The prevalence of glaucoma in an onchoendemic community in South-Eastern Nigeria

***Chimdi M. Ekwerekwu and R. E. Umeh**
Department of Ophthalmology, University of Nigeria Teaching Hospital, Enugu, Nigeria.

Summary

***Methodology*: With the aim of examining all the adults aged 30 years and above a survey was conducted in Alum-Inyi, a mesoendemic Community in South-Eastern Nigeria. The people were subjected to basic ophthalmic tests for the diagnosis of glaucoma namely corrected and uncorrected visual acuity at 6 metres using an illiterate E-chart, with pinhole assessment if visual acuity < 6/18; direct ophthalmoscopy to assess the vertical cup-disc ratio through undilated pupils and Schiotz indentation tonometry. In addition, static visual field analysis using the MK 1 Friedman visual field analyser was carried out in any glaucoma suspect.**

***Results*: Of 664 eligible persons examined (out of the estimated total of 946), 14 definite cases of glaucoma were identified, giving a prevalence of 2.10% in the 30 years of age and older population. The mean vertical cup-disc ratio for the non-glaucoma cases were 0.30 (+0.004) and 0.31 (±0.004) and 0.31 (± 0.09) in the right and left eyes respective.**

Among the glaucoma cases, the average vertical cup-disc ratio in the right and left eye were 0.63 (± 0.05) and 0.70 (± 0.06 respectively.

No physiological cup of ≥ 0.6 was recorded in our study. The mean IOP in the right and left eyes respectively were 18.54 (±0.15) and 19.42 (±0.14) in the nonglaucomatous cases and 26.39 (± 1.75) and 27.46 (± 2.59) in the glaucoma cases.

***Conclusion*:**

Despite its limitations, this study confirms that the prevalence of glaucoma varies from one African population or population of African origin to another. It agrees with other reports that the risk of glaucoma increases with age.

Key words: ***Glaucoma, Onchoendemic.***

Résumé

Méthodologie: Une étude a été effectué à Alum-Inyi dans la communauté mesoendémique au sud-est du Nigéria, afin d'examiner les adultes âgés de 30 ans et plus de trente. Ce peuple étaient soumis aux éprouves foundamentaux d'ophtalmique pour la diagnose de glaucome c-à-d acuité visuelle rectificative et non-rectificative à distance 6 metres en utilisant le E-chart analphabète – une avec évaluation trou d'épingle dans le cas où l'acuité visuelle <6/18; ophtalmoscopie directe pour évaluer la proportion cup-disc vertical à travers les pupilles sans dilater et schiotz découpade tonometrie.

En outre, l'analyse visuelle statique en utilisant le MK 1 Friedman Visual field analyser dans le cas présumé de glaucome.

Resultat: Parmi les 664 cas présumés étudiés (dans le grand numbre de 946) on a pu identifier 14 cas précis de glaucomes avec la fréquence de 2,10% chez les gens de la classe 30 ans et plus de trente. La proportion moyenne verticale cup disque pour les cas non-glaucomes étaient 0,30 (+0,004) et 0,31 (± 0,09) dans les yeux droite et gauche respectivement.

Parmi les cas de glaucome, la proportion moyenne verticale cup-disque dans les yeux droite et gauche étaient 0,63 (± 0,05) et 0,70 (± 0,06) respectivement.

La non physiologie tasse de >0,6 était noté dans notre étude. La moyenne IOP dans les yeux droite et gauche respectivement étaient 18,54 (± 0,15) et 19,42(± 0,14) dans les cas nonglaucomes et 26, (± 1,75) et 27,46 (± 2,59) dans les cas glaucomes.

Conclusion: En dépit de ses bornes, cette étude a confirmé que la fréquence de glaucome varie d'une population d'origine africaine à l'autre. Cette étude est en rapport avec la convention courrant qui soutient le fait que le problème de glaucome s'accroit avec l'âge.

Introduction

Glaucoma is the third leading cause of blindness in the world. About 5.2 million people are blind from it[1]. In Africa alone, there are estimated to be at least 1.5 million blind from glaucoma and 20% of these will be found in Nigeria with a population of approximately 100 million[2].

There is evidence that chronic open-angle glaucoma (COAG) occurs with higher prevalence, earlier onset and greater severity in black patients than in white, and blindness from COAG maybe 8 times more common[3-10]. However, in Africa itself the available reports suggest that the disease varies in frequency from one geographical area and one ethnic group to another[4].

Most existing information on glaucoma blindness in Nigeria is from blindness surveys and clinic-based studies in various parts of the country. The proportion of total blindness due to glaucoma from clinic-based studies in Nigeria ranges from 6.6%[11] to 20%[12] while that from blindness surveys ranges from 7.6%[13] to 15.56%[14]. In the first population-based study to measure the prevalence of glaucoma and glaucoma-relationed parameters in the onchoendemic and non-endemic communities in Kaduna, Northern Nigeria, Murdoch noted that the prevalence of glaucoma was generally lower than that reported in other studies in blacks.

Onchocerciasis is a public health problem in large areas of West and Central Africa, and complicates the assessment of glaucoma in these areas because it causes secondary glaucoma as well as optic atrophy. This glaucoma survey was conducted in Alum-Inyi, a community mesoendemic (skin snip positivity: 30-60%) for onchocerciasis in South-Eastern Nigeria, with the aim of examining all the adults aged 30 years and above.

This is the first population-based study on glaucoma in Southern Nigeria and the second in Nigeria.

Method

Alum is one of the nine villages that make up Inyi town in Oji River Local government Area of Enugu State. A rapid census by the executive and health committee members of Alum progressive Union (APU) gave an estimate of 1,422 adults aged 30 years and above, of which 476 had migrated to urban areas. The estimated 946 eligible were invited to attend for examination in the community hall, and those not attending were followed up by personal contact by the mobiliser, voluntary health worker, chairman of the APU, other elders, and by other methods. Fifty adults who could not come to the central location were examined at home.

Examination consisted of

a) Visual Acuity Assessment: Corrected and uncorrected visual acuity using the illiterate E-chart with multiple optotypes at 6 metres was checked. If either acuity was < 6/18 an assessment with pinhole was performed. Vision for each eye was recorded (according to WHO classification) as

*Correspondence

1. for 6/6 – 6/18
2. for < 6/18 – 6/60
3. for < 6/60 – 3/60
4. for < 3/60 - NPL

The grade of vision in the better eye was recorded as the persons vision.

b) Vertical cup-disc ratio estimation using the direct ophthalmoscope: Vertical cup-disc (i.e. vertical diameter of the disc) measurement was achieved by examining the disc through the undilated pupils of the participant.

c) Indentation tonometry by schiotz tonometry with the standard 5.5g weight: The procedure was first explained to the patient to obtain his co-operation then xylocaine drops instilled into the inferior conjunctival fornix. Two minutes later when topical anaesthesia had been achieved the test was carried out with the patient lying supine.

Only one reading of the intraocular pressure was taken.

d) Visual field analysis: Static visual field analysis using the MK 1 Friedman visual field analyser was carried out in any glaucoma suspect. The fields were measured first with threshold for estimated age, then consecutively with two higher thresholds.

Definitions

For the purposes of this study, a glaucoma case fulfills at least two of the following three criteria, in one or both eyes:

1. Either a vertical cup-disc ratio of ≥ 0.5 or asymmetry of disc cupping of ≥ 0.2;
2. Intraocular pressure of ≥ 28mmHg;
3. Field defect characteristic of glaucoma.
4. Glaucoma suspect is a person who, prior to visual field testing, fulfilled either of the first two criteria.

Results

Out of the estimated 946 total eligible population aged 30 and over in the village, 664 people were examined (70%). There were more females (69%) than males.

Fifty one glaucoma suspects were tested for visual field defects, and 14 definite cases of glaucoma were found. This gave a prevalence of 2.1% in the population aged 30 and over and 2.78% in those 40 and above. Only two of these 14 cases had previously been diagnosed. There was no difference in the occurrence of glaucoma between the sexes. The proportion of the general population with glaucoma increased with age, so that 11 of the 14 cases occurred over the age of 59 (Table 1).

Table 1 Glaucoma by age

Age-group	Number examined	Glaucoma cases
30-39	196	1
40-49	137	1
50-59	129	1
60-69	136	6
70-79	60	4
80+	6	1
Total	664	14

The bases of the diagnosis of glaucoma was the vertical cup-disc ratio ≥ 0.5 and characteristic field defect in 7 cases; cup-disc ratio ≥ 0.5 plus IOP ≥ 28mmHg in 6 and raised IOP plus characteristic field defect in 1.

Onchocerciasis was not associated with a high prevalence of glaucoma.

The distribution of vertical cup-disc ratio in non-glaucomatous subjects is shown in Table 2. Apart from cases of non-glaucomatous optic atrophy, presumed to be due to onchocerciasis, which were recorded as 0.9, no cup greater than 0.6 was recorded amongst the nonglaucomatous population.

Table 2 Cumulative frequency of vertical cup-disc ratio in the non-glaucoma cases

Vertical cup-Disc ratio Ratio	Nos R	Cumulative Frequency (%) (R)	Nos L	Cumulative Frequency (%) (L)
0.1	29	4.6	27	4.2
0.2	159	29.6	142	26.6
0.3	275	72.9	273	69.7
0.4	141	95.2	159	94.8
0.5	25	99.2	28	99.2
0.6	2	99.2	3	99.7
0.7	-	-	-	-
0.8	-	-	-	-
0.9	3	100	2	100

Comparatively, among the glaucoma cases the mean vertical cup-disc ratio were 0.63 (± 0.06) and 0.70 (± 0.05) in the right and left eyes respectively.

Table 3 Cumulative frequency of intraocular pressure in the non-glaucoma cases

Intraocular Pressure	Nos R	Cumulative Frequency (%) (R)	Nos L	Cumulative Frequency (%) (L)
10	3	0.5	1	0.2
12	48	8.3	29.7(30)	5.0
15	118	27.6	62	15.0
17	119	55.1	195	46.5
21	167	82.4	185	76.3
24	106	99.7	144	99.5
29	1	99.8	3.0	100
35	1	100	-	-

The distribution of intraocular pressure in non-glaucomatous subjects is shown in Table 3. More than 70% of the nonglaucomatous glaucomatous population recorded IOP of ≤ 21mmHg in either eye. Table 4 summarises the mean vertical cup-disc ratio and IOP recorded in both glaucoma and non-glaucoma cases.

Table 4 Vertical cup-disc ratio and IOP in both glaucoma and non-glaucoma cases

	Mean vertical cup-disc ratio (R) ± SD	Mean vertical cup-disc ratio (L) ± SD	Mean IOP (mmHg) R ± SD	Mean IOP (mmHg) L ± SD
Glaucoma Cases	0.63(±0.06)	0.70(±0.05)	26.39 (±1.75)	27.46 (±2.59)
Non-glaucoma Cases	0.30(±0.004)	0.31(±0.09)	18.54 (±0.15)	19.42 (±0.14)

The difference in mean IOP between the two groups was statistically significant (student's t-test: P = 0.000).

Discussion

This was a population-based study aimed at examining all the adults aged 30 years and above in the community estimated to be 946 of which we were able to examine 664 (participation rate of 70%).

The prevalence of glaucoma was found to be 2.1% in those aged 30 years and above and 2.78% in those aged 40 and over. These values are lower than those found in ≥ 30 year-olds in St. Lucia (8.8%)[15] and ≥ 40 year-olds in Barbados (7%).

The Liberian survery[16] also reported a 4.35% prevalence of glaucoma in those aged 40 years and above. These differences in estimates may be accounted for by differences in sampling meth-

odology, procedures and case-definitions.

Our study demonstrated an increase in prevalence of glaucoma from 0.15% in those aged 30-39 years to 16.67% in the 30 year-olds and over. This finding agrees with those of other studies[8,15]. However, it should be noted that the results are not comparable by case-definitions, sampling methodology and procedures but they do confirm the trend towards higher prevalences with age as much as > 10% in the 80 year-olds and above in blacks.

The mean vertical cup-disc ratios in our study were found to be 0.30 (±0.004) and 0.31 (± 0.09) for the right and left eyes of the non-glaucoma cases respectively, lower than what was expected in an onchoendemic community. Those with cup-disc ratio of 0.3 constituted the highest proportion (frequency 43% for each eye). This was similar to Vaughan's study in Jamaica[17] where the greatest proportion of the people had cup-disc ratio of 0.2 and 0.3, frequency of 23.9% each. Murdoch[2] in this study in the onchocerc mesoendemic communities in Northern nigeria got the following cup-disc ratio:

	Males	Females
R:	0.35	0.33
L:	0.35	0.32

A students t-test comparing the findings in males and females showed a slightly greater mean vertical ratio in the males. In our study the findings were:

	Males	Females
R:	0.29	0.30
L:	0.31	0.31

There was no significant difference in cup-disc ratio between the sexes and no change with age observed in our study. The inability of our study to observe any association between cup-disc ratio and age as well as sex may be due to its small size.

The mean IOP in our study were 18.54 (±0.15) and 19.42 (±0.14) in the right and left eyes respectively. There was no difference between the sexes. Murdoch in onchoendemic communities in Northern Nigerian reported mean IOP of 13.4 (±0.4) mmHg in the right eye.

These studies are not comparable because of the difference in instruments and methods of measurement employed for each, however, our finding of no difference in IOP between the sexes agrees with the findings by David et al[18] and Murdoch[2]

Sources of systematic (non sampling) errors in this study include:

1. under-coverage because of an incomplete census.
2. Significant non response rate of 30% which may also be an under-estimate.
3. Methodology:
   - i) Field analysis was carried out on only suspects selected based on abnormal cup-disc ratio or raised intraocular pressure. This is not a very sensitive method of detecting glaucoma.
   - ii) Method of the field analysis: Humphrey's central visual field analyser which, currently, is the most sensitive visual field analyser starts detecting visual field defects when at least 50% of optic nerve fibres have been lost.
   - iii) Single tonometric readings: The intraocular pressure shows a diurnal variation so single tonometric readings in a day do not give the true picture of the patient's intraocular pressure status.
   - iv) Confirmation of glaucoma was not possible in 16 cases examined. This could give a falsely lower estimate of the prevalence of glaucoma.

Conclusion

Despite its limitations, this study confirms that the prevalence of glaucoma varies from one African population, or population of African origin, to another. It agrees with other reports that the risk of glaucoma increases with age, particularly after the age of 60

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