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ORIGINAL ARTICLE

Prevalence and Aetiology of Visual Impairment and Blindness in Persons with HIV/AIDS on Highly Active Anti-Retroviral Therapy in Benin City, Nigeria

Prévalence et Étiologie de la Déficience Visuelle et de la Cécité chez les Personnes Atteintes du VIH/SIDA sous Traitement Antirétroviral Hautement Actif à Benin City, Nigeria

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ABSTRACT

BACKGROUND: The use of Highly Active Anti-Retroviral Therapy (HAART) has revolutionized the course and pattern of eye diseases in persons with HIV/AIDS which ultimately affects the visual status.

OBJECTIVE: To determine the prevalence and etiology of visual impairment and blindness in people with HIV/AIDS on HAART in Benin City, Nigeria.

METHODOLOGY: This was a descriptive hospital-based study on all HIV/AIDS patients on HAART in the United States President's Emergency Plan for AIDS Relief (PEPFAR) clinics of University of Benin Teaching Hospital seen from July to August 2018 and Central Hospital, Benin City in October 2019. Demographic data and other relevant questions related to the disease were obtained from participants and recorded in an interviewer administered questionnaire. Participants were examined and ocular findings recorded. The IBM SPSS software version 21 was used for data analysis and level of significance set at $p<0.05$.

RESULTS: There were 451 persons comprising 104 (23.1%) males and 347 (76.9%) females. More participants, 176(39%) were within the age group 41–50 years, with a mean age of 46.6± 10.78 years, and age range of 14–75 years. Visual impairment was present in 105 (23.3%), blindness in 10 (2.2%) and 336(74.5%) had normal visual acuity. Refractive error was the most common cause of mild 34 (29.6%) and moderate 23(20%) visual impairment. Cataract 4(3.5%) was the predominant cause of blindness. There was no case of severe visual impairment recorded.

CONCLUSION: The major causes of visual impairment and blindness in persons with HIV are not HIV-related diseases which may be an indication of improved management protocols. **WAJM 2023; 40(2): 155–160.**

Keywords: Visual impairment, Blindness, HIV/AIDS, HAART.

RÉSUMÉ

CONTEXTE: L'utilisation de la thérapie antirétrovirale hautement active (HAART) a révolutionné le cours et le modèle des maladies oculaires chez les personnes atteintes du VIH/SIDA, ce qui affecte finalement l'état visuel.

OBJECTIF: Déterminer la prévalence et l'étiologie de la déficience visuelle et de la cécité chez les personnes atteintes du VIH/SIDA sous HAART à Benin City, au Nigeria.

MÉTHODOLOGIE: Il s'agissait d'une étude descriptive en milieu hospitalier sur tous les patients atteints du VIH/sida sous HAART dans les cliniques du Plan d'urgence du président des États-Unis pour la lutte contre le sida (PEPFAR) de l'hôpital universitaire de Benin vu de juillet à août 2018 et de l'hôpital central de Benin City en octobre 2019. Les données démographiques et d'autres questions pertinentes liées à la maladie ont été obtenues des participants et enregistrées dans un questionnaire administré par un enquêteur. Les participants ont été examinés et les résultats oculaires enregistrés. Le logiciel IBM SPSS version 21 a été utilisé pour l'analyse des données et le niveau de signification fixé à $p<0,05$.

RÉSULTATS: 451 personnes ont été recensées, dont 104 (23,1%) hommes et 347 (76,9%) femmes. La plupart des participants, 176 (39%) étaient dans la tranche d'âge 41-50 ans, avec un âge moyen de 46,6± 10,78 ans, et une fourchette d'âge de 14-75 ans. La déficience visuelle était présente chez 105 (23,3%), la cécité chez 10 (2,2%) et 336 (74,5%) avaient une acuité visuelle normale. L'erreur de réfraction était la cause la plus fréquente de déficience visuelle légère (34, 29,6 %) et modérée (23, 20 %). La cataracte, 4 (3,5 %), était la cause prédominante de cécité. Aucun cas de déficience visuelle grave n'a été enregistré.

CONCLUSION: Les principales causes de déficience visuelle et de cécité chez les personnes séropositives ne sont pas des maladies liées au VIH, ce qui peut indiquer une amélioration des protocoles de prise en charge. **WAJM 2023; 40(2): 155–160.**

Mots clés: Déficience Visuelle, Cécité, VIH/SIDA, HAART.

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INTRODUCTION

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.[1,2] Human immunodeficiency virus infection (HIV) and the advanced form of the disease, Acquired Immune Deficiency Syndrome (AIDS) was first reported in the United States of America in 1981 and has since become a worldwide pandemic.[3] This has had grave socioeconomic and health consequences and above all a potential for visual loss and ultimately blindness on mankind. Sub-Saharan Africa has more than 25 million people living with HIV/ AIDS of the over 37.9 million persons living globally with the disease accounting for the largest burden of HIV/ AIDS.[4,5] In Nigeria, HIV infection was first reported in 1986.[6] Nigeria is one of those countries greatly affected by HIV/AIDS in the subcontinent, with 1.5% of the populations 15 to 49 years living with HIV estimated to be 1.9 million people.[5] The ocular manifestation of HIV/AIDS was first reported by Holland *et al.*[7] HIV/AIDS related eye disease may affect 50–75% of HIV infected people world-wide at some point during the course of their illness.[8] This generally takes the form of opportunistic infections that can affect any ocular tissue from the eye lid to the retina. In particular, those conditions affecting the retina result in chronic visual impairment or blindness. The spectrum of HIV related disease appears to differ by geographical location with some studies suggesting that infection related retinitis is not as common in sub-Saharan Africa compared with industrialized countries and south east Asia.[9-12]

Before the introduction of highly active antiretroviral therapy (HAART), it was reported that non-refractive visual problems occurred in 50–75% of HIV infected individuals during the course of the illness in North America and Europe[13] while 5–25% of HIV positive patients were expected to develop blindness at some point in time during the course of their illness in developing countries due to poor standard of care increasing the risk of blindness or low vision.[14,15] CMV retinitis was the leading cause of visual loss in patients with HIV/AIDS infection in the pre-HAART era being responsible for close to 2 million cases of bilateral vision loss globally[16] However, in Nigeria, the condition was not common possibly because most patients had died by the time the CD4 count drops to levels that predispose to the disease.[12] The widespread use of HAART has greatly improved the course of HIV/AIDS infection with immune recovery and changing pattern in the causes of visual loss. The aim of the study was to determine the prevalence and etiology of visual impairment and blindness in people living with HIV/AIDS who are on HAART in Benin City, Nigeria.

MATERIALS AND METHODS

This was a descriptive hospital-based study on all consenting consecutive patients confirmed to be retro-viral disease (RVD) or Human Immunodeficiency Virus (HIV) positive attending two centres, the United States President's Emergency Plan for AIDS Relief (PEPFAR) clinics of University of Benin Teaching Hospital, Benin City from July to August 2018 and the PEPFAR clinic of Central Hospital, Benin City in October 2019. Participants attending the clinics who met the study criteria during the study period were identified and interviewed. All non-consenting participants were excluded. Demographic data and other relevant questions related to the disease were obtained from the participants and recorded in a semi structured interviewer administered questionnaire designed for this study. Participants were examined and ocular findings were also recorded in the questionnaire. The eye examination included their visual acuity using the Snellen chart and the illiterate E chart for respondents who could not read at a distance of 6 metres in a well-lit room. The visual acuity was carried out on one eye with the other eye occluded. Patients who could not read the chart at a distance of 6 metres were examined at 3 metres. The distance was gradually reduced to 2 metres, then to 1 metre until the patient could read. They were asked to count the fingers of the examiner at various distances if they could not read the chart at 1 metre. 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 motion was tested. The adnexae, anterior and posterior segments were examined with a pen torch, Slit Lamp and indirect ophthalmoscope. The intraocular pressure was measured using the rebound I-Care^{R} tonometer and the eyes were dilated with tropicamide 1% eye drops where necessary. Blood pressure, weight, height and body mass index were also obtained and recorded. The most recent CD4 count and viral load were retrieved from the case notes and recorded in the questionnaire.

The World Health Organization (WHO) definition for visual impairment and blindness was used in this study[17] whereby blindness was defined as presenting visual acuity (VA) < 3/60 in the better eye, Severe visual impairment (SVI) defined as VA <6/60 to 3/60 in the better eye, Moderate visual impairment (mod VI) defined as VA<6/18 to 6/60 in the better eye, Mild visual impairment (mild VI) defined as VA < 6/12 to 6/18 in the better eye and Normal vision (N) defined as VA> 6/12 in the better eye.

Ethical clearance to conduct the study was sought and granted from the Ethical review committees of the University of Benin Teaching Hospital, Benin City and Central Hospital, Benin City. Permission was also obtained from the heads of PEPFAR clinics in both hospitals. The study was conducted in line with the declaration of Helsinki on research on human subjects. Informed verbal and written consent were obtained from each participant before conducting the interview and examining them. The participants were assured of strict confidentiality and privacy during the interview. The aim and objectives of the study were explained to the participants in a health talk given to them by the principal researcher. Participation was voluntary and they were not coerced or induced to participate in the study. The total duration of the study was 16 months from 1st July, 2018 to 31st October, 2019. The International Business Machine Statistical Product for Scientific

Solutions (IBM SPSS) software version 21 was used for data analysis. Descriptive inferential statistics was done and the level of significance set at $p<0.05$.

RESULTS

The total number of participants in this study was four hundred and fifty-one comprising 104 (23.1%) males and 347 (76.9%) females with a male to female ratio of 0.3:1. There were no persons who declined participating in the study. Majority of the participants, 176 (39%) were within the age group 41–50 years, with a mean age of 46.6± 10.78 years, and age range of 14–75 years. Occupational skill level 1 was the predominant skill level in 405 (89.8%) of the participants. Most of the participants, 381(84.5%) resided in an urban area and almost half of the participants171(46.1%) had a CD4 count ≥500. Almost one-third of the participants, 145(32.2%) have been living with HIV for a period ranging from 1 to 5 years. (See Table 1).

Table 1: Socio-Demographic Characteristics of Visual Acuity Status of Participants Variable

	Normal (%)	Mild (%)	Moderate (%)	Blindness (%)	Total (%)	p-value (%)
Age (years)						
≤20	0(0)	1(0.2)	0(0)	0(0)	1(0.2)	<0.0001
21 – 30	23(5.1)	5(1.1)	2(0.4)	0(0)	30(6.7)	
31 – 40	82(18.2)	12(2.7)	4(0.9)	2(0.4)	100(22.2)	
41 – 50	149(33)	11(2.4)	16(3.5)	0(0)	176(39)	
51 – 60	62(13.7)	20(4.4)	13(2.9)	3(0.7)	98(21.7)	
>60	20(4.4)	11(2.4)	10(2.2)	5(1.1)	46(10.2)	
Sex						
Female	256 (56.8)	47(10.4)	37(8.2)	7(1.6)	347(76.9)	0.743
Male	80 (17.7)	13(2.9)	8(1.8)	3(0.7)	104(23.1)	
Marital status						
Married	231(51.2)	42(9.3)	27(6)	5(1.1)	305(67.6)	0.57
Widowed	38(8.4)	10(2.2)	11(2.4)	3(0.7)	62(13.7)	
Single	45(10)	5(1.1)	1(0.2)	1(0.2)	52(11.5)	
Separated/Divorced	22(4.9)	3(0.7)	6(1.3)	1(0.2)	32(7.1)	
Religion						
Christian	331(73.4)	58(12.9)	44(9.8)	9(2)	442(98)	0.101
Islam	5(1.1)	1(0.2)	1(0.2)	1(0.2)	8(1.8)	
ATR	0(0)	1(0.2)	0(0)	0(0)	1(0.2)	
ILO classification of Occupation						
Skill level 1	300(66.5)	57(12.6)	38(8.4)	10(2.2)	405(89.8)	0.232
Skill level 2	27(6)	3(0.7)	7(1.6)	0(0)	37(8.2)	
Skill level 3	9(2)	0(0)	0(0)	0(0)	9(2)	
Residence						
Urban	286(63.4)	51(11.3)	36(8)	8(1.8)	381(84.5)	0.811
Rural	50(11.1)	9(2)	9(2)	2(0.4)	70(15.5)	
Duration of living with HIV/AIDS (years)						<
1 20(4.4)	7(1.6)	5(1.1)	1(0.2)	33(7.3)	0.581	
1 – 5	108(23.9)	19(4.2)	17(3.8)	1(0.2)	145(32.2)	
6 – 10	99(22)	18(4)	10(2.2)	3(0.7)	130(28.8)	
11 – 15	89(19.7)	15(3.3)	9(2)	4(0.9)	117(25.9)	
>15	20(4.4)	1(0.2)	4(0.9)	1(0.2)	26(5.8)	
$CD4^+$ count						
0 – 199	56(15.1)	13(3.5)	8(2.2)	3(0.8)	80(21.6)	0.05
200 – 499	86(23.2)	14(3.8)	18(4.9)	2(0.5)	120(32.3)	
≥500	139(37.5)	22(5.9)	9(2.4)	1(0.3)	171(46.1)	
Body mass index						
Underweight	20(4.4)	5(1.1)	4(0.9)	1(0.2)	30(6.7)	0.664
Normal weight	143(31.7)	28(6.2)	23(5.1)	4(0.9)	198(43.9)	
Overweight	103(22.8)	15(3.3)	9(2)	1(0.2)	128(28.4)	
Obesity	70(15.5)	12(2.7)	9(2)	4(0.9)	95(21.1)	

Visual Acuity Status of Participants

Three hundred and thirty-six 336 (74.5%) participants had normal visual acuity while 60 (13.3%) had mild visual impairment. Forty-five (10%) had moderate visual impairment, with 10 (2.2%) having blindness. There was no case of severe visual impairment found. Refractive error was the most common cause of visual loss in 58(50.4%) of participants. It was also the most common cause of mild and moderate visual impairment in 34(29.6%) and 23(20.0%) respectively while cataract 4 (3.5%) was the most common cause of blindness. Cataract was responsible for blindness and visual impairment in 23/144 (16%) of those above 50 years. All the cases of visual impairment and blindness from cataract were in persons above 40 years. The cases of blindness from cataract occurred in the age group above 60 years. There were no cases of uveitis from toxoplasmosis or immune recovery. (See Table 2).

Males were 0.663 times less likely than females to have some form of visual loss. Those in the 21–30 age group were 0.162 times less likely to have visual impairment than those above 60 years ($p= 0.003$), that is, were significantly less likely than those above 60 years. Similarly, the 31–40 age bracket were 0.129 times less likely to have visual impairment compared to those above 60 years ($p < 0.0001$), those within the 51–60 years age bracket were 0.365 less likely to have visual impairment, compared to the respondents who were above 60 years ($p=0.012$). The odds of having visual loss as it pertains to the CD4 count was not statistically significant. (See Table 3).

Table 2: Causes of Visual Impairment and Blindness in HIV Positive Patients

Type of Visual Loss	ARMD	CAT	MAC	RET	COR	GLA	TOXO	REF	Total
Mild	4(3.5)	14(12.2)	1(0.9)	0(0)	1(0.9)	5(4.3)	1(0.9)	34(29.6)	60(52.2)
Moderate	4(3.5)	9(7.8)	3(2.6)	1(0.9)	1(0.9)	2(1.7)	2(1.7)	23(20)	46(40.0)
Blindness	1(0.9)	4(3.5)	2(1.7)	0(0)	2(1.7)	0(0)	0(0)	1(0.9)	10(8.7)
Total	**9(7.8)**	**27(23.5)**	**6(5.2)**	**1(0.9)**	**4(3.5)**	**7(6.1)**	**2(1.7)**	**58(50.4)**	**115(100)**

ARMD, Age related macular degeneration; CAT, Cataract; MAC, Maculopathy; RET, Retinitis Pigmentosa; COR, Corneal scars; GLA, Glaucoma; TOXO, Presumed ocular toxoplasmosis/ Chorioretinal scar; REF, Refractive error.

Table 3: Logistic Regression Model for Determinants of Visual Loss

Predictors	B (regression Co-efficient)	Odds Ratio	95% CI		p-value
			Lower	Upper	
Sex		0.352	1.248	0.203	
Male	–0.411	0.663			
Female	(Ref)				
CD4⁺ Count					
0 – 199	0.578	1.783	0.924	3.441	0.085
200 – 499	0.67	1.954	1.075	3.551	0.028
≥500 (Ref)		1			
Age (years)					
≤20	20.941	1.23E9	0–.		1
21 – 30	–.822	0.162	0.048	0.542	0.003
31 – 40	–2.053	0.128	0.052	0.317	<0.0001
41 – 50	–2.163	0.115	0.052	0.255	<0.0001
51 – 60	–1.007	0.365	0.166	0.803	0.012
>60 (Ref)					

DISCUSSION

In this study, the mean age of participants was 46.55±10.78 years, higher than other studies in the South-South geopolitical zone of Nigeria of 36.9 years and 36.2 years in Rivers and Bayelsa states respectively.[12,15] This may be indicative of longer life spans in persons living with HIV/AIDS. However, while the study in Rivers was conducted on HIV positive patients irrespective of their HAART status, the study in Bayelsa was conducted on new HIV patients receiving treatment. Males were disproportionately less in number being 23.1% of the participants. This trend in which males are less in number was also reported in the studies in Ethiopia (37.8%) and Uganda (37%) both in East Africa but reasons not proferred.[18,19] The increased prevalence of HIV in the female folk may be attributed to biologic and socio-cultural factors. The factors stated include greater mucus area exposure to HIV during penile penetration, concurrent reproductive tract infections and sexually transmitted diseases in women increasing the risk of HIV transmission making them more vulnerable to infection. Others factors include lower socio-economic status of women who lack power and economic independence to negotiate safe sex, the predominant heterosexual mode of transmission of the disease in this environment whereby females are the receptive partners. High rates of voluntary male circumcision in this setting are also believed to be protective for men.[20,21] The pattern likely related to community prevalence of HIV. More persons have had the disease for less than or equal to 5 years which could indicate that there is still active transmission of the disease. There is thus need for sustained public health efforts to ensure increased awareness and prevention strategies of HIV to ensure a healthy populace.

The prevalence of mild visual impairment, moderate visual impairment and blindness was 13.3%%, 10% and 2.2% respectively. There was no case of severe visual impairment among the participants. This prevalence is much lower than what had previously been reported that 25 to 50% of people with HIV AIDS will develop visual impairment and blindness during the course of the disease.[13] This assertion was during the pre-HAART era in which the pre-dominant causes of visual impairment and blindness were from opportunistic infections such as with cytomegalovirus retinitis with low CD4 counts. Other common causes of visual loss associated with RVD in the pre-HAART era include herpes simplex virus retinitis with acute retinal necrosis (ARN), progressive outer retinal necrosis (PORN) and herpes zoster ophthalmicus (HZO). HIV-related ischaemic microvasculopathy, ocular tuberculosis, ocular syphilis and ocular toxic or allergic drug reactions also cause visual impairment and blindness. With the introduction of HAART, other causes of decreased vision such as immune recovery uveitis were on the increase.

The predominant cause of mild and moderate visual impairment in this study was refractive errors while cataract was the leading cause of blindness. This is similar to the current trend in the general population with refractive errors as the most common cause of visual impairment. In Uganda, cataract and refractive errors were found to be the predominant causes of visual impairment with cataract occurring more commonly with increasing age.[19] In the study in Uganda, 25% of persons above 50 years had cataract while in this study, 16% of those above 50 years had cataract.[19] The Nigerian national survey on blindness and visual impairment also reported increasing age as a risk factor cataract blindness and visual impairment.[23] This may be linked to the current treatment protocol that entails commencement of HAART on all persons on diagnosis, no longer waiting for a decline in CD4 count, the major hallmark in the ocular involvement in HIV/AIDS as documented in another publication from

this study.[22] This coupled with the ready availability and access to HAART treatment irrespective of socioeconomic status to all persons with RVD as treatment is almost free of cost may be responsible for the changing pattern of presentation of visual loss in persons living with HIV. This study indicates that the causes of poor vision in persons living with HIV have reversed to similar disease conditions found in the general population.[23] This would suggest efficacy of current management regimen in improving the quality of life in persons with HIV/AIDS. Increasing age an established risk factor for visual impairment and blindness in the general population was found to be a significant determinant of visual loss while other variables such as sex and CD4 count were not significant. The majority of persons with HIV/AIDS have had the condition for over 5 years (60.3%), a reflection of increasing longevity without succumbing to the virus by these persons due to use of HAART. The occurrence of HIV/AIDS defining complex diseases such as cytomegalovirus retinitis which resulted in visual loss and blindness was previously a marker of reduced or decreased chances of survival. In Ilorin, Nigeria, diagnosis with high predictive values for HIV were Herpes Zoster Ophthalmicus, Unresolving bilateral toxoplasmosis and Steven Johnson Syndrome. However, these were not found to be markers for HIV. Toxoplasmosis uveitis though present in 1.7% of cases in this study was not a cause of blindness. The improvement in the visual state and hence quality of life of persons living with HIV is also likely a direct dividend of improved outcomes as a result of more effective management protocols of persons with HIV in which they are now commenced on HAART therapy immediately diagnosis is made in contrast to previous guidelines whereby a predetermined level of CD4 count is achieved before commencement of HAART as indicated in a previous report from this study.[22]

In conclusion, there is a changing trend in the pattern and prevalence of visual impairment and blindness in persons living with HIV from opportunistic infections such as cytomegalovirus retinitis to causes similar to that found in the general population such as refractive errors and cataract. This may be suggestive of very effective protocol and treatment guidelines in the use of HAART leading to improved treatment outcomes.

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Duality of Interest

The authors declare no conflict of interests.

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