

## Prevalence and Causes of Blindness and Visual Impairment in Plateau State, Nigeria

### [Nijerya'nın Plateau Eyaletinde Körlük ve Görme Kaybı Sıklığı ve Nedenleri]

#### SUMMARY

AIM: to assess the prevalence and causes of blindness and visual impairment in persons 50 years and above in Plateau state

METHOD: seventy clusters of 60 persons 50 years and above were selected by probability proportional to size. Households were selected by the random walk method and all persons eligible in the household had their eyes examined. Visual acuity was assessed with the Snellen chart and all persons with visual acuity less than 6/18 in any eye had the eye examined to determine the major cause of blindness/visual impairment.

RESULTS: 4115 persons (98% response rate) were examined. Bilateral blindness prevalence was 4.2% (95% CI: 4.1-4.3). The prevalence of severe visual impairment was 6.7% (95% CI: 6.5-6.9) while that for visual impairment was 15.8% (95% CI: 15.3-16.3). 80% of the causes of blindness, 83% of the causes of severe visual impairment and 88% of the causes of visual impairment were avoidable with cataract, uncorrected Aphakia and refractive errors being the major causes.

CONCLUSION: the prevalence of blindness and visual impairment are high and most of the causes are avoidable. There is a need to develop an eye care plan including cataract surgery and refraction services to reduce the causes of blindness and visual impairment.

#### ÖZET

AMAÇ: Plateau eyaletinde yaşayan 50 yaş üstü kişilerde körlük ve görme kaybı sıklıkları ve nedenleri incelenmesi amaçlanmıştır.

YÖNTEM: 50 yaş ve üstü 60'ar kişiden oluşan yetmiş küme olasılık büyüklüğüne orantılı olarak seçilmiştir. Hane halkı, rasgele yürüyüş yöntemi ile seçilmiş ve uygun olanların göz muayeneleri gerçekleştirilmiştir.

BULGULAR: 4115 (%98) kişi muayene edilmiştir. Bilateral körlük sıklığı 4.2% (95% CI: 4.1-4.3), görme kaybı sıklığı 15.8% (95% CI: 15.3-16.3), Ciddi görme kaybı sıklığı ise 6.7% (95% CI: 6.5-6.9) olarak bulunmuştur. Saptanan körlüklerin %80'i, görme kayıplarının %88'i, ciddi görme kayıplarının %83'ü, katarakt, düzeltilmemiş afaki ve kırma kusurlarına bağlı olduğu saptanmıştır.

SONUÇ: Körlük ve görme bozukluklarının yaygınlığı yüksektir ve çoğu önlenilebilir nedenlerden kaynaklanmaktadır. Körlük ve görsel kayıpları azaltmak için katarakt cerrahisi ve kırma kusuru hizmetlerini içeren bir göz bakım planı geliştirilmelidir.

**Caleb Mpyet,  
Perpetua Odugbo,  
Olukorede Adenuga,  
Lohdip Velle,  
Amos Nyonkyes**

Department of  
Ophthalmology Jos  
University Teaching  
Hospital, Jos, Nigeria.

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#### Anahtar Kelimeler:

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#### Corresponding author:

Caleb Mpyet  
Department of  
Ophthalmology Jos  
University Teaching  
Hospital, PMB 2076, Jos,  
Nigeria.  
mpyetc@yahoo.com

## INTRODUCTION

Vision 2020- the right to sight is aimed at eliminating avoidable blindness by the year 2020 (1). This requires eye care programs to develop action plans to tackle the major causes of blindness in their regions. The prevalence and major causes of blindness differ from one region to another and especially between the developed and developing parts of the world. In the developing parts of the world, above 75% of the causes of blindness are avoidable; these can be treated or prevented (2).

Reports from Cameroon suggest blindness prevalence in persons 40 years and above to be 1.1% to 1.4% depending on whether it is a rural or urban setting (3,4). In Kenya the prevalence of blindness in persons 50 years and above was 2.0% (5). In these

surveys, although the dominant cause is still cataract, posterior segment diseases are assuming greater importance because there are on-going cataract programs in the districts surveyed.

In northern Nigeria, a blindness prevalence survey done over ten years showed all age blindness prevalence of 1.14% (6); while in persons 40 years and above the prevalence was 8.2% (7). In southern Nigeria the reported prevalence of blindness ranges from 0.9% (8) to 1.2% (9) in whole population surveys. More recently, the Nigerian national blindness and visual impairment survey conducted in persons 40years and above has revealed that 43% of blindness is caused by cataract with 80% of blindness being avoidable (10).

While the prevalence of blindness is similar in the different regions of Nigeria, the major causes vary

from one region to another; these variations in the major causes of blindness depend on the region the survey has been conducted. While cataract has remained the main cause of blindness in the surveys reported from various parts of Nigeria, in the southern part of Nigeria, glaucoma is the second most common cause of blindness while trachoma is the second most common cause of blindness in the northern part of the country which lies in the trachoma belt (7,8).

With varying prevalence and causes of blindness, there is a need for the various regions in Nigeria to have correct data on blindness to be able to develop action plans aimed at tackling these causes of blindness. We undertook a Rapid Assessment of Cataract Surgical Services to obtain needed information for the development of a realistic vision 2020 action plan for Plateau state, located in North-central Nigeria.

## **MATERIAL AND METHOD**

### **Sample size calculation**

The estimated population of persons 50 years and above was 627206 and the expected prevalence of cataract blindness was 4.0%; with a precision of 20%, design effect of 1.7 and 95% confidence interval a minimum sample size of 4148 was obtained using Epi Info 6.04.

### **Sampling procedure**

This was a population based cross sectional study involving persons 50 years of age and above. Plateau state has seventeen local government areas (LGA) divided into three senatorial districts two of which have six LGA's each and one has five LGA's. One local government area was selected by balloting from each of the three senatorial districts in the state. All villages in the selected local government areas formed the sampling frame for the study. Villages were selected from the sampling frame based on probability proportional to size. A total of 70 clusters were selected. In each cluster, sixty individuals aged 50 years and above were selected through the random walk method until the required sample was attained; where this was not possible in the selected cluster, a nearby village not among the selected clusters was selected to complete the required sample population for that cluster. Age was obtained from family records or estimated from historical events where family records were unavailable. The team made one return visit to examine persons not available for examination at the time of the initial visit. Persons below 50years of age and those who have not resided

in the villages for up to six months were excluded from the study.

### **Data collection**

There were four survey teams each day consisting of one ophthalmologist, an ophthalmologist in training, an ophthalmic nurse and a guide. Prior to the commencement of the survey, a training course and a pilot survey was conducted for team members on the survey protocol and how to fill the survey form, the interview process, assessment of visual acuity and ocular examination. Visual acuity assessment by the nurses was compared with that of an ophthalmologist while ocular examination by the ophthalmologists was compared with that of the most senior ophthalmologist to ensure agreement and a kappa of 0.8.

A standardized protocol for the Rapid Assessment of Cataract Surgical Services (RACSS) was used for all eligible subjects. Data collected included general demographic information and history of cataract surgery, visual acuity (VA) and details of ocular examination. All subjects were examined in their households. Visual acuity was measured at 6 or 3meters in broad day light with the letter or illiterate E chart using available correction. Persons with visual acuity less than 6/18 were assessed with a pinhole while a +10 spectacle was used for aphakic patients. Ocular examination was done in a shaded area with a pen torch and direct ophthalmoscope on all persons with VA less than 6/18 to establish the main cause of blindness or visual impairment. The main cause of blindness or visual impairment in an eye was attributed to the primary disorder or the most treatable cause where there are two co-existing disorders.

### **Study definitions**

Blindness: presenting VA of <3/60 in the better eye with available correction. Severe visual impairment (SVI): presenting VA of <6/60 to  $\geq$ 3/60 in the better eye with available correction

Visual impairment (VI): presenting VA of <6/18 to  $\geq$ 6/60 in the better eye with available correction

Cataract: presence of visually significant lens opacity

Trachomatous corneal opacity (CO): the presence of corneal opacification in an eye with evidence of corrected or uncorrected entropion or trichiasis.

Non-trachomatous CO: the presence of CO without corrected or uncorrected entropion or trichiasis.

Glaucoma: the presence of a pale and cupped disc with a cup-to-disc ratio of 0.8 or more.

Aphakia: the absence of the lens; while uncorrected aphakia refers to an aphakic eye whose vision improves with a +10 spectacles.

Surgical complications: an eye that was blind or visually impaired that had undergone cataract surgery or couching (traditional cataract surgery) in the absence of other causes of blindness/visual impairment.

Data was entered into RACSS software (WHO, Geneva, Switzerland), and analyzed for simple percentages and odds ratio (OR). All patients with minor ailments were treated free of cost while those requiring surgical intervention were referred to the hospital where surgery was done for free. Reading glasses were sold at subsidized cost to those requiring them. Oral consent was obtained from all participants after detailed explanation of the study procedure in their local language. The study was approved by the ethics committee of the University of Jos Teaching Hospital.

## RESULTS

A total of 4115 persons out of 4200 were examined giving a response rate of 98%. Of the 75 persons not examined 55(73%) were not available and 20(27%) persons refused examination. More females (52.9%) were examined while more males (52.7%) were not available for examination and more females (76.7%) refused examination. The proportion of younger persons examined was more than the older persons as shown in table 1.

### Visual acuity

A total of 173 persons were blind in both eyes with a blindness prevalence of 4.2% (95% CI: 4.1-4.3) (Table 2). Unilateral blindness was over twice as common as bilateral blindness with 441(10.7%; 95% CI: 10.4-11.0) persons unilaterally blind.

**Table 1.** Age and sex distribution of persons examined.

Age group (yrs)	Male		Female		Total	
	n	%	n	%	n	%
50-54	457	23.6	620	28.5	1077	26.2
55-59	344	17.7	411	18.9	755	18.4
60-64	364	18.8	413	19.0	777	18.9
65-69	233	12.0	222	10.2	455	11.1
70-74	265	13.7	215	9.9	480	11.7
75-79	123	6.3	119	5.5	242	5.9
80+	153	7.9	176	8.1	329	8.0
<b>Total</b>	<b>1939</b>	<b>100.00</b>	<b>2176</b>	<b>100.00</b>	<b>4115</b>	<b>100.00</b>

**Table 2.** Visual acuity distribution of the study population.

VA with available correction VA <3/60	Male (n=1939)		Female (n=2176)		Total (n=4115)	
	No.	Prevalence (95% CI)%	No.	Prevalence (95% CI)%	No.	Prevalence (95% CI)%
<b>Bilateral blindness</b>	76	3.9(3.8-4.0)	97	4.5(4.3-4.6)	173	4.2(4.1-4.3)
<b>Unilateral blindness</b> VA <6/60-≥3/60	239	12.3(11.9-12.7)	202	9.3(9.0-9.6)	441	10.7(10.4-11.0)
<b>Bilateral severe visual impairment</b>	123	6.3(6.1-6.5)	151	6.9(6.7-7.1)	274	6.7(6.5-6.9)
<b>Unilateral severe visual impairment</b> VA <6/18-≥6/60	275	14.2(13.9-14.6)	237	10.9(10.6-11.2)	512	12.4(12.0-12.8)
<b>Bilateral visual impairment</b>	282	14.5(14.1-14.9)	366	16.8(16.3-17.3)	648	15.8(15.3-18.3)
<b>Unilateral visual impairment</b>	301	15.5(15.0-16.0)	280	12.9(12.5-13.4)	581	14.1(13.7-14.5)

**Table 3.** Age and sex distribution of blindness in study population.

Age group (yrs)	Male		Female		Total	
	No.	Prevalence (95%CI)%	No.	Prevalence (95%CI)%	No.	Prevalence (95%CI)%
50-54	1	0.2 (0.18-0.22)	3	0.5 (0.48-0.52)	4	0.4 (0.39-0.41)
55-59	4	1.2 (1.18-1.22)	4	1.0 (0.98-1.02)	8	1.1 (1.09-1.11)
60-64	2	0.6 (0.58-0.62)	11	2.7 (2.61-2.79)	13	1.7 (1.67-1.73)
65-69	12	5.2 (4.99-5.22)	13	5.9 (5.67-5.81)	25	5.5 (5.35-5.65)
70-74	11	4.2 (4.04-4.36)	12	5.6 (5.39-5.81)	23	4.8 (4.67-4.93)
75-79	12	9.8 (9.39-10.21)	16	13.5 (12.95-14.05)	28	11.6 (11.27-11.93)
80+	34	22.2 (21.23-23.17)	38	21.6 (20.71-22.49)	72	21.9 (21.25-22.55)
<b>Total</b>	<b>76</b>	<b>3.9 (3.75-4.05)</b>	<b>97</b>	<b>4.5 (4.33-4.67)</b>	<b>173</b>	<b>4.2 (4.09-4.32)</b>

**Table 4.** Causes of blindness, severe visual impairment and visual impairment.

	Blindness (VA <3/60) n=173 (%)	Severe visual impairment (VA <6/60 to 3/60) n=274 (%)	Visual impairment (VA <6/18 to 6/60) n=648 (%)
Cataract	99 (57.2)	163 (59.5)	379 (58.5)
Refractive error	0	4 (1.5)	90 (13.9)
Glaucoma	29 (16.8)	35 (12.8)	45 (6.9)
Uncorrected Aphakia	18 (10.4)	31 (11.3)	44 (6.8)
Surgical complications	2 (1.2)	2 (0.7)	9 (1.4)
Phthisis bulbi/no globe	3 (1.7)	0	0
Trachomatous cornea opacity	6 (3.5)	14 (5.1)	18 (2.8)
Other corneal opacity	11 (6.4)	14 (5.1)	34 (5.2)
Macular degeneration	2 (1.2)	3 (1.1)	6 (0.9)
Other posterior segment disease	3 (1.7)	9 (3.3)	23 (3.5)
<b>Avoidable†</b>	<b>139 (80.3)</b>	<b>228 (83.2)</b>	<b>574 (88.6)</b>

†Cataract, uncorrected Aphakia, refractive error, corneal opacity, trachoma, surgical complications and phthisis

The prevalence of severe visual impairment was 6.7% (95% CI: 6.5-6.9) with 274 persons having SVI; while 648 (15.8%; 95% CI: 15.3-16.3) had visual impairment. The prevalence of blindness VI and SVI were slightly higher in females than males. Assuming that 82% (2)2 of blind people are aged 50 years and above, the overall prevalence of blindness is estimated to be 0.46%.

#### Age distribution of blindness

The prevalence of blindness increased with age; 4 (0.37%) persons less than 54yrs were blind while 72 (21.9%) persons above the age of eighty were blind (Table 3). In both males and females, blindness prevalence increased with age except in the males 60-64 yrs where there were 2 (0.6%) blind persons.

#### Causes of blindness and visual impairment

The most common causes of blindness and severe visual impairment are cataract (59.5% and 57.2% respectively), glaucoma (16.8% and 12.8%) and uncorrected Aphakia (10.4% and 11.3%). Cataract (58.5%) was also the main cause of visual impairment but refractive errors (13.9%) were the second most common cause. Other causes of blindness, severe visual impairment and visual impairment are shown in table 4.

#### Sex distribution of causes of blindness

The prevalence of blindness in males; 3.9% (95% CI: 3.7-4.1) was lower than in females; 4.5% (95% CI: 4.3-4.7); with females being 1.14 (95% CI: 0.83-1.56) times more at odds of being but there was no statistically significant difference between the sexes (X<sup>2</sup> 0.68, p>0.05).

**Table 5.** Sex distribution of causes of blindness.

Cause	Males		Females		Total	
	n	%	n	%	n	%
<b>Cataract</b>	41	53.9	58	59.8	99	57.2
<b>Glaucoma</b>	14	18.4	15	15.5	29	16.8
<b>Uncorrected Aphakia</b>	11	14.5	7	7.2	18	10.4
<b>Other corneal opacity</b>	5	6.6	6	6.2	11	6.4
<b>Trachomatous corneal opacity</b>	0	0	6	6.2	6	3.5
<b>Phthisis bulbi/no globe</b>	1	1.3	2	2.1	3	1.7
<b>Surgical complications</b>	2	2.6	0	0	2	1.2
<b>Macular degeneration</b>	1	1.3	1	1.0	2	1.2
<b>Other posterior segment lesion</b>	1	1.3	2	2.1	3	1.7
<b>Total</b>	76	100	97	100	173	100

More females were blind than males and more females were blind from all the causes of blindness except uncorrected Aphakia and complications of surgery which were more in males. An equal number of males and females had macular degeneration as shown in table 5.

## DISCUSSION

The high response rate (98%) obtained in this study could be attributed to the re-visits to the homes of persons absent at the first visit and the fact that the survey was conducted in the dry season. This high response rate means the results could find application in the whole of the state.

The prevalence of blindness in this survey is low when compared to the 9% WHO estimates for Africa in this age group (2); it is also lower than that reported in a similar study in Nigeria (8.2%) (7). This prevalence is however high compared to that reported in a similar age group in Cameroun (1.1%) (3), Kenya (2.0%) (5) and Rwanda (1.8%) (11); this is despite the fact that over the past twenty years, the University Department of ophthalmology and a mission hospital have provided on-going eye care services in Plateau State. The studies from Kenya and Cameroun were conducted in areas where there are on-going organized eye care programs; this may explain the lower prevalence of blindness reported from these studies compared to ours since the two public eye units are considered inadequate for the total population of the state. This is compounded by the fact that there is no planned eye care program so the eye units are more likely to concentrate on their immediate environments. This lends credence to the need to develop an eye care program so that eye care services can be provided in a comprehensive and coordinated manner to meet the current needs in the state. The prevalence of blindness in this study is

similar to that reported from Birnin-Kebbi (North-western Nigeria) in a similar age group where there is also no on-going eye care program (12). The prevalence of blindness, SVI and VI was somewhat higher in women than men which is consistent with data from a number of studies as females are less likely to access eye care services or live longer so are more likely to go blind (13,14).

Cataract was the most common cause of blindness, severe visual impairment and visual impairment. While glaucoma was the second most common cause of both blindness and severe visual impairment, refractive errors were the second most common cause of visual impairment. This finding is similar to the results from other studies in Nigeria (10,13). Most of the causes of blindness (80.3%), severe visual impairment (83.2%) and visual impairment (88.6%) were avoidable as reported in the results of the Nigeria national blindness and visual impairment survey where 84% of the causes of blindness were avoidable (10). This further emphasizes the need to develop an eye care program in the state. While the proportion of blindness and severe visual impairment caused by glaucoma and other posterior segment diseases may have been underestimated due to our operational definitions and lack of sophisticated equipment to diagnose glaucoma in the field, this is also not unexpected considering the magnitude of blindness caused by cataract. We expect the proportion of blindness caused by posterior segment lesions to increase once the cataract challenge is tackled. There is a need therefore to develop a comprehensive eye care service that will take care of these other causes of blindness in addition to cataract surgical services. Such a comprehensive service will also take care of the spectacle needs of those with refractive errors and the few pockets of trachoma in the state. Cataract blindness was more common in females as has been documented in other studies (10,15). There were only males blind from surgical

complications; this may suggest that males are having a greater access to cataract surgery than females. Expectedly, only females were blind from trachoma as blinding trachoma is more common in females and unlikely to be found in males in areas of low trachoma endemicity (16,17).

The main strength of this study was the high coverage of the study population and the large sample size, this was achieved by the adequate pre-survey arrangements and follow-up visits. The result of this study is thus a likely reflection of the blindness situation in Plateau state. The pre-survey training ensured that information bias was minimized since ocular examination was undertaken by ophthalmologists with good inter-observer reliability.

This study was limited by the use of the random walk method in identifying the study subjects thus introducing some element of subjectivity. There was no up-to-date information on the age distribution in the area so we could not calculate the age adjusted prevalence or compare the sampled population to the population structure of Plateau state. The lack of pupillary dilatation would have caused an underestimation of the proportion of posterior segment diseases causing blindness/visual impairment.

In conclusion, most of the causes of blindness in Plateau state are avoidable. An organized and effective eye care program having focus on cataract surgery and refractive services will substantially reduce the prevalence of blindness and make eye care available to most of the population in Plateau state.

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