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Glaucoma prevalence may not be uniformly high in all 'black' populations

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Summary

Epidemiological data on the prevalence of glaucoma are generally presented for populations described as "whites" or "blacks". "Black" populations appear to have a higher glaucoma prevalence than "white" populations. We describe a population-based survey for glaucoma in rural Northern Nigeria. A total of 1563 Hausa/Fulani individuals aged 5 years and above, underwent an extensive screening test and a detailed ophthalmological examination was performed on individuals who failed the test. The overall prevalence of open angle glaucoma in this population was 1.02% (0.12 to 3.64, 95% confidence interval) in individuals 45 years of age and older. This is lower than the prevalence rates reported for other "black" populations. The low prevalence of glaucoma detected in this African population may be, to some extent, a reflection of the age structure of the population studied or methodological differences in ophthalmic examinations performed. It is also possible that the prevalence of glaucoma varies considerably between "black" populations due to genetic heterogeneity or the effect of some unidentified environmental exposure. The use of the simple description of populations as 'black' (or 'white'), which focuses on a commonality, tends to obscure the potential heterogeneity within and between populations and thus may be unhelpful in some circumstances.

Keywords: *Glaucoma, prevalence, black, populations*

Résumé

Les données épidémiologiques portant sur la fréquence de glaucome sont présentées généralement pour des populations dites "blancs" ou "noirs". La population des noirs paraît d'avoir une fréquence de glaucome plus élevée que la population des blancs. Nous décrivons une étude basée sur la population de glaucome dans la partie rurale, au nord du Nigéria. 1563 personnes d'origine Hausa/Fulani âgées de 5 ans et plus ont été subies un test screening étendu et une examination ophthalmologique détaillée était faite sur les individus qui ont échoué le test. L'ensemble de fréquence de glaucome de coin ouvert dans cette population était 1,01% (0,12 à 3,64, 95% l'intervalle de confiance) dans les individus âgés de 45 ans et plus. Ce chiffre est plus baissé que le taux de la fréquence présenté pour d'autres populations noires. La fréquence baissée de glaucome détectée dans la population africaine peut-être jusqu'à un point, une réflexion de la structure d'âge de la population étudiée ou une réflexion des différences méthodologiques des examinations ophthalmique faite. C'est aussi possible que la fréquence de glaucome peut varier considérablement entre les populations noires dû au fait de la hétérogénéité génétique ou l'effet de quelques hypothèses d'environnement non-identifié. L'emploi d'une description simple de populations comme "noir" (ou "blanc"), qui met au point une standardisation, a tendance d'obscurer

l'hétérogénéité potentielle à l'intérieur et entre les populations et ainsi peut-être inutile dans quelques circonstances..

Introduction

Epidemiological data on the prevalence of open angle glaucoma in various countries are increasingly available. The majority of populations sampled in these studies are of Caucasian or African/Caribbean origin. To date the terms "whites" and "blacks" have been used to describe and distinguish these two populations. The reported prevalence of open angle glaucoma in the studied "black" populations of 30 years and older ranges from 3.9% to 8.8%, about 4 times higher than those in "white" populations in the same or similar studies. [1,2]

Materials and methods

We carried out a population-based survey in two rural savannah communities west of Zaria, Kaduna State, Northern Nigeria where entomological prospection indicated that there was currently no blackfly breeding. The communities are descended from two phenotypically and culturally distinct groups, the Fulani and the Hausa. A census identified 1890 individuals aged 5 years or more of whom 1563 (83%) were examined after obtaining informed consent. Only 5 individuals out of 1400 were skin snip positive for onchocercal infection. An ophthalmic screening examination, with high sensitivity for the detection of optic nerve disease in onchocercal communities in Northern Nigeria, was performed [3,4,5].

In brief, individuals were examined by a team of 6 trained ophthalmic nurses who showed good inter-observer agreement for the tests employed. The screening examination consisted of a series of visual function tests including visual field assessment [5] designed to identify optic nerve disease, examination of pupillary light response and direct ophthalmoscopy to assess optic disc colour and cup/disc ratio. A screening applanation tonometer called the glaucotest was used to measure intraocular pressure (IOP). This consisted of a weight representative of 18mmHg which rests on the cornea to produce a meniscal ring that indicates the level of the intraocular pressure against this weight.

Participants were referred for further examination by one of the two ophthalmologists (IEM, OEB) if they had reduced visual acuity that did not improve to 6/9 with pinhole, failed any of the visual function tests, had an abnormal pupillary light response, intraocular pressure in excess of 18mmHg, suspicion of disc pallor or a high cup/disc ratio (>0.5). In addition a weighted, computer-generated random sample of individuals (21%) was identified, all of whom were examined by the ophthalmologists regardless of findings at screening. The weighting favoured the inclusion of individuals aged over 20 years.

The examination by the ophthalmologist included central visual field analysis with a Friedman Mark 1 analyser, full ocular examination using a slit-lamp biomicroscope with gonioscopy, applanation tonometry and dilated direct and indirect ophthalmoscopy.

Individuals were considered to have glaucoma with varying degrees of certainty if they presented with any of the following:

Definite

A typical glaucomatous disc appearance in one or both eyes.

Probable

An equivocal glaucomatous disc appearance in combination with an IOP raised over 21mmHg *Or* an IOP in excess of 30mmHg with the disc not visible, or a history of glaucoma surgery.

Possible

Other optic nerve disease with open angles on gonioscopy and no other ocular abnormality to account for the nerve pathology.

All data collected were recorded on standard forms and were double entered with verification using DBase III. Statistical analysis was performed using SAS v 7.1 and Stata version 5.0. "Exact" confidence intervals were obtained directly from the log likelihood.

Ethical approval was given by the World Health Organisation Ethical Review Committee and by the Ahmadu Bello University Ethical Committee. Informed consent was obtained first at the community level and then, prior to examination, from individuals.

Results

Only 1 case of glaucoma with a typical glaucomatous disc appearance was identified. This individual (female, age 26 years) had IOPs of 16 mmHg (right eye) and 14mmHg (left eye), with grade III open drainage angles. There was severe field loss in the right eye. In addition, three other individuals had probable glaucoma in one or both eyes:

Case 2: Female aged 50 years. Left eye: phthisis bulbi. Right eye: field defects and mild disc pallor with an IOP of 27mmHg and a shelved optic disc cup. Gonioscopy showed a grade III open angle.

Case 3: Male aged 46 years. Bilateral visual field defects with vertical cup:disc ratios of 0.6 bilaterally with no neuroretinal rim notching visible. Both IOPs measured 22mmHg. Gonioscopy was not performed but the anterior chamber was deep.

Case 4: Female aged 30 years. Right eye: visual field defects with mild pallor of the optic disc. Both vertical cup:disc ratios were 0.1. IOPs were 27mmHg right and 15mmHg left with grade III open angles on gonioscopy.

Table 1: Age sex distribution of study population

Age group	Male (%)	Female(%)	Total (%)
5-25	512(65.9)	512(66.3)	1024(66.1)
26-30	53(6.8)	77(9.9)	130(8.4)
31-35	47(6.1)	36(4.7)	83(5.4)
36-40	42(5.4)	38(4.9)	80(5.2)
41-45	34(4.4)	36(4.7)	70(4.5)
46-50	26(3.4)	19(2.5)	45(2.9)
51-55	21(2.7)	17(2.2)	38(2.5)
56-60	11(1.4)	13(1.7)	24(1.6)
61-65	12(1.5)	13(1.7)	24(1.6)
66-70	10(1.3)	5(33.3)	15(1)
71-75	2(0.3)	2(0.3)	4(0.3)
76-80	5(0.6)	3(0.4)	8(0.5)
80+	2(0.3)	1(0.1)	3(0.2)

A further 7 cases with optic nerve disease in one or both eyes were identified. Five had pale optic discs in one or both eyes with no ocular abnormality to account for the finding. The re-

maining two individuals had retinal pathology in association with the disc pallor. All seven had open angles on gonioscopy and all are considered possible cases of glaucoma. No cases of secondary glaucoma were identified. There were 4 individuals with single blind eyes from trauma and a further four with phthisical blind eyes of unknown aetiology.

The overall age/sex characteristics of the study population are shown in table 1, while the prevalences of glaucoma for different age ranges are given in table 2.

Table 2: Age-restricted prevalence of open angle glaucoma in Hausa-Fulani communities, non-endemic for onchocerciasis, Kaduna State, Northern Nigeria.

Age (years)	Number (%) Examined	Prevalence (95% c.i.) of Definite + Probable Glaucoma	Prevalence (95% c.i.) of Definite+Probable+ Possible Glaucoma
5 and above	1563 (82)	0.26% (0.07,0.65)	0.70% (0.35,1.26)
35 and above	361 (84)	0.55% (0.07,1.99)	2.21% (0.96,4.32)
45 and above	196 (82)	1.02% (0.12,3.64)	3.57% (1.45,7.22)
55 and above	99 (79)	0% (0,3.66)	5.05% (1.66,11.4)

Discussion

Sound epidemiological data on glaucoma in the African continent are lacking. The overall prevalence of glaucoma in the study population in Northern Nigeria was lower than might be expected based on figures from community-based studies on "black" populations outside the African continent. [1,2]. In Baltimore the prevalence amongst American 'blacks' was 4.2% for those aged 40 years or more and in Barbados 7% for those aged 40 – 84 years. Definitions of glaucoma in these studies were comparable to our definite category. The screening protocols used were more rigorous than ours.

The age structure in our study population is heavily weighted towards the younger age groups compared with more 'developed' countries. This may partly explain the lower prevalence observed - glaucoma being an age-related disease.

Open angle glaucoma is known to have a genetically determined component that is probably polygenic. One possible explanation for the apparently lower prevalence of glaucoma in our population is that the allele frequencies of these genes in our population differ from those of other 'black' populations studied. Another possible explanation is that there exists some unidentified environmental or lifestyle factor which increases the risk of glaucoma and is more widespread in Baltimore and Barbados than in Northern Nigeria. Lastly, differences in prevalence of glaucoma could arise if the presence of glaucoma adversely affects survival in rural Nigeria to a greater extent than in North America of the Caribbean.

The use of the simple description of populations as 'black' (or 'white'), which focuses on a commonality, tends to obscure the potential heterogeneity within and between these populations and thus may be unhelpful. Further studies examining the pattern and prevalence of glaucoma in different populations in sub-Saharan Africa with similar and different environments may help to elucidate the aetiology of this disease.

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- References**
1. Tielsch JM, Sommer A, Katz J, Royall RM, Quigley HA and Javitt J. Racial variations in the prevalence of primary open angle glaucoma: The Baltimore Eye Survey. *JAMA* 1991;266(3):369-374.
 2. Leske MC, Connell AMS, Schachat AP and Hyman L. The Barbados Eye Study: Prevalence of open angle glaucoma. *Arch Ophthalmol* 1994;112:821-829.
 3. Abiose A, Jones BR, Cousens SN, Murdoch I, Cassels-Brown A, Babalola OE, Alexander NDE, Nuhu I, Evans J, Ibrahim UF and Mahmood AO. Reduction in incidence of optic nerve disease with annual ivermectin to control onchocerciasis. *Lancet* 1993; 341: 130-134.
 4. A Abiose, I Murdoch, Babalola O, Cousens S, Liman I, Onyema J, Evans J, Gregory W and Jones B. Distribution and aetiology of blindness and visual impairment in mesoendemic onchocercal communities, Kaduna State, Nigeria. *Brit. Jour. Ophthalmol* 1994;78:8-13.
 5. Murdoch I, Jones BR, Babalola OE, Cousens SN, Bolarin I and Abiose A. Red-dot card test of the paracentral field as a screening test for optic nerve disease in onchocerciasis. *Bull. of the WHO* 1996; 74(6): 573-576.