

# The Magnitude of Low Vision and Blindness: Association with Socio-Demographic Determinants and Ocular Pathologies Amongst Adults in Enugu, South-East Nigeria

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## ABSTRACT

**Background:** Low vision and blindness are emerging public health challenges worldwide. Nigeria, despite being the home for growing elderly population, does not have well-structured, low vision and rehabilitative services. South-East zone of Nigeria has the highest prevalence of low vision in the country. The changing demographics and epidemiologic transitions call for urgent need to generate recent data on the magnitude of low vision and blindness and advocate for establishment of Low vision and rehabilitation services. This study evaluated the magnitude of low vision and blindness, and highlights its association with socio-demographic factors in adult patients.

**Methods:** This is a cross-sectional hospital based study. A total of 400 participants were enrolled. Thorough ocular evaluation to confirm diagnosis of low vision / blindness was carried out. Data was analysed with SPSS 20.0. Descriptive and inferential statistics were done. Kruskal-Wallis, Chi-Square or Fisher exact test were performed where appropriate and a p-value of <0.5 was considered significant. Moderately Severe Visual Impairment, MSVI and Severe Visual impairment/ Legal Blindness accounted for 72.8% and 91.0% respectively amongst those that were above 41 years of age. Prevalence of Visual impairment increased with advancing age and low education was associated with VI.

**Conclusion:** The study observed that advancing age is constantly associated with visual

impairment and blindness. Glaucoma contributed significantly to impairment of vision. The study buttressed the need for development of low vision and rehabilitation services in the state. Knowing the huge economic consequences of low vision/blindness, stakeholders should be encouraged to invest in comprehensive eye care.

**Keywords:** Low vision/Blindness, Elderly, Rehabilitation services

## INTRODUCTION

Low vision (Moderate and Severe Visual Impairment, MSVI) and blindness are emerging public health challenges worldwide. In 2015, the World Health Organization (WHO) estimated that there were 253 Million visually impaired people worldwide and of these, 36 Million were blind while 217 Million had Moderately Severe Visual Impairment (MSVI).<sup>[1]</sup> In 2020, the Vision Loss Expert Group (VLEG) in collaboration with Global Burden of Disease group (GBD) estimated that of the 7.79 billion people globally, 43 Million were blind and 295 Million had MSVI.<sup>[2]</sup> Thus in 2020 globally, there was an estimated prevalence of blindness of 0.55% and MSVI of 3.74% respectively.<sup>[1]</sup> Nearly 90% of those who are blind and MSVI live in Low and Middle Income Countries (LMICs).<sup>[3]</sup> Despite these

numbers, the LMICs are not equipped to handle challenges relating to MSVI and the blind.

This study aimed to evaluate the magnitude of low vision and blindness, and highlights its association with socio-demographic factors in adult patients presenting to eye clinic of Enugu state University Teaching Hospital Parklane, Enugu.

## LITERATURE REVIEW

Nigeria is the most populous nation in Africa<sup>[4]</sup> and a home for large number of aging population.<sup>[5]</sup> Despite the exponential growth in aging population in the country and the consequent rise in number of people with low vision, Nigeria has no well-developed low vision and rehabilitative services. Studies have shown that 85% of those living with low vision may stand to benefit from improved functional vision if low vision services are made available.<sup>[6]</sup> In resource poor nations like Nigeria, <10% of those living with Low vision accessed Low vision services.<sup>[7]</sup>

Enugu is a city in South-East Nigeria. According to the Nigeria National Blindness and Visual Impairment Survey, NNBVIS (2005-2007),<sup>[8]</sup> the prevalence of low vision in people above the age of 40 years is 3.5% (95%CI, 3.1-3.9%) and south-east zone had the highest prevalence (4.2%) of low vision in the country.<sup>[9,10]</sup> There is a dearth of data on the magnitude of low vision in the south-east region of Nigeria.<sup>[11]</sup> With changing demographics and epidemiologic transitions there is an urgent need to generate recent data on the burden of low vision in South-Eastern Nigeria and highlight the ocular pathologies associated with it.

Most studies on low vision in Nigeria were mainly done in other parts of the country. The NNBVIS is a population based study, but it was conducted over a decade ago. This study therefore was undertaken to evaluate the magnitude of low vision and blindness in a hospital setting, and highlight its association with socio-demographic factors and causes of visual impairment in adult patients presenting to the hospital with

a view to advocating for an ideal eye care service that will incorporate effective low vision and rehabilitation services.

## MATERIALS & METHODS

**Study design and setting:** This was a cross-sectional, hospital-based study conducted from October 2019 to December, 2020. It was carried out in the Enugu State University Teaching Hospital, ESUTH Parklane Enugu. The strategically located hospital caters for the population of Enugu as well as the neighbouring states. The Ophthalmology department of the hospital provides comprehensive eye care services to all its patients. There are 5 consulting clinics with a weekly clinic attendance of 350 per week. During the study period, a total of 15, 805 patients were seen. Low vision patients were seen along with the regular ophthalmic patients. All consenting, consecutive participants numbering 400 were recruited into the study.

### Study Participants:

Participants aged 18 years and above with low vision (MSVI and SVI/LB) and Blindness who consented were enrolled into the study.

### Operational definitions.

**Low vision:** is defined as a (VA of <6/18 or 20/60 Logarithmic Minimal Angle of resolution (logMAR0.5) and or equal to or better than 3/60 or 20/400 (logMAR 1.3) in the better eye with best possible correction or a visual field loss to less than 20° in the better eye with the best possible correction.<sup>[12, 1]</sup>

**Moderate Severe Visual Impairment (MSVI):** VA between the ranges of 6/24 or 20/80 (logMAR 0.6 to 6/48 or 20/160 (logMAR 0.9) in better eye.

**Severe Visual Impairment/ Legally blind (SVI/LB):** VA worse than 6/60 in the better eye or between 6/60 or 20/200 (logMAR1.0) and 3/60 or 20/1000 (logMAR 1.3) in the better eye.

**Total Blindness (TB):** Presenting visual acuity (PVA) of less than 3/60 (logMAR 1.8) in the better eye or NPL. Nil Perception of Light, (NPL) (logMAR 2.0) visual field less than 10° from fixation.

### **Ethical consideration**

Ethical approval for the study was obtained from the Research and Ethics Committee of the ESUTH, Enugu with the protocol number ESUTHP/C-MAC/RA/034/Vol.2/107). Prior to the recruitment, written informed consent was obtained from the participants. Participants were assured of confidentiality of information.

**Instruments for the study:** Study was done in 2 parts. Section A involved a questionnaire comprising the proforma which dealt on the socio-demographics while Section B dwelt on the clinical assessment of the participants.

A detailed ocular examination was carried out. This included VA with Snellen's chart and tumbling E chart for those who were unable to read the letters. Intra ocular pressure, (IOP) measurement was done with Perkins tonometer, perimetry was done with Humphrey's central visual field analyzer, pachymetry with sonomed, gonioscopy with 4 Mirror goniolens and dilated eye examination using 90 D lens.

### **Procedure and Measurements**

Patients presenting to the eye clinic formed the sampling frame. The study population was all eligible and consenting participants who satisfied the inclusion criteria were recruited into the study. For the purpose of this study, inclusion criteria included participants who were 18 years and above with visual acuity of 6/18 and below in the better eye and cannot be corrected any further by optical, medical, or surgical procedures. They should also be eligible and consenting to participate in the study. The members of the research team underwent special training on the study

procedure and standardized documentation of the findings.

The ocular diagnoses and confirmation of low vision or blindness was determined independently by two ophthalmologists with expertise in this area. Three levels of low vision were observed: moderately severe (MSVI), severe or legal (SVI/LB) and total blindness (TB). The level of diagnostic agreement between the two ophthalmologist was acceptable (Cronbach alpha = 0.80).

The participants were evaluated for their presenting VA as well as the best corrected VA. Both eyes were measured separately using Snellen's Chart and equated to logMAR scale (logarithm of minimum angle of resolution). Two resident doctors were assigned to measure IOP on the participants. Detailed anterior and posterior segment examinations were done.

At the end of the evaluation, participants were diagnosed on the cause of visual impairment. Those that had one diagnosis, two diagnosis and others were made and categorized as such.

### **STATISTICAL ANALYSIS**

Data was analyzed using the International Business Machine-Statistical Package for Social Sciences (IBM-SPSS) version 20.0 Descriptive statistics was used to highlight the prevalence and pattern of low vision and blindness among the participants. Kruskal-Wallis test was used to compare the age and duration of visual loss across the severity of low vision/blindness. The relationship between other socio-demographic variables and severity of low vision/blindness was done using chi-square test or Fischer's Exact Test as appropriate. All test of significance was two-tailed at 95% confidence interval and p-value was considered significant if it was less than 0.05.

### **RESULT**

A total of 465 low vision patients were assessed for eligibility. Of these, 28 were too ill, 27 refused participation while 10 were excluded due to incomplete data.

A total of 400 patients were enrolled into the study. Nearly 81% of the participants were 41 years and above while the mean age of the participant was 57 years. (Table 1) Majority of the participants were males.

Three quarter of the participants had modest education. (Table 1) A greater number of the participants were civil servants and retirees.

**Table 1: Socio-demographic characteristics of the study participants**

Variables	n(%)	Mean (SD)
<b>Mean age (years)</b>		<b>57.27(16.34)</b>
<b>Age group (years)</b>		
18-30	36 (9.0)	
31-40	39(10.0)	
41-50	58(15.0)	
51-60	69(17.0)	
61-70	109(27.0)	
>70	89(22.0)	
<b>Gender</b>		
Male	208(52.0)	
Female	192(48.0)	
<b>Marital status</b>		
Single	38 (9.5)	
Married	362(90.5)	
<b>Educational status</b>		
Primary	155(39.0)	
Secondary	140(35.0)	
Tertiary	105(26.0)	
<b>Occupation</b>		
Civil servants/professionals	106(27.0)	
Traders	89(22.0)	
Artisans	8(2.0)	
Students	25(6.0)	
Retirees	113(28.0)	
unemployed	59(15.0)	
<b>Ethnicity</b>		
Igbo	373(93.0)	
Others	27(7.0)	
<b>Religion</b>		
<b>Christianity</b>	389 (97.0)	
Islam	7 (2.0)	
Traditional	4 (1.0)	

*\*Others include Hausa, Yoruba, Fulani, Igala*

The relationship between severity of VI and age (Fig 1) showed that advancing age is constantly associated with visual impairment. Worsening VI and blindness were observed amongst those above 41 years of age. Total blindness was not observed amongst 18-40 years of age. Amongst those that had MSVI, 72.8% (164 out of the 225 of participants) were above 41 years of age. Similarly, those that had LB/SVI 91% (142 out of 156) were above 41. With advancing age, 61years and above,

LB/SVI and TB were more frequent. (LB: 64.7% (101) TB: 63.1% (12)

Those with modest education (primary and secondary) had greater proportion of those with varying severity of VI (primary education MSVI 36.4% (82), Secondary: 35.1% (79)) SVI/LB (43.6% (68)) primary education, secondary 35.3% (55) respectively. However, total blindness was more common amongst those that had tertiary education (42.1% (8)).

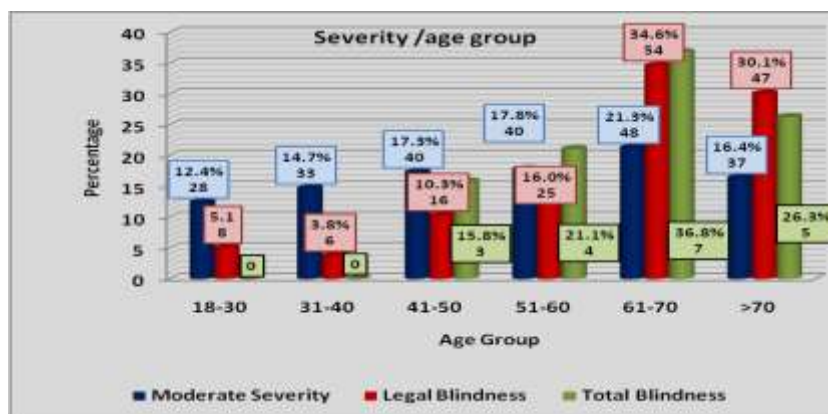


Figure 1: Visual Impairment across age groups

Figure 2 showed that over half of the study population had unilateral LVI, Low Vision Impairment either in the right / left eye. A third of the population was bilaterally visually impaired. Amongst the participants, none was bilaterally blind while one fifth of the participants were bilaterally legally blind.

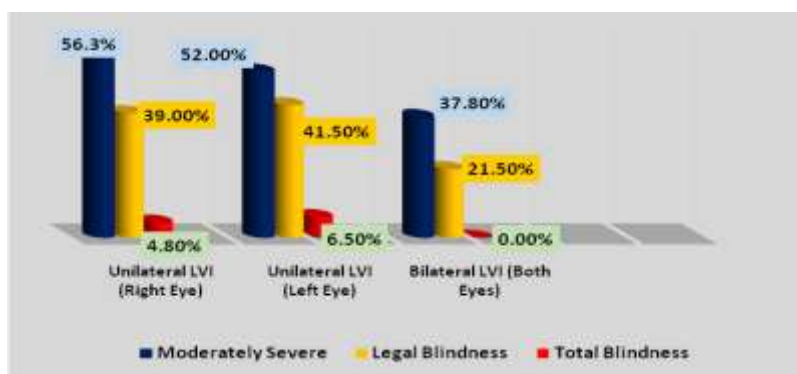


Figure 2: Prevalence of legal and total blindness in the eyes and among the participants

Though there were several causes of eye diseases, cataract and glaucoma contributed significantly to visual impairment. Glaucoma contributed to 64.7%, (259), MSVI, 31.6% (126) of SVI/LB and 3.7% (15) of total Blindness). Dual diagnosis (glaucoma and cataract) contributed to 47.4%(190) of MSVI and 52.60% (210) of SVI/LB. Others included various causes of visual impairment, viz. corneal opacity, diabetic retinopathy, ARMD, aphakia and trauma

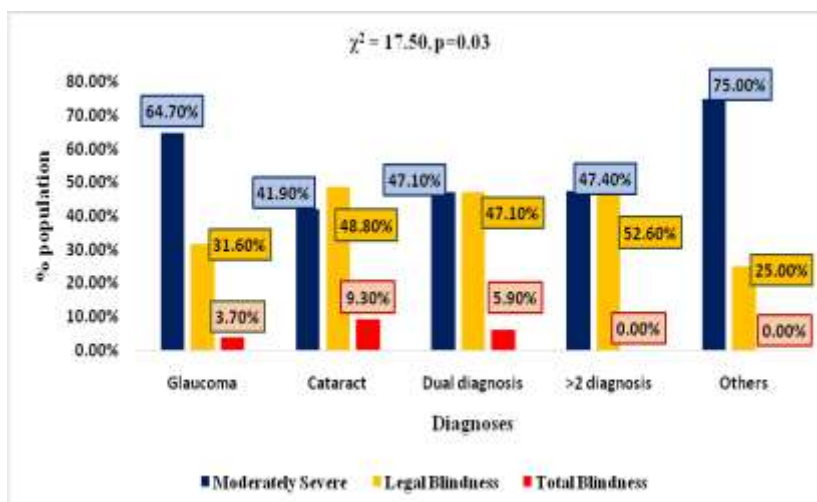


Figure 3: The relationship between diagnosis and low visual impairment among the participant

**Table 2: Association of socio-demographic variables with low visual impairment in the study participants**

Variables	Low Visual Impairment (LVI)				P Value	Test stat
	MSVI	SVI/LB	TB			
<b>Age (years)</b> Median (IQR)	<b>55.00(28.00)</b>	<b>65.00(17.00)</b>	<b>66.00(16.00)</b>			
<b>DUI (years)</b> Median (IQR)	2.00(1.00)	3.00(1.75)	3.00(2.00)	$\chi^2=1.86$	FT	
<b>Age group (years)</b>				0.17	<0.001*	
18-30	28(12.4%)	18(5.1%)	0(0.0%)			
31-40	33(14.8%)	6(3.8%)	0(0.0%)			
41-50	39(17.3%)	16(10.3%)	3(15.8%)			
51-60	40(17.8%)	25(16.0%)	4(21.1%)			
61-70	48(21.3%)	54(34.7%)	7(36.8%)			
>71	37(16.4%)	47(30.1%)	5(26.3)			
Total	225(100.0%)	156(100.0%)	19(100.0%)			
<b>Gender</b>				$\chi^2=0.78$		
Male	118(52.4%)	74(47.4%)	8(42.1%)			
Female	107(47.6%)	82(52.6%)	11(57.9%)			
Total	225(100.0%)	156(100.0%)	19(100.0%)			
<b>Marital status</b>						
Single	29(12.9%)	9(5.8%)	0(0.0%)		FT	
Married	196(87.1%)	147(94.2%)	19(100.0%)		0.02	
Total	225(100.0%)	156(100.0%)	225(100.0%)			
<b>Education</b>						
Primary	82(36.4%)	68(43.6%)	5(26.3%)		FT	
Secondary	79(35.1%)	55(35.3%)	6(31.6%)			
Tertiary	64(28.4%)	33(21.2%)	8(42.1%)		0.22	
Total	225(100.0%)	156(100.0%)	19(100.0%)			
<b>Occupation</b>				$\chi^2=16.95$	0.15	
Professionals/CS	64(28.4%)	34(21.8%)	8(42.1%)			
Traders	54(24.0%)	32(20.5%)	3(15.8%)			
Artisans	2(0.9%)	5(3.2%)	1(5.3%)			
Students	19(8.4%)	6(3.8%)	0(0.0%)			
Farmers	22(9.8%)	19(12.2%)	1(5.3%)			
Retirees	55(24.4%)	52(33.3%)	6(31.6%)			
Unemployed	9(4.0%)	8(5.1%)	0(0.0%)			
Total	225(100.0%)	156(100.0%)	19(100.0%)			

\*Pairwise Post-Hoc test shows that the difference was between the ages of moderately severe and severe (p <0.001) and moderately severe and legal blindness (p <0.001).  $\chi^2$ =Kruskal-Wallis test, IQR = Inter-quartile range

## DISCUSSION

Low vision and blindness are significantly high amongst elderly and contribute to significant morbidity. This trend is consistent across the globe as well as Nigeria.<sup>[13-16, 9]</sup> The NNBVIS observed that the prevalence of low vision increased with advancing age. The findings from the survey conducted in 2005-2007 documented that each decade increase in age was significantly associated with increasing prevalence of VI.<sup>[9]</sup> The present study recorded a prevalence of 72.8%, and 91% for MSVI and SVI/ LB respectively amongst those above the age of 40. This is comparable to a hospital based study in Ethiopia<sup>[17]</sup> and others from Nepal, Sri-Lanka, and India <sup>[18-20,14,16,9]</sup> Similar patterns were observed in Barbados Eye study, Salisbury Ophthalmology assessment study, Rotterdam study and Andhra Pradesh

Eye study.<sup>[21-25]</sup> Age has often been associated with some common causes of blindness like cataract, glaucoma, Age Related Macular Degeneration, (ARMD) and diabetic retinopathy. Lack of comprehensive affordable eye care as part of healthcare package often worsens the problem of the aged which is more profound in the LMICs. The elderly are often faced with competing health challenges which often leave the eye challenges unattended to. In this study, 3,58% of the study population had low vision.

**Gender:** Unlike studies from Sub Saharan Africa, SSA and East Africa, <sup>[26-27, 17]</sup> more males (43%) experienced some form of visual impairment as compared to females 38.25% though it was not statistically significant. Plausible reason could be that this is a hospital-based study and the

participants' character may not be a true reflection of a rural setting. In the urban areas, both gender accessed health care equally. In rural areas the women presented more readily to services at doorsteps rather than going to hospitals. Information easily filtered to the rural folks at market places, churches and other places where women often gathered. In Nigeria 63% of the population live in rural areas with limited access to eye care services.<sup>[28]</sup>

**Socio-economic status:** Across developing and developed nations visual impairment is strongly associated with low socio-economic status.<sup>[29]</sup> Though this study did not assess the socio-economic status of the participants, the demographics on the level of education and occupation indirectly reflected this association. (Table 2) Those with modest education had profound visual impairment. Low educational level and the consequent low socio-economic status are catalysts for disability of a population. Visual disability will predispose them to other forms of disability resulting from possible falls. A conglomerate of visually impaired individuals in a society will lead to a vicious cycle of poverty. Ignoring visual impairment is a subtle form of oppression and has a threshold to dis-empower people.<sup>[30]</sup>

**Severity:** Over 50% of the population studied had unilateral visual impairment SVI/LB, while a third of the population had bilateral SVI/LB. None were bilaterally blind. Rohit Varma et al <sup>[31]</sup> observed that patients with unilateral/ bilateral MSVI/SVI experienced remarkable vision related challenges in their daily lives as compared to those that had none. However, low vision is not synonymous with absolute loss of vision/ total blindness. Individuals with low vision are capable of using residual vision if given appropriate Low Vision Aids (LVAs).<sup>[32]</sup> LVA enhances the possibilities of performing Activities of Daily living, (ADL) by augmenting the residual vision.<sup>[33]</sup> Studies from Africa

reported an increasing global and regional prevalence of Low vision. The NNBVIS estimated that over 2.3 Million people in Nigeria suffered from LV 2005-2007.<sup>[10]</sup>

**Aetiology:** Despite the several causes of VI, in order of significance, glaucoma remained the prime cause of low vision and blindness (64.7%MSVI, 31.6% SVI/LB and 3.7%TB). This was followed by cataract (41.9% MSVI, 48.8% LVI/LB, and 9.3% TB). This is unlike the findings from the study in India by Gupta et al <sup>[34]</sup> as well as others <sup>[13, 16, 20, 21, 26]</sup> in which cataract (50.9%) was the main cause followed by un-corrected refractive error (36%) . In Nigeria, Glaucoma being more prevalent in the south-eastern part of the country dominates the scene. Cataract has been identified as the leading cause of VI in other parts of world like USA, Europe, Asia <sup>[22,35,24,25]</sup> and it still accounted for 36.2% blindness in Mongolia,36 39.1% Malaysia,<sup>[37]</sup> 45.5% India <sup>[22]</sup> and 51.7% Hong Kong.<sup>[38]</sup> There is a need to further explore why glaucoma was the predominant cause of VI in south-east of Nigeria.

The magnitude of low vision and blindness are emerging public health challenges and is well documented in developed countries.<sup>[39]</sup> Globally, socio-demographic dynamics is shifting the goal post towards the well-being of the aged. Pascolini et al documented that VI is especially problematic in developing countries where approximately 80% of all VI live.<sup>[40]</sup> A Ghanaian study by Nurtey et al <sup>[41]</sup> recorded a prevalence of Low vision and blindness in those above 50 to be 12.9%, a finding that resonates with other studies in SSA.

For the most part, low vision patients do not have any prospect for curative treatment of the underlying condition.<sup>[42]</sup> It is also well established that vision loss is a traumatic life event <sup>[43]</sup>and these patients need urgent attention to achieve some support. The stakeholders involved in provision of health care should advocate for an inclusive health care where eye care is given equal priority. Disability of vision is disability of a

person / disability of a population. It is paramount that the stakeholders should work together to plan and implement strategies to improve eye care services for all.

Low vision and rehabilitative services should be incorporated into eye care services. This study recorded that more than three quarter of the population had either MSVI /SVI. Despite these numbers, they do not have access to LVA or rehabilitation services.<sup>[42]</sup> Monye et al reflected extensively on the dearth of low vision services in south-east Nigeria where the largest pool of low vision patients resided.<sup>[11]</sup> Rehabilitation enhances independence and sense of self worth. The glaring statistics is a call to establish these services in no distant time.<sup>[42]</sup>

Globally, the population of the world is projected to rise by 25% in 2050. It is expected that number of those living above the age of 65 will double from 1 in 11 people to 1 in 6 people.<sup>[20,22]</sup> Given this trend, available eye care services are unlikely to cope with future needs in SSA. A significant investment in eye care services is a great step forward in the development of a nation. Sighted citizenry is a great step towards an economically viable nation.

### Limitation of the Study

The study was conducted in an urban setting where there is access to availability of eye care services, hence the finding may be under reported. The rural population lacked eye care services and accessed them less often. They may have more visual challenges that may contribute to more significantly to this burden.

### CONCLUSION

This study found that VI and blindness were constantly associated with advancing age. Though there were several causes of VI, glaucoma was identified as the major culprit of VI. All stake holders must strive to invest in comprehensive eye care services. This would be a great step towards a sighted

citizenry which is a step towards economically viable nation

### Recommendation

The findings of this study strongly support the need to expand low vision services in the state as well as the south-east region of the country. Globally, low vision is associated with economic disadvantage.<sup>43</sup> Investment in eye health services is an indirect way of not only eliminating poverty, but enhancing overall health of the people. It has humongous potentials to transform the lives of many visually disabled patients.

### Declaration by Authors

**Ethical Approval:** Approved

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### REFERENCES

1. Bourne RA, Flaxman SR, Braithwaite T et al. Vision Loss Expert Group. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. *Lancet Glob Health*. 2017 Sep;5(9):e888-e897. doi: 10.1016/S2214-109X(17)30293-0.
2. GBD 2019 Blindness and Vision Impairment Collaborators; Vision Loss Expert Group of the Global Burden of Disease Study. Trends in prevalence of blindness and distance and near vision impairment over 30 years: an analysis for the Global Burden of Disease Study. *Lancet Glob Health*. 2021 Feb;9(2):e130-e143. doi: 10.1016/S2214-109X(20)30425-3.



3. Ehrlich JR, Stagg BC, Andrews C et al. Vision Impairment and Receipt of Eye Care Among Older Adults in Low- and Middle-Income Countries. *JAMA Ophthalmol.* 2019 Feb 1;137(2):146-158. doi: 10.1001/jamaophthalmol.2018.5449.
4. United Nations, Department of Economic and Social Affairs, Population Division (2019). *World Population Prospects 2019; Volume II: Demographic profiles.* Available from [https://population.un.org/wpp/publications/files/wpp2019\\_highlights.pdf](https://population.un.org/wpp/publications/files/wpp2019_highlights.pdf)
5. Mbam KC, Halvorsen CJ, Okoye UO. Aging in Nigeria: A Growing Population of Older Adults Requires the Implementation of National Aging Policies. *Gerontologist.* 2022 Oct 19;62(9):1243-1250. doi: 10.1093/geront/gnac121.
6. van Nispen RM, Virgili G, Hoeben M et al. Low vision rehabilitation for better quality of life in visually impaired adults. *Cochrane Database Syst Rev.* 2020 Jan 27;1(1):CD006543. doi: 10.1002/14651858.CD006543.pub2.
7. Adio A, Bekibele C, Lewerenz D et al. (2021). Low vision evaluation training in Nigeria: Time to improve human resource in developing countries. *British Journal of Visual Impairment*, 2020, May 7: 39(2), 147-160. <https://doi.org/10.1177/0264619620915263>
8. Kyari F, Gudlavalleti MV, Sivsubramaniam S et al. Nigeria National Blindness and Visual Impairment Study Group. Prevalence of blindness and visual impairment in Nigeria: the National Blindness and Visual Impairment Study. *Invest Ophthalmol Vis Sci.* 2009 May;50(5):2033-9. doi: 10.1167/iovs.08-3133
9. Akano OF. Vision health disparities in blindness and visual impairment in Nigeria: A review of the Nigerian National Blindness and Visual Impairment Survey. *Afr Vision Eye Health.* 2017 Mar 28;76(1), a345. Available from <https://doi.org/10.4102/aveh.v76i1.345>
10. Abdull MM, Sivasubramaniam S, Murthy GV et al. Nigeria National Blindness and Visual Impairment Study Group. Causes of blindness and visual impairment in Nigeria: the Nigeria National Blindness and Visual Impairment Survey. *Invest Ophthalmol Vis Sci.* 2009 Sep;50(9):4114-20. doi: 10.1167/iovs.09-3507.
11. Monye HI, Kyari F, Momoh RO. A situational report on low vision services in tertiary hospitals in South-East Nigeria. *Niger J ClinPract.* 2020 Jul;23(7):919-927. doi: 10.4103/njcp.njcp\_375\_19.
12. World Health Organization. (2007). *Global Initiative for the Elimination of Avoidable Blindness: action plan 2006-2011.* World Health Organization. Available from: <https://apps.who.int/iris/handle/10665/43754>
13. Congdon N, O'Colmain B, Klaver CC et al. Eye Diseases Prevalence Research Group. Causes and prevalence of visual impairment among adults in the United States. *Arch Ophthalmol.* 2004 Apr;122(4):477-85. doi: 10.1001/archophth.122.4.477.
14. He Y, Nie A, Pei Jet al. Prevalence and causes of visual impairment in population more than 50 years old: The Shaanxi Eye Study. *Medicine (Baltimore).* 2020 May; 99(20):e20109. doi: 10.1097/MD.00000000000020109.
15. Olusanya, B, Onoja, G, Ibraheem, W et al. Profile of patients presenting at a low vision clinic in a developing country. *BMC Ophthalmol.* 2012 Jul;12(31) Available from <https://doi.org/10.1186/1471-2415-12-31>
16. Ajayi I, Omotoye OJ, Ajite K et al . Prevalence and Causes of Visual Impairment in Ekiti, Nigeria: A Hospital Based Study. *J Ophthalmol* 2018, 3(4): 000158.
17. Tegegn MT, Belete GT, Ferede AT et al. Proportion and Associated Factors of Low Vision among Adult Patients Attending at University of Gondar Tertiary Eye Care and Training Center, Gondar Town, Ethiopia. *J Ophthalmol*, 2020 May 28, 2020:7042905. <https://doi.org/10.1155/2020/7042905>
18. Thapa R, Bajimaya S, Paudyal G et al. Prevalence and causes of low vision and blindness in an elderly population in Nepal: The Bhaktapur retina study. *BMC Ophthalmol.* 2018 Feb,18, 42. <https://doi.org/10.1186/s12886-018-0710-9>
19. Ubeysekara HA, Wijayaratne WM, Fonseka P et al. Prevalence of low vision among adults in Galle District, Sri Lanka. *Galle Medical Journal*, 2020 Mar 25 (1),

- 2020.<https://www.researchgate.net/publication/340589372>
20. Vijaya L, George R, Asokan Ret al. Prevalence and causes of low vision and blindness in an urban population: The Chennai Glaucoma Study. *Indian J Ophthalmol*. 2014 Apr;62(4):477-81. doi: 10.4103/0301-4738.111186
  21. See JL, Wong TY, Yeo KT. Trends in the pattern of blindness and major ocular diseases in Singapore and Asia. *Ann Acad Med Singap*. 1998 Jul;27(4):540-6. Available from <https://pubmed.ncbi.nlm.nih.gov/9791663/>
  22. Dandona L, Dandona R, Srinivas M et al. Blindness in the Indian state of Andhra Pradesh. *Inves Ophthalmol Vis Sci*. 2001 Apr; 42(5):908-16. Available from <https://iovs.arvojournals.org/article.aspx?articleid=2162530>
  23. Klaver CC, Wolfs RC, Vingerling JR et al. Age-specific prevalence and causes of blindness and visual impairment in an older population: the Rotterdam Study. *Arch Ophthalmol*. 1998 May;116(5):653-8. doi: 10.1001/archopht.116.5.653
  24. Hyman L, Wu SY, Connell AM et al. Prevalence and causes of visual impairment in The Barbados Eye Study. *Ophthalmology*. 2001 Oct;108(10): 1751-6. doi: 10.1016/s0161-6420(01)00590-5.
  25. Muñoz B, West SK, Rubin GS et al. Causes of blindness and visual impairment in a population of older Americans: The Salisbury Eye Evaluation Study. *Arch Ophthalmol*. 2000 Jun;118(6):819-25. doi: 10.1001/archopht.118.6.819.
  26. Naidoo K, Kempen JH, Gichuhi S et al. Prevalence and causes of vision loss in sub-Saharan Africa in 2015: magnitude, temporal trends and projections *Br J Ophthalmol*. 2020 Dec;104(12):1658-1668. doi: 10.1136/bjophthalmol-2019-315217.
  27. Cherinet, FM, Tekalign, SY, Anbesse, DH et al. Prevalence and associated factors of low vision and blindness among patients attending St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia. *BMC Ophthalmol*. 2018 Sep 3; 18(1) 232. <https://doi.org/10.1186/s12886-018-0899-7>
  28. Dineen B, Gilbert CE, Rabiou M et al. The Nigerian National Blindness And Visual Impairment Survey: Rationale, objectives and detailed methodology. *BMC Ophthalmol*. 2008 Sep 22;8:17. doi: 10.1186/1471-2415-8-17.
  29. Tegegn MT, Assaye AK, Mersha GA. Proportion, Causes and Associated Factors of Blindness Among Adult Patients Attending Tertiary Eye Care and Training Center in Ethiopia. *Clin Optom (Auckl)*. 2021 Mar 2;13:83-91. doi: 10.2147/OPTO.S295626.
  30. Wang Z, Xu X, Han Q et al. Factors associated with public attitudes towards persons with disabilities: a systematic review. *BMC Public Health*. 2021 Jun 3;21(1):1058. doi: 10.1186/s12889-021-11139-3.
  31. Varma R, Wu J, Chong K et al. Los Angeles Latino Eye Study Group. Impact of severity and bilaterality of visual impairment on health-related quality of life. *Ophthalmology*. 2006 Oct;113(10):1846-53. doi: 10.1016/j.ophtha.2006.04.028.
  32. Patrick O, Darlington O. Barriers to uptake of low vision aids among Visually impaired elderly Nigerian patients: A multi-centered clinic-based study *Int J Disabil Hum Dev*. 2018 Feb;17(4): 467-474.
  33. Pardhan S, Latham K, Tabrett D et al. Objective Analysis of Performance of Activities of Daily Living in People With Central Field Loss. *Invest Ophthalmol Vis Sci*. 2015 Nov;56(12):7169-78. doi: 10.1167/iovs.15-16556.
  34. Gupta N, Vashist P, Malhotra S et al. Rapid Assessment of Visual Impairment in Urban Population of Delhi, India. *PLoS ONE* 2015 Apr 27; 10(4): e0124206. <https://doi.org/10.1371/journal.pone.0124206>
  35. The Eye Diseases Prevalence Research Group. Causes and Prevalence of Visual Impairment Among Adults in the United States. *Arch Ophthalmol*. 2004; 122(4):477-485. doi:10.1001/archopht.122.4.477.
  36. Baasanhu J, Johnson GJ, Burendei G et al. Prevalence and causes of blindness and visual impairment in Mongolia: a survey of populations aged 40 years and older. *Bull World Health Organ*. 1994;72(5):771-6.
  37. Chew FL, Salowi MA, Mustari Z et al. Estimates of visual impairment and its causes from the National Eye Survey in Malaysia (NESII). *PLoS ONE* 2018 Jun 26; 13(6): e0198799. <https://doi.org/10.1371/journal.pone.0198799>

38. Michon JJ, Lau J, Chan WS et al. Prevalence of visual impairment, blindness, and cataract surgery in the Hong Kong elderly. *Br J Ophthalmol.* 2002 Feb;86(2):133-9. doi: 10.1136/bjo.86.2.133.
39. Flaxman SR, Bourne RRA, Resnikoff S. Global causes of blindness and distance vision impairment 1990-2020: a systematic review and meta-analysis. *Lancet Glob Health.* 2017. Dec 5(12):e1221–e1234.
40. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *Br J Ophthalmol.* 2012 May;96(5):614-8. doi: 10.1136/bjophthalmol-2011-300539.
41. Nuerthey BD, Amisah-Arthur KN, Addai J et al. Prevalence, Causes, and Factors Associated with Visual Impairment and Blindness among Registered Pensioners in Ghana. *J Ophthalmol.* 2019(5):1-10 DOI:10.1155/2019/1717464
42. Sivakumar P, Vedachalam R, Kannusamy V et al. Barriers in utilization of low vision assistive products. *Eye (Lond).*2020 Feb;34(2):344-351. doi: 10.1038/s41433-019-0545-5.
43. Jyoti J, Lene Øverland PR, Vilas Kovai et al. Poverty and Eye Health. *Health* 2014: 6, 1849-1860.  
<http://dx.doi.org/10.4236/health.2014.61421>

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