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Causes of Low Vision and Blindness in a Leprousarum in Kano State, Nigeria

Okpo Eme[1,*], Nwakuche P. Ikechukwu[2], Ejukunemu Barbie O.M.[2]

[1]Department of Optometry Bayero University Kano / Department of Ophthalmology, Aminu Kano Teaching Hospital, Kano, Nigeria
[2]Department of Optometry, Bayero University Kano, Nigeria
*Corresponding author: doctorokpo@yahoo.co.uk

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Abstract Low vision includes moderate visual impairment and severe visual impairment based on presenting distance Visual Acuity (VA). Leprosy is a chronic granulomatous disease caused by the Bacillus Mycobacterium leprae. Individuals with visual impairment and blindness due to ocular leprosy; form a severely disadvantaged group because of other disabilities due to the disease, its social stigma and delay in receiving appropriate eye care. The purpose of this study was to ascertain the causes of Low Vision and Blindness in a Leprosarium in Kano State, Nigeria. This study was a Cross sectional descriptive study conducted over a period of six month on 109 Low Vision and Blind patients aged 14 years and above. Ocular examinations of the external and internal structures of the patients were performed. Visual acuity was measured using the logMAR E chart. Of the 109 participants, 51 (46.8%) were females and the mean age was 46.8 ±18. The main causes of low vision and blindness are Cataract (47.0%), leprosy related corneal opacity (45%) and chronic uveitis (28%). Madarosis was the most common ocular lesion in my study accounting for 68.8% of the cases followed by lagophthalmos which occurred in 43.1% of the cases. The relationship between types of leprosy and causes of low vision and blindness (Chi = 3.488; df =6; p = 0.74557) was not Significant (P > 0.05). The low vision and blindness suffered by leprous patients is an additional health burden often overlooked by health service providers. Ocular complications are common and sight threatening in leprosy patients. There is a need for better collaboration between leprosy control and blindness prevention programmes.

Keywords: *low vision, blindness, leprosy, Kano, causes*

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1. Introduction

According to the World Health Organization (WHO), visual impairment includes both low vision and blindness based on presenting visual acuity. Low vision includes moderate visual impairment and severe visual impairment based on presenting distance Visual Acuity (VA). Moderate visual impairment is defined as visual acuity of less than 6/18, but equal to or better than 6/60 based on the presenting distance VA; severe visual impairment is VA less than 6/60, but equal to or better than 3/60 based on presenting VA. Blindness is visual acuity of less than 3/60 based on presenting VA [1].

World Health Organization shows that about 285 million people in the world are visually impaired from various causes and of these, 39 million people are blind and 246 million have low vision [2].The main cause of moderate and severe visual impairment is uncorrected refractive errors whereas cataracts remain the leading cause of blindness in middle- and low-income countries. Eighty percent (80%) of all visual impairment can be prevented or cured [3].

Leprosy is a chronic granulomatous disease caused by the Bacillus *Mycobacterium leprae.* This primarily affects the skin and peripheral nerves [4,5]. Leprosy is treated with a Multi-Drug Therapy (MDT) combination of rifampicin, clofazimine, and dapsone. Two main regimens are used depending on whether the patient has paucibacillary or multibacillary disease [6]. Eye complications in leprosy have decreased. This is a result of earlier diagnosis and highly effective MDT of leprosy, combined with timely treatment of secondary nerve damage by steroids [7]. The eye may become involved in leprosy in three ways as a complicationof the trigeminal nerve; by invasion of the eye ball by large numbers of acid-fast bacilli in lepromatous leprosy; and by participation in the generalized allergic reaction, known as the reactive phase [8]. In 1998, the number of people living with leprosy-related visible impairments was estimated to be 2 million. Social problems resulting from stigma are often not restricted to the person who has had leprosy him or herself, but affect the whole families.

Prevalence of leprosy has fallen by means of effective antibiotic therapy; it is still endemic in various regions of the world. In 2003, only 513,798 new patients were detected for treatment worldwide [9]. The prevalence of

low vision and blindness (based on BCVA < 6/18 to No Light Perception) in Kano state, in Nigeria were 13.0% and 25.0% respectively [10]. The prevalence of low vision and blindness is higher among leprosy patients than in the wider population. It occurs as a complication of the disease or as part of the ageing process. Individuals with visual impairment and blindness due to ocular leprosy; form a severely disadvantaged group because of other disabilities due to the disease, its social stigma and delay in receiving appropriate eye care. The low vision and blindness suffered by leprous patients is an additional health burden often overlooked by health service providers. Our study assessed the causes of low vision and blindness, of Yadakunya leprosy settlement village in Kano State, Nigeria.

2. Materials and Method

This study was a cross sectional descriptive study involving people living with leprosy at Yadakunya leprosy settlement village. The aim was to determine the causes of low vision and blindness in patients with leprosy. It was carried out at Yadakunya leprosy hospital for a period of six months (from February 1st, to July 1st, 2016). Yadakunya is a Leprosy village located near Yadakunya Leprosy Hospital with a population of about 5,595. The village is located in the North-Eastern part of Kano City under Ungogo Local Government Area of Kano State Nigeria. Yadakunya lies between latitudes 12.1050 north of equator and longitude 8.0129 east of the prime meridian [11]. Data on age, sex and duration since diagnosis of leprosy were recorded. The type of leprosy and duration of treatment was determined from the patient's medical records.

Ethical approval was obtained from the Ethical committee, Aminu Kano Teaching Hospital Kano and the Health Service Management Board Kano State. The patients were clearly explained the purpose of this study, before written informed consent was taken for eye examination. Instrument of research includes: review of medical record, semi structured questionnaires and clinical examination. To be eligible to be included in this study, participants met the following criteria:

1. Signed a written consent form.
2. Diagnosed with leprosy> 6 years.

The following materials were used during the research: Direct Opthalmoscope (for examination of the internal ocular structure), Retinoscope (for objective refraction), Trial lens boxes and trial frames (for subjective refraction), pen torch (for examination of the external structures of the eyes), pinhole disc (for pinhole acuity assessment), pupillary distance rule (for measurement of pupillary distance), Schiotz tonometer (for intraocular pressure measurement) and sloan letters and baily-lovie design tumbling E logMAR charts for distance and near Visual Acuity (VA) assessment. The World Health Organization (WHO) classification of blindness and low vision [12] (Table 1) was used in classification of patient's visual impairment.

Visual impairment was defined as visual acuity range of 0.52 – 4.0 logMAR (< 6/18 – No Light Perception is the Snellen equivalent). Visual acuity of 0.52–1.30 logMAR (< 6/18 –3/60 is the Snellen equivalent) was classified as low vision. 1.32 – 4.0 logMAR (< 3/60 –No light perception is the Snellen equivalent) was classified as blindness.

The pre-tested study questionnaire was administered to eligible patients through the help of the ophthalmic nurse. For each consenting individual, data on age, sex, and duration since diagnosis of leprosy were recorded. The examination was done by Low Vision Optometrist using a pen torch and direct ophthalmoscope.

After taking the ocular history, visual acuity was tested with a Sloan Letters and Baily-Lovie Design Tumbling Es illiterate logMAR charts in a well illuminated room. Pinhole disc was used to detect if reduced visual acuity (VA) was due to refractive error or eye disease/ anomaly. Examination of the ocular adnexa (eyebrows, eyelids, lacrimal sac), anterior segment of the eye (conjunctiva, sclera, cornea, anterior chamber, iris and pupil) was done with pen torch. Fundus examination was done with direct ophthalmoscope in a semi dark room. Objective and subjective refraction were performed, and best corrected VA was measured and recorded. Intraocular pressure was measured with Schiotz tonometer under topical anaesthesia (xylocaine eye drops). Confrontation field testing was performed to measure the extent of visual fields loss. Since majority of the patients has lost sensitivity as a result of leprosy, visual field assessment using automated visual field analyzer was not instrument of choice. The data collected was subjected to statistical analysis using percentages, Chi -square test (computer software) [13] and presented in table.

Table 1. Classification of Visual Impairment (WHO, 2008)

S/N	Actual	Size	Letter	Equivalent				C of LV / B	Cat
	13 Foot	4 Meter	Size	20 Foot	6 Meter	LogMAR	Decimal		
1	13/13 – 13/39	4/4 – 4/12	4M – 12.5M	20/20 – 20/60	6/6 – 6/18	0.0 – 0.50	1.00 – 0.32	N-Mild LV	0
2	13/39 – 13/130	4/12 – 4/40	12M – 40M	20/60 – 20/200	< 6/18 – 6/60	0.50 – 1.0	0.32 - 0.10	MLV	1
3	13/130 – 13/260	4/40 – 4/80	40M – 80M	20/200 – 20/400	<6/60 – 3/60	1.02 – 1.30	0.10 – 0.05	SLV	2
4	13/260 – 13/812.5	4/80 - 4/250	80M – 250M	20/400 – 20/1250	<3/60 – 1/60	1.32 – 1.80	0.05 – 0.016	LB	3
5	13/812.5 – 13/13000	4/250 – 4/4000	250M – 4000M	20/1250 – 20/20000	<1/60 – LP	1.82 – 3.00	0.016 – 0.001	PB	4
6	NPL	NPL	NPL	NLP	NLP	4.0	NLP	TB	5

Key: C = Classification, Cat = Category, MAR = Minimum Angel of Resolution, LP = Light Perception NPL = No Light Perception, N = Normal, LV =Low Vision MLV = Moderate Low Vision, SLV = Severe Low Vision, LB = Legal Blindness PB = Partial Blindness, TB = Total Blindness.

3. Results

Out of a total of 303 registered patients in the Yadakunya Leprosy hospitals eye clinic, 109 (comprising 51 females and 58 males) met the inclusion criteria. 283(comprising 112 females and 171 males) had normal vision (0.0 – 0.50 logMAR {6/6 - ≥ 6/18}) with Best Corrected Visual Acuity (BCVA) during the screening and were excluded. Six (6) patients declined consent. Fourteen patients (whose names were in the hospital medical records) were absent during the screening excise for the study. One hundred and nine (109) patients were interviewed and examined for the study. There were 51 (46.8%) females and 58 (53.2%) males and in a ratio of 1:1.14 who had low vision and blindness (Table 2). The age range was from 14 years to 89 years with a mean age of 48.6, a standard deviation of 18 and point estimate of 48±18. Thirty-eight and half percent (38.5% [95 % confidence interval (CI) 46.50 – 50.699]) of patients living with Leprosy who had low vision and blindness are between 50 to 69 years of age (Table 2).

Majority of the patients were more than 50 years old. Participants aged 50 to 69 years old (38.5%) had the highest frequency while those less than 15 years old (6.4%) were lest.

Table 2. Demographic Characteristics of the Participants

Age (years)	Male (%)	Female (%)	Total (%)
<15	5 (4.6)	2 (1.9)	7 (6.4)
15 – 29	0 (0)	13 (11.9)	13 (11.9)
30 – 49	13 (11.9)	13 (11.9)	26 (23.9)
50 – 69	25 (22.9)	17 (15.6)	42 (38.5)
70 >	15 (13.8)	17 (15.6)	21 (19.3)
Total	58 (53.2)	51 (46.8.)	109 (100)

Table 2 above shows the gender and age demographic characteristics of the participants. Those between the age of 50 and 69 years had the highest frequency followed by those in the age bracket of 30 – 49 years. There was no male affected in the age bracket of 15 – 29 years while 11.9% of females were affected. These groups (15 – 29 years), due to pregnancy and hormonal changes being in the pick of their productive age, are more susceptible to diseases.

Table 3. BCVA of patients with low vision seen from February, 2016 to July, 2016

Month	Frequency	0.0 - 0.50 logMAR (Normal-Mild LV)	0.52 – 1.0 logMAR (Moderate LV)	1.02 – 1.30 logMAR (Severe LV)
February	51	27	8	2
March	58	37	5	1
April	52	40	3	0
May	43	20	7	3
June	35	20	2	2
July	44	30	3	1
Total	283	174	28	9

28 patients Moderate Low Vision while 9 had Severe Low Vision (Table 3) based on Visual Acuity.

Table 4. BCVA of patients with blindness seen from February, 2016 to July, 2016

Month	Frequency	1.32 – 1.8 logMAR (Legal Blindness)	1.82 – 3.00 logMAR (Partial Blindness)	4.0 logMAR (Total Blindness)
February	51	5	3	6
March	58	2	4	9
April	52	2	2	5
May	43	3	2	8
June	35	5	1	5
July	44	1	3	6
Total	283	18	15	39

Table 5. Distribution of Non-Leprosy Conditions Causing Low Vision and Blindness

Conditions	Male (%)	Female (%)	Total (%)
Cataract	33 (30.3)	18 (16.5)	51 (45.8)
Glaucoma	5 (4.6)	7 (6.4)	12 (11.0)
ARMD	2 (1.8)	7 (6.4)	9 (8.3)
Optic Atrophy	0 (0)	1 (0.9)	1 (0.9)
DR/ Pigmentosa	0 (0)	1 (0.9)	1 (0.9)
Aphekia/ Pseudoaphakia	2 (1.8)	1 (0.9)	3 (2.8)

Key: ARDMD =Age Related Macular Degenration, DR = Diabetic Rtinopaty.

Table 6. Potentially Blinding Conditions Causing Low Vision and Blindness by Gender

Variables	Male (%)	Female (%)	Total (%)
Corneal opacity	31 (28.4)	18 (16.5)	49 (45 .0)
Cataract	33 (30.3)	18 (16.5)	51 (47 .0)
Chronic uveitis	17 (15.6)	13 (11.9)	30 (28.0)
Glaucoma	5 (4.6)	7 (6.4)	12 (11.0)
Phthisis bulbi	11 (10.1)	10 (9.2)	22 (20.2)
Others	18 (16.5)	14 (12.8)	32 (29.4)

Table 7. Gender distribution of ocular signs in percentage

Conditions	Male (%)	Female (%)	Total (%)
Ptreygium	30 (27.5)	19 (17.4)	49 (45.0)
Lagophthalmos	25 (22.9)	22 (20.2)	47 (43.1)
Corneal opacity	31 (28.4)	18 (16.5)	49 (45.0)
Exposure keratitis	15 (13.7)	14 (12.8)	29 (26.6)
Trichisis	16 (14.6)	11 (10.1)	27 (24.8)
Phthisis	11 (10.1)	10 (9.2)	21 (19.3)
Uveitis	17 (15.6)	13 (11.9)	30 (27.5)
Ectropion	2 (1.8)	3 (2.7)	5 (4.6)
Conjunctivitis	24 (22.0)	20 (18.4)	44 (40.4)
Madarosis	52 (47.7)	23 (21.1)	75 (68.8)

Table 8. Data Analysis

Potential Blinding Conditions	Lepromatous Leprosy	Non-Lepromatous Leprosy	Total
Corneal Opacity	28	18	49
Cataract	33	18	51
Chronic Uveitis	16	14	30
Secondary Glaucoma	5	7	12
Phthisis Bulbi	13	8	21
Lagophthalmos	29	18	47
Exposure Keratistis	15	14	29

There was no relationship existing between types of leprosy and causes of low vision and blindness, considering the statistical analysis (Table 8), the Chi square was 3.488, Degree of Freedom (DF) was 6 and *P* value was 0.74557 at 0.05 Level Significance. The result was statistically not significant at $P > 0.05$.

4. Discussion

This study was a cross sectional survey carried out on people living with leprosy at Yadakunya leprosy settlement village. There were more male than women that participated in the study which is in agreement with the study carried out in North Eastern Nigeria [14] and Ossiomo leprosarium in Edo state, Nigeria [15]. Ebeigbe and Kio [15], in their study concluded that the male lifestyle generally exposes them to greater risks of infection, while women may tend not to seek medical help even when it is required as a reason for the males' preponderance in previous studies. Most of the patients were above 50years of age. Aging has been shown to be significantly associated with leprosy related ocular complication and visual loss [14,16]. Age is a risk factor and other risk factors include disease duration and type of leprosy [16].

The main causes of low vision and blindness are cataract (47.0%), leprosy related corneal opacity (45%) and chronic uvetitis (28%). These findings were in agreement with studies reported in north eastern Nigeria [14], Northern Viet Nam study [17], Southern Cameroon [18], India [19], tertiary care hospital in Lucknow, Uttar Pradesh [21] and South Viet Nam [25]. Globally, approximately 45 million people are blind, and almost half of these are blind due to cataract. Four percent of people over 60 years old are blind and 60% of these live in India, China and Sub Saharan Africa [20]. Non-leprosy related ocular conditions causing low vision and blindness among the patients were age related cataract 51 (45.8%) followed by glaucoma 12 (11.0 %). Cataract in leprosy patients usually caused due to age, extensive use of steroids and as a complication of uveitis; rarely does it occur as a complication of the disease process itself [15].

A lot of cases of blindness recorded in leprosy are due primarily to corneal opacity [14,18]. Corneal opacity was the second potentially blinding conditions Causing Low Vision and Blindness recorded in 45.0% of this study sample which is in agreement the work done in North eastern Nigeria [14]. Corneal involvement in leprosy is known to be influenced by factors such as lagophthalmos, ectropion, and corneal anaesthesia [15].

Madarosis was the most common ocular lesion in my study accounting for 68.8% of the cases. This was also reported in studies carried out in the Department of Ophthalmology, Government Medical College, Srinagar India [23] and Ossiomo leprosarium in Edo state, Nigeria [15]. In those studies prevalence of 72.46% and 72.5% for madarosis has been observed respectively. Another common ocular lesion was lagophthalmos which occurred in 43.1% of the cases. Lagophthalmos is reported as common ocular lesion in most studies on leprosy in Eastern Nepal [22], Ossiomo leprosarium in Edo state, Nigeria [15], in east and west Godavari districts of Andhra Pradesh state, India [5], and Bokaro district of Jharkhand, India [24] and should be one of the primary indicators for monitoring ocular disability in leprosy, as it presents early in the course of the disease. Lagophthalmos leads to exposure of the cornea, micro traumata, secondary infections and ultimately progressive opacification of the cornea [15]. Participants for this study were from only one leprous population in Kano State, Nigeria, therefore findings may not be generalised for the North Western zone of Nigeria.

5. Conclusion

The low vision and blindness suffered by leprous patients is an additional health burden often overlooked by health service providers. Ocular complications are common and sight threatening in leprosy patients. The main causes of low vision and blindness observed in this study were cataract (47.0%), corneal opacity (45.0%) and chronic uvetitis (28.0%). Madarosis (68%) and lagophthalmos (43.1%) were the most common ocular lesion in our study. A focus on the optical correction of refractive errors, low vision rehabilitation and surgical intervention in the case of cataract would lead to a significant reduction in the burden of visual impairment among leprous patients who utilize Yadakunya leprosy hospital for eye care services. Also, early detection and appropriate management of lagophthalmos and glaucoma will reduce the burden of this ocular morbidity. There is a need for better collaboration between leprosy control and blindness prevention programs. Leprosy screening and surveillance programs should include ocular examination as part of routine screening. Special care should be taken on women who are living with leprosy. There is need to conduct a population based study in another state of the region to compare the findings.

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