Prevalence and Causes of Visual Impairment amongst Working and Retired Population in Dawakin Kudu Local Government Kano State

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Abstract

Background: Low vision has a negative impact on the quality of life of people living with it. **Aim:** The purpose of the study was to determine the prevalence and causes of visual impairment amongst the working and retired population in Dawakin Kudu Local Government, Kano State. **Methods:** A prospective cross-sectional survey was carried out over six months on 395 participants 15 years and above. Ocular examinations of the external and internal structures of the participants were performed. Visual acuity was measured by the unaided and pinhole method with Baily-Lovie Design Tumbling Es illiterate logMAR charts at the standard viewing distance (4 meters). **Results:** The age range encountered varies from 15 to 95 years with ages 45 – 59 being the highest. The overall prevalence of visual impairment was 22.03%, consisting of moderate visual impairment (74.7%), severe visual impairment (20.7%) and blindness (4.6%). Major causes of visual impairment were cataracts (44.8%), glaucoma (17.2%), trachoma (2.3%) and retinitis pigmentosa (2.3%). Ageing is positively correlated with visual impairment while gender has no statistical significance in this study. **Conclusion:** The provision of support and welfare services need to be organized sequentially. It is recommended that early screening of those populations with proper counseling, by visiting eye clinics could help to reduce the magnitude of visual impairment.

Keywords: Low vision, Blindness, Prevalence, refractive error, Cataract
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Introduction

Low vision as limited to patients requiring low vision care, is defined by the World Health Organization (WHO) as a person who has impairment of visual functioning even after treatment and/or standard refractive correction and has (in the better eye) visual acuity less than $^6/_{18}$ (0.3) to light perception, or a visual field of less than 10degrees, (.i.e. a diameter of less than 20degrees), from the point of fixation, (Fovea – the physiological centre of the visual field) in the eye with the field of greater central extent, but who uses or is potentially able to use, vision for the planning and/or execution of a task (WHO, 2006). These definitions of low vision, however, do not give a complete picture of how much vision an individual has or how they function with their remaining vision. (Moore & LeJeune, 2010) A useful way to think of the types of problems the patient may encounter is to use functional terms (Ike et al., 2020) to classify the type of visual impairment with respect to the presence of a visual field defect: (a) No visual field defect, but a loss of resolution or contrast throughout the entire visual

field; general haze, glare or blurring of vision, (b) Central visual field defect and (c) Peripheral visual field defect. (Moore & LeJeune, 2010)

Low vision is an impairment of visual function for which full remediation is not possible by conventional spectacles, contact lenses or medical intervention and which causes restriction in the person's daily life activity. (Bittner et al., 2023) It can manifest as reduced visual acuity or contrast sensitivity, visual field loss, photophobia, diplopia, visual distortion, visual perceptual difficulties, or any combination of the above which can result from congenital (genetic or developmental abnormalities), hereditary (e.g., retinitis pigmentosa, Stargardt's macular degeneration), or acquired conditions (e.g., ocular infection or disease, trauma, age-related changes, or systemic diseases. (Freeman et al., 2007)

Low vision and blindness are serious global public health problems with increasing prevalence due to the shifting of demographics and the ageing population. (Varma et al., 2016) It constitutes a serious public health concern, in developing countries like Nigeria where about 90% of the world's visually impaired live. (WHO, 2014) A recent World Health Organization (WHO) report showed that the population size of the visually impaired has increased to 2.2 billion, and 1 billion cases of VI could have been prevented. (Steinmetz et al., 2021; Katibeh et al., 2015) Among this 1 billion people, the main conditions causing distance vision impairment or blindness are cataracts (94 million), refractive error (88.4 million), age-related macular degeneration (8 million), glaucoma (7.7 million), diabetic retinopathy (3.9 million) (GBD, 2019).

The main condition causing near vision impairment is presbyopia (826 million). (Fricke et al., 2018)

The prevalence of distance vision impairment in low- and middle-income regions is estimated to be 4 times higher than in high-income regions (GBD, 2019). With regards to near vision, rates of unaddressed near vision impairment are estimated to be greater than 80% in western, eastern and central sub-Saharan Africa, while comparative rates in high-income regions of North America, Australasia, Western Europe, and Asia-Pacific are reported to be lower than 10%.(Fricke et al., 2018) More than 80% of the global visual impairment burden is preventable, and more than 90% of the visually impaired people live in developing countries.(Pascolini & Mariotti, 2012) The prevalence of visual impairment is expected to be higher in developing countries due to the low level of health care services in many of the countries. It has subsequently been reported that 110 million people have severely impaired vision and, hence are at great risk of becoming blind.

The National Blindness and Low Vision survey results (2007) show that there are over 1 million adults blind and 3 million visually impaired people in Nigeria of which 66% are avoidable. Cataract is the single most common cause of blindness with an estimated 486,000 adults in need of immediate cataract surgery. The major causes of blindness are cataracts (50%), and glaucoma (16%) and two out of every three Nigerians blind could have been avoided. (Kyari et al., 2009) Furthermore, studies carried out in different parts of Nigeria revealed that blindness and visual impairment are high in the northeast (8.2% and 6.9%) and lowest in the south-

west (2.8% and 3.3%).(Kyari et al., 2009; Akano, 2017)

Visually impaired children are often developmentally delayed in the areas of gross and fine motor skills and perception. (Moore & LeJeune, 2010) For students, the inability to read standard-sized print, to see the chalkboard, overhead projection, or the computer, or to discriminate colour can have a significant impact on their educational development. Visually impaired adults are concerned with securing and maintaining employment, productivity, and independence, as well as maintaining a home and fulfilling family and social obligations.

Many people are living with low vision and preventable blindness due to lack of data, knowledge and intervention planning. People live with low vision without concern. This study focuses on assessing the burden of low vision in Dawakin Kudu Local Government of Kano State, Nigeria and hence helps the government officials to plan early intervention. Also, most population-based studies carried out did not include refraction in their methodology rather visual acuity was used as a criterion for grading low vision.

Materials and Methods
This study was a population-based prospective study carried out in Dawakin Kudu Local Government Area of Kano State, Nigeria. The Local Government has an area of 384 km^2 and a population of about 225,389 projected from the 2006 census (Kano Municipal, 2007). Dawakin Kudu Local Government is composed of fifteen (15) wards.

The sample size was 395 (with a 10% attrition factor) determined using the Taro Yamane Formula for estimating the minimum sample size for studies, n = **N/ (1+N (e) 2.** Calculated from a similar work from Kano. (Abdu, 2002) Where n= Sample size, e = Margin error (0.05) and N= 3596 people. The participants were recruited from visual screening conducted in three wards, namely Dawaki, Tsakuwa and Dabar Kwari. The purpose of this study was clearly explained to the participants before written informed consent was taken for eye examination. Three hundred and ninety-five (395) participants were screened using the Snellen chart (Literate and illiterate) for distant vision at a distance of six (6) meters. Those with a V.A. of 6/12 or less were presented with pinhole and the test was repeated.

To be eligible to be included in this study, participants met the following criteria: those who signed a written consent form, whose visual acuity taken with their best refractive corrections (after being screened and refracted), was worse than 6/18 and below. Eighty-seven (87) out of 395 (screened) participants met the inclusion criteria and were included in the study. The instrument of research includes: semi-structured questionnaires and clinical examinations.

The following materials were used during the research: Direct Keller Ophthalmoscope (for examination of the internal ocular structure), Keller 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), 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's (WHO, 2008) classification of blindness and low vision was used in the classification of patient's visual impairment. Visual impairment was defined as a 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 87 participants after obtaining their informed consent and the purpose of the study was also explained to them. For each consenting individual, data on age, sex, occupation and use of spectacle were recorded. After taking the ocular history, visual acuity was tested with 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, the anterior segment of the eye was done with a pen torch. Fundus examination was done with a direct ophthalmoscope in a semi-dark room. Objective and subjective refraction were performed, and the best corrected VA was measured and recorded. Visual field assessment was carried out using the Confrontation field Test, which is a gross field test to estimate peripheral defects/hemianopia and an educational tool for patients with central defects. The results were used to confirm the ocular diagnosis made by the researcher. Data was recorded on a designed data collection tool. Ethical approval was given by the thesis committee of the department and Health Research Ethics Committee of the Ministry of Health, Kano State with Reference number: MOH/Off/797/T.1/2140, as well as Dawakin Kudu Authority for permission to conduct the study. Any serious ocular diseases detected during the examination were referred to the appropriate hospital for further evaluation and management.

Data were analyzed using the Statistical Package for the Social Sciences (SPPS) version 25. Chi-square test was used to test the significance of the differences between the categorical variables Results were in Tables, Bar Chat and pie chat

Results
Socio-Demographic Profile of the Participants

A total of 395 participants were interviewed and examined in the study. Eighty-seven (87) participants had visual impairment, having an overall prevalence of 22.03%. The prevalence of visual impairment and blindness were 83 (21.01%) and 4 (1.01%) respectively, while the remaining 309 participants had normal vision. Table: 1 shows socio socio-demographic distribution of the participants, 57(65.5%) were males and 30(34.5%) were females. The ratio of male to female was approximately 1.9:1. Among 87 participants included in the study, the youngest participant was 15 years. The age range was from 15-80 years, those participants between ages 45 – 59 were in the majority 35(40.2%), while those in the age group of 15 – 29 had the least frequency 7(8.0%). The occupational distribution of the participants shows farming 30(34.5%) to be the highest occupation of the participants, followed by animal rearing with 12(13.8%), while knitting and fishing has the least 5(5.7%) and 4(4.6%) participants respectively

Table 1: *Socio-Demographic Data of the Participants*

Variable	Frequency (N=87)	Percentage (%)
Gender Distribution		
Male	57	65.5
Females	30	34.5
Age Range(years)		
15 – 29	7	8.0
30 – 44	22	25.3
45 – 59	35	40.2
60 > above	23	26.4
Occupational Distribution		
Farming	30	34.5
Animal Rearing	12	13.8
Trade	11	12.7
Civil Servants	10	11.4
Tailoring	9	10.3
Students	6	6.8
Knitting	5	5.7
Fishing	4	4.6
Total	87	100.0

Table 2: Distribution of Best Corrected Visual Acuity (BCVA) after Subjective Refraction by Age

Age Group	Moderate VI (%)	Severe VI (%)	Blindness (%)	Total (%)
15 – 29	7(8.0)	0(0.00)	0(0.00)	7(8.0)
30 – 44	12(13.8)	10(11.5)	0(0.00)	22(25.3)
45 – 59	28(32.18)	6(6.89)	1(1.15)	35(40.2)
60 > above	18(20.68)	2(2.29)	3(3.45)	23(26.4)
Total	65(74.7)	18(20.5)	4(3.45)	23(26.4)

VI: Visual Impairment   P = 0.152 at 0.05 Level Significance. This was not statistically significant.

The prevalence of visual impairment (VI) and blindness in this study was 21.01% and 1.01% respectively. The study showed that 65(74.7%) had moderate visual impairment (MVI), 18(20.0%) had severe visual impairment (SVI) and 4(4.6%) had blindness. (Tab.3)

Table 3: *Distribution of Best Corrected Visual Acuity (BCVA) after Subjective Refraction by Gender*

Gender (%)	Moderate VI (%)	Severe VI (%)	Blindness (%)	Total (%)
Male	42 (48.3)	12 (13.9)	3(3.4)	57(65.5)
Females	23 (26.4)	6(6.7)	1(1,2)	30(34.5)
Total	65(74.4)	18(20.7)	4(4.6)	87(100.0)

VI: Visual Impairment   P = 0.290 at 0.05 Level Significance. The difference is not statistically significant.

Table 4: Distribution of the Causes of Low Vision

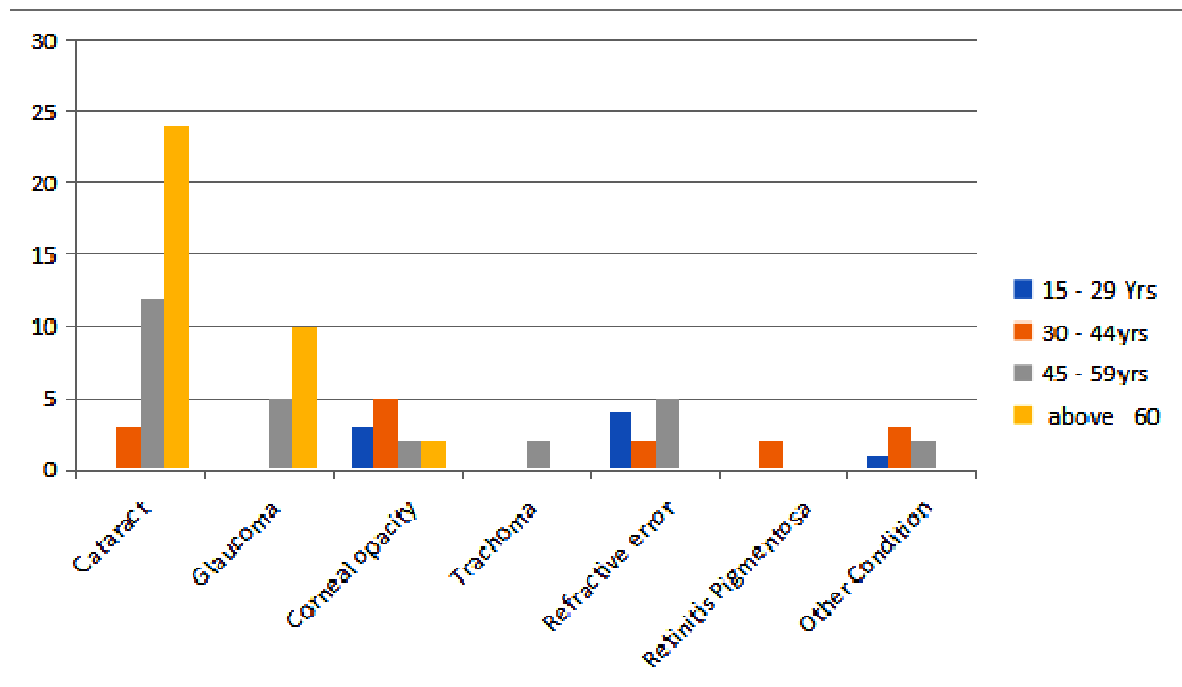| Ocular Disorders	Frequency	Percentage (%)
Cataract	39	44.8
Glaucoma suspect	15	17.2
Corneal Opacity	12	13.8
R. Error	11	12.6
Trachoma suspect	2	2.3
R. P suspect	2	2.3
Other Conditions	6	6.9
Total	87	100.0

Figure 1: *Distribution of Causes of Low Vision by Age*

Irreparable cataract was found to be the leading cause of visual impairment with 39(44.8%) participants. This is followed by glaucoma having 15(17.2%) participants, while trachoma and retinitis pigmentosa have the least 2(2.3%) participants each respectively. (Fig 1) P = 0.5 at 0.05 Level Significance. The difference between the causes of low vision and blindness is not statistically significant.

Discussion
Eighty-seven (87) participants had visual impairment, having an overall prevalence of 22.03%. The prevalence of visual impairment and blindness were 83 (21.01%) and 4 (1.01%) respectively in our study. This is higher than 8.2% and 1.5% in China, (He et al., 2020) 10.3% and 7.3% in Ethiopia Cherinet et al., 2018) 2.98% reported in Nigeria (Ahuama et al., 2012). However, it was lower than 33.9% and 13.6% in Nigeria (Ajayi et al., 2018)

30.2% and 7%, (Otuka et al., 2021) 28.2% in Ghana (Ansah, 2017). In this study, the prevalence was higher or lower than other above studies may be due to the differences in the definition of visual impairment used in the various projects, variation in geographical area and population characteristics. (Schelling et al., 2009)The higher prevalence recorded in this study may also be due to a lack of adequate low-vision care centres in the region.

In this study, the majority of participants engaged in agricultural activities. Farming occupied 30(34.5%), animal rearing 12(13.8%), while trade and civil servants occupied 11(12.4%) and 10(11.4%) respectively, but the least occupation participated by participants were knitting and fishing 5(5.7%) and 4(4.6%) respectively. Farming is the major occupation of the participants in this study because it is an area where agricultural activities take place (known for the cultivation of crops such as rice, maize and vegetables) and is located out of the Kano metropolis.

The majority of the participants were in the age range of 45 – 59 years 35(40.2%), followed by 60 > above 23(26.4%), although the difference was not statistically significant (P>0.05). This study shows that the prevalence of visual impairment increases with advancing age. Advancing age was found to have a positive association with low vision. Ageing has been shown to be associated with leprosy-related ocular complications and vision loss. World Health Organization (WHO, 2012) said in both developing and developed countries, the prevalence of visual impairment and blindness increases with age, particularly among people over 60 years of age. This

is due to age-related eye diseases such as cataract, macular degeneration, which have high prevalence among this age group.

Males were predominant than females across the gender, with a frequency of 57(65.5%) males and 30(34.5%) females in a ratio of 1.9:1, although the difference between gender and low vision (P>0.05) was not statistically significant. This shows that there was a preponderance of males than females. This is because males are more likely to be exposed to danger or engage in sight-threatening activities than females. It is also possible that more males attended the eye screening than females due to cultural reasons where women stay indoors in the region. This finding was contrary to the studies in Nigeria (Achigbu et al., 2019), South Africa (Mashige & Ramklass, 2020), Japan (Yoshiaki & Tajimi 2006) and Ghana (Ansah, 2017) recorded a higher prevalence among females than males. This can be due to the difference of geographical location, continent and those women are adjudged to have a higher life expectancy than men as suggested by these studies. But it is in line with several studies in Nigeria. (Muhammad etal., 2011; Timothy et al., 2014; Adamu & Muhammad, 2014; Akpalaba & Idogho, 2006; Ekpeyong & Ndukwe, 2010; Okwudishu et al., 2023; Okpo et al., 2018). This implies that more males visited the clinic and look for eye care services than females.

Inoperable cataract was found to be the leading cause of low vision with 39(44.8%) participants. Follow by glaucoma 15(17.2%) participants, while trachoma and retinitis pigmentosa has the least 2(2.3%) participants in Dawakin Kudu Local Governments due to lack of

access to primary eye care services and illiteracy. This result is almost in line with the study in Nigeria (Mansur, 2008), Nepal (Thapa et al., 2018), China(Yuan et al., 2008) and that reported globally in 2010 (Janet et al., 2016).

1.1 Conclusions

There was a remarkably moderate prevalence of visual impairment in Dawakin Kudu Local Government of Kano State, majorly among the age from 45 years and above. Inoperable cataract was found to be the leading cause of low vision and prevalence was greater in males. Provision of support and welfare services need to be organized sequentially. Early screening of those populations with proper counseling, by visiting eyes clinic can help to reduce the magnitude of visual impairment.

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