET JR, Margolis TP. Ocular Manifestations of HIV infections. N Engl J Med. 1998;338:236-44.
6. Kestelyn PG, Cunningham ET Jr. HIV/AIDS and blindness. Bull World Health Organ. 2001;79(3):208-213.
7. Lightman S. HIV/AIDS. The differing ocular manifestation in developed and developing countries. Community Eye Health Journal. 1995;8:17-19.
8. Lewallen S. Herpes Zoster. Ophthalmicus in Malawi. Ophthalmology. 1994;101:1801-4
9. Ateenyi-Agaba C. Conjunctival squamous cell carcinoma associated with HIV infection in Kampala, Uganda. The lancet. 1995;345:695-96.
10. Kestelyne P. The epidemiology of CMV retinitis in Africa. Ocul Immunol Inflamm 1999;7:173-77.
11. Beare NAV, Kublin JG, Lewis DK et al. Ocular diseases in patients with tuberculosis and HIV presenting with fever in Africa. Br J Ophthamol. 2002;86:1076-79.
12. Del Amo J, petruckevitch A. Philips AN et al. Spectrum of disease in Africans with AIDS in spectrum of disease in Africans with AIDS in London. AIDS 1996;10:1563-69.
13. Weiss RA. How does HIV Cause AIDS? Science. 1993;260:1273-79.
14. Douek DC, Roederer D, Koup RA. Emerging concepts in the immunopathogenesis of AIDS. Annual Reviews. 2009;60:471-84.
15. Center For Disease Control (CDC) Kaposi sarcoma and pneumocystis pneumonia among homosexual men. new york city and california, mmwr mortality and morbidity weekly report. 1981;30(25):305-308.

16. National AIDS/STD control programme (NASCOP): Research monitoring and evaluation unit ministry of health. National HIV surveillance; 2008.
17. United Nations General Assembly Special Session (UNGASS). Country progress report; 2008.
18. Jabs DA. Ocular manifestations of HIV Infection. Trans Am Ophthalmol Soc. 1995;93:623-683
19. UNAIDS, Joint United Nations Programme on HIV/AIDS (UNAIDS), 2006 report on the global AIDS Epidemic, Geneva; 2006.
20. Nussenblatt RB, Lane HC. Human immunodeficiency virus disease: Changing pattern of intraocular inflammation. American Journal of Ophthalmology. 1998;129:373-82.
21. Maclean H, Hall AJ, Mc Combe MF, Sandland AM. AIDS and the Eye. A 10 year experience. Austr NZ J Ophthalmol. 1996;24:61-7.
22. Azonobi RI, Udoye E, Tebepah T, Opubiri IR. Ocular manifestation of HIV/AIDS infection among patients receiving highly active Anti retro viral therapy (HAART) in a tertiary eye care centre. Journal of AIDS and HIV, Research. 2013;5:322-27,
23. Arowolo OM, Awoyesuku EA, Pedro-Egbe CN. Ocular diseases in HIV positive patients in a Tertiary Hospital in Nigeria. International Journal of Tropical Diseases and Health. 2019;39(31):1-9.
24. Nwosu NN. HIV/AIDS in ophthalmic patients. The guinness centre onitsha experience. Niger Postgrad Med J. 2008;15(1):24-7.
25. Ukponmwan CU, Ukponmwan EU, Kayoma D, Ese-Onakewhor J Omorogiuwa. Pattern of ocular morbidity in patients attending an ophthalmic outreach in Southern Nigeria. Arch Ophthalmol. Eye Disord. 2020;2(1): 01-09.
26. Ukponmwan CU. Pattern of ocular morbidity in Nigeria. Asian Pac J Trop Dis. 2013;3(2):164-166.
27. Ani EU, Fiebei B. Pattern of ocular disorders in an oil rich community. Int J Community Med Public Health. 2018;5(5): 1726-1729.
28. Emina MO, Odjimogho SE. Ocular problems in HIV and AIDS patients in Nigeria. Optom Vis Sci. 2010:87(12):979-84.
29. World report on vision, executive Summary.lapb.org/wp-content/upload/world report on vision, accessible executive summary. Pdf (accessed on 6/7/2020)
30. Asefa Y, Asfawassen GY, Azanaw M. Ocular manifestation of HIV/AIDS patients in Gondar University Hospital, north-west Ethiopia. Ethiopia J Health Dev. 2006;20:166-169.
31. Amsalu A, Desta K ,Nigussie D, Delelegne D. Ocular manifestations and their associated factors among HIV/AIDS patients receiving HAART in southern Ethiopia. Int J Ophthalmol. 2017;10(5): 776-781.
32. Kehinde AV, Samaila E, Eni RN. Ocular aids: Experience at the guinness ophthalmic unit, Kaduna, Nigeria. Niger J Surg Res. 2005;7(3):305-308.
33. Osahon AI, Onunu AN. Ocular disorders in patients infected with the human immunodeficiency virus at the University of Benin Teaching Hospital, Benin City. Niger J Clin Pract. 2007;10(4):283-6.
34. Copeland RA, Dahl AA, Phillpots BA. Ocular manifestations of HIV infection. Medscape, e medicine; June 2019. assessed 29/6/2020.
35. Lucca JA, Farris RL, Bielory L, Caputo AR. Kerato conjunctivitis Sicca in male patients infected with Human Immunodeficiency Virus Type 1. Ophthalmology. 1990;97(8): 1008-10.
36. Sudharshan S, Kaleemunnisha S, Ashraf Banu A, Shrikrishna S, George AE, Rajesh Babu B et al. Ocular lesions in 1000 consecutive HIV positive patients in India : A long term study. J Ophthalmic Inflamm Infect. 2013;3(1):2.
37. Omolase CO, Komolafe OO, Ayodeji OO, Akinwalere AK. Journal of South Africa Family Practice. 2012;54(5).

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/62957