Original Article

Study of onchocerciasis-related visual impairment in North Kivu province of the Democratic Republic of Congo in Africa

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Purpose: The Objective of this study is to determine baseline data regarding onchocercal eye lesions and associated visual loss in the Nord Kivu province, an onchocerciasis hyperendemic tropical rain forest area in the Democratic Republic of Congo (DRC). **Methods:** A cross-sectional study was conducted in the Nord Kivu province of the DRC during which 2150 subjects were examined ophthalmologically. The eye examination included visual acuity (VA), slit-lamp examination, ophthalmoscopy, intraocular pressure, and visual field assessment by the confrontation test. Patients with suspicion of glaucoma were further evaluated by Humphreys automated perimeter. **Results:** 39 (1.81%) out of 2150 subjects had onchocerciasis-related eye lesions and 4 (0.19%) were blind (VA <3/60). Chorioretinitis (0.88%) was the most frequent onchocerciasis lesion followed by keratitis (0.46%), microfilaria in the anterior chamber (0.28%), iridocyclitis (0.28%), secondary glaucoma (0.19%), complicated cataract (0.19%), and optic atrophy (0.19%). Visual impairment was discovered in 114 (5.3%) out of 2150 subjects, of whom 39 (0.19%) had blindness and 75 (3.4%) had low vision. Visual impairment was mostly caused by nononchocerciasis-related diseases like cataract (27.2%), retinal diseases (19.3%), glaucoma (15.8%), and iridocyclitis (15.8%) rather than because of onchocerciasis (9.6%) among all causes of visual impairment. **Conclusion:** Features of ocular onchocerciasis usually described in forest and savanna areas were relatively less common than expected in and around Goma, the capital of the Nord Kivu province of the DRC.

Access this article online

Website: www.ijo.in

DOI: 10.4103/ijo.IJO_1653_18

Quick Response Code:

Key words: Onchocerciasis, uveitis, epidemiology, community ophthalmology, parasitic diseases

Onchocerciasis is an insidious nonfatal insect-borne disease caused by filarial nematode onchocerciasis volvulus. It is transmitted to humans by the bite of the black fly of the genus Simulium. The Simulium fly breeds in rapidly flowing rivers. Because of this, the onchocerciasis infection of the eye is called river blindness.

It is the world's second-leading cause of infectious blindness.[1] It is endemic in many countries of Africa and a few countries of central and South America. An estimated at least 1 million are either blind or severely visually disabled out of 18 million people infected with the disease living in these endemic countries.[1] Life expectancy is reduced to one-third of the sighted in these blind and most die within 10 years of onset of blindness.[1] Onchocerciasis because of itching, fatigue, weakness, social stigma, and lack of sleep leads to poor school performance and higher school drop-out rates in children and low productivity, low income, and higher health-related costs in adults. Often scratching leads to bleeding wounds in affected parts.

The Democratic Republic of Congo (DRC) is the third largest country by area (2.345 million km^2) of Central Africa with an estimated population of 62.6 million. About 48% of the population is under the age of 15 years. The life expectancy is estimated to be 50 and 53 years, respectively, for men and women. Approximately 65% of the population lives in rural areas. About 84% of men and 61% of women are literate. Most parts of the country are endemic for onchocerciasis.[2] Out of the 18 million people infected in Africa and Central and South America, ~270,000 (40,000 in the DRC)) are blind and 500,000 severely visually impaired.[1] The implementation of the Onchocerciasis Control Programme in 1974 has resulted in marked reduction and control of disease in most parts of West Africa. It was initially launched in 7 and then in 11 West African countries. Aerial application of larvicides to the breeding sites of black flies was done for vector control. High effectiveness, safety, and free of cost provision of ivermectin by the manufacturer led to the WHO officially celebrating the elimination of onchocerciasis in most West African countries in October 1999.[3]

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Received: 17-Nov-2018 Revision: 28-Mar-2019
Accepted: 09-Apr-2019 Published: 20-Apr-2020

Cite this article as: Baranwal VK, Shyamsundar K, Kabuyaya V, Biswas J, Vannadil H. Study of onchocerciasis-related visual impairment in North Kivu province of the Democratic Republic of Congo in Africa. Indian J Ophthalmol 2020;68:890-4.

WHO in 1995 launched the African Programme for Onchocerciasis Control (APOC) in 11 new countries. DRC is one of these.[4,5] APOC is based on ivermectin distribution by a community-directed strategy. Its ultimate goal was to treat the remaining 60 million people at risk of contracting the disease and to eliminate onchocerciasis as a public health problem in Africa by 2007. It is expected that the prevalence of onchocercal eye lesions have fallen down with the implementation of APOC and it has been successful in controlling onchocerciasis in cities and towns but villages have a large number of cases even now. The specific aims of the study were to estimate the prevalence of eye diseases in the region with special emphasis on onchocerciasis.

Methods

Study area

This prospective cross-sectional, observational study was conducted in the Nord Kivu province of the DRC having 59,483 square km area and a population of 5,767,945 (2010 est.). L The base hospital was UN level-3 hospital in Goma. Data were collected by organizing camps at Base hospital in Goma and outreach camps held in Beni, Butembo, Lubero, Massisi, Rutshru, and Walikale [Figs. 1 and 2], which were rural areas. The camps were located in different places every time. This province is supposed to be hyperendemic for onchocerciasis. The climate is tropical with the rainy season from September to April and the dry season from May to August. The vegetation is primary forest furrowed by several streams and degraded by several savanna areas. The study was conducted from April 2008 to June 2009. There is only 1 eye specialist looking after an area of ~ 300 km radius. Therefore, eye care services are very poor. Slit-lamp examination was done in camps but Humphreys field analyser test was only done at Base hospital at Goma. This area was chosen for the study for the following reasons: first, it is supposed to be hyperendemic for onchocerciasis; second, it is reasonably accessible throughout the year.

Ophthalmological examination

A total of 2150 subjects were examined ophthalmologically. The eye examination included uncorrected and corrected visual acuity measurement, slit-lamp examination, direct and indirect ophthalmoscopy with the 20D lens, intraocular pressure measurement, and visual field assessment by the confrontation test. Patients with suspicion of glaucoma were further evaluated by Humphreys automated perimeter at Base hospital in Goma. The diagnosis of Onchocerciasis was arrived based on a dermatological examination>, slit-lamp examination depicting microfilaria in the anterior chamber, and skin biopsy.…

Consent and ethical considerations

This study adheres to the guidelines of the Declaration of Helsinki and the study was approved by the Institutional Ethics Committee of Bethesda Hospital, Goma, DRC. Written informed consent was taken from the participants of the study.

Results

Demographical characteristics of the participants [Table 1]

Out of a total of 2150 individuals who attended the survey, 1259 (58.56%) were males. Their distribution in age groups is displayed in Table 1. Most (70.24%) were <40 years of age.

The ocular lesions were found in 564 (26.23%) subjects who underwent a complete eye examination. We tried to establish a single diagnosis as a cause for visual impairment in each case as far as possible. However, some cases had multiple diseases and had >1 diagnosis [Fig. 3]. Thirty-nine out of 2150 subjects had onchocerciasis-related eye lesions. Among onchocerciasis-related eye lesions, chorioretinitis in 19 (0.88%) subjects was the most prevalent condition. The other onchocercial lesions were keratitis in 10 (0.46%) and microfilariae in the anterior chamber in 6 (0.28%), iridocyclitis in 6 (0.28%, Fig. 4), secondary glaucoma in 4 (0.19%), complicated cataract in 4 (0.19%, Fig. 5), and optic atrophy in 4 (0.19%) subjects [Table 2].

Prevalence of visual loss

Cases with visual acuity of less than 6/18 and 3/60 in the better eye with the best correction were considered as having low vision and blind, respectively, in this study. All cases with visual acuity of 6/18 or more in the better eye with correction were considered having normal vision. The overall prevalence of visual loss increased with age and ranged from 12.28% in people aged 0–20 years to 24.56% in those aged >50 years. Overall, 114 out of 2150 (5.30%) had various degrees of visual impairment. Out of these the prevalence of blindness and low vision were 1.86% and 3.44%, respectively. Among these, people aged ≥40 years (47.37%) were most affected [Table 3].

Causes of visual impairment [Table 4]

Among the 114 subjects with different degrees of visual impairment, onchocercal pathologies were thought to be the cause in 11 (9.6%) of them, whereas non-onchocercal conditions were incriminated in the remaining 103 (90.4%) of subjects. Among the total 114 subjects with visual impairment, the major causes were cataract 31 (27.19%), retinal diseases 22 (19.30%),

Table 1: Distribution of participants in age groups (*n*=2150)

Age group (years)	Total number, *n*	Percentage
0-10	130	06.05
11-20	420	19.53
21-30	432	20.09
31-40	511	23.76
41-50	429	19.95
51-60	161	07.49
≥61	67	03.12
Total	2150	100.00

Table 2: Prevalence of onchocercal ocular lesions (*n*=2150)

Disease	No. cases, *n*	Prevalence (%)
Keratitis (punctate and sclerosing)	10	0.46
Microfilariae in anterior chamber	6	0.28
Iridocyclitis	6	0.28
Chorioretinitis	19	0.88
Secondary glaucoma	4	0.19
Complicated cataract	4	0.19
Optic atrophy	4	0.19

Many cases had multiple lesions

Figure 1: Map of the DRC showing the North Kivu province. DRC: Democratic Republic of Congo

Figure 3: "Leopard skin" appearance in a child. The classic general appearance of a patient of onchocerciasis

glaucoma 18 (15.79%), iridocyclitis 18 (15.79%), phthisis bulbi 8 (7.02%), and optic atrophy 5 (4.39%).

Discussion

The overall prevalence of eye lesions was 26.23%. Onchocercal lesions like chorioretinitis, punctate keratitis, microfilariae in the anterior chamber, and white intraretinal deposits were very less than expected. This pattern differs from that found in other similar ecological areas.[6,7] In addition, the prevalence of chorioretinal diseases, microfilariae in the anterior chamber, sclerokeratitis, and punctate keratitis is lower than in other countries supposed to be endemic of onchocerciasis [Fig. 6]. However, the cases of onchocerciasis are much more common in villages than in urban areas. However, a study is needed to support this statement >. When comparing the prevalence of this

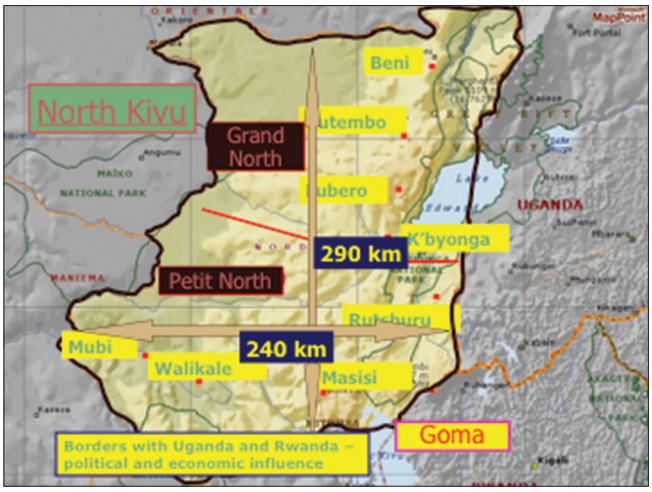

Figure 2: Distance scale of the North Kivu province of the DRC. DRC: Democratic Republic of Congo

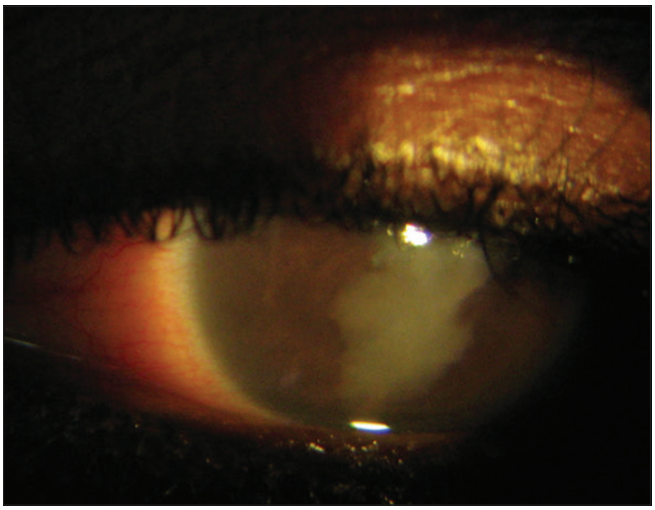

Figure 4: Iridocyclitis related to onchocerciasis

condition in men and women, we found that women were more affected than men. A similar finding has been reported by others.[6,8] The reason for such a difference is unclear, as both men and women are exposed in the same way. It has been hypothesized that in women, hormones would play a protective role during their productive age.[8] So far, it has not been confirmed. However, women have a higher life expectancy than men.

Previous studies regarding the prevalence of blindness in this region are not available. However, the following estimates have been reported from other African areas: 0.4%–1.9% in Liberia,[6,9,10] 1.3% in Sierra Leone,[11] 2.2% in the Central African Republic,[12] 3.3%–5.4% in Nigeria,[7,13,14] and 2% in Cameroon.[8] The onchocerciasis blindness rate in forest areas is low.[8,15]

Previous reports indicate that posterior segment lesions, especially chorioretinitis, cause most onchocercal blindness cases in forest-savanna areas. However, in our study, though the posterior segment onchocercal lesions were more common than anterior segment, the low vision was more common with anterior segment lesions especially iridocyclitis [Table 4].

Table 3: Distribution of prevalence of visual impairment by all diseases in various age groups (*n*=114)

Age group (years)	Total number	Low vision	Blind	Total visual impairment, *n* (%)
0-10	130	4	2	6 (5.26)
11-20	420	6	2	8 (7.02)
21-30	432	9	6	15 (13.16)
31-40	511	11	10	21 (18.42)
41-50	429	26	10	36 (31.58)
51-60	161	11	7	18 (15.79)
≥61	67	7	3	10 (8.77%)
Total	2150	74	40	114 (100)

Table 4: Causes of visual impairment by all diseases (*n*=114)

Disease	Total no. of cases	Low vision (VA <6/18)	Blind (VA <3/60)	Total visual impairment, *n* (%)
Onchocerciasis anterior segment lesions	17	4	2	6 (5.27)
Onchocercial posterior segment lesions	28	3	2	5 (4.39)
Refractive error	201	3	0	3 (2.6)
Cataract	97	20	11	31 (27.19)
Glaucoma	42	10	8	18 (15.79)
Phthisis bulbi	15	5	3	8 (7.02)
Optic atrophy	20	3	2	5 (4.39)
Iridocyclitis	27	12	6	18 (15.79)
Retinal diseases	53	18	4	22 (19.30)
Corneal diseases	13	3	2	5 (4.39)

Many cases had multiple causes of visual impairment. VA=Visual acuity

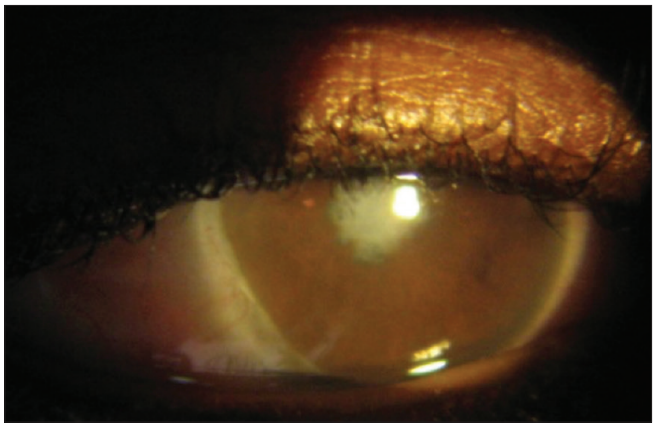

Figure 5: Resultant complicated cataract

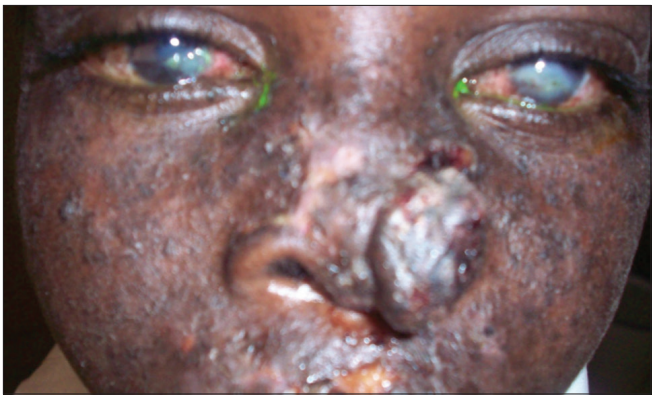

Figure 6: A case of sclerokeratitis. The skin involvement is evident with onchodermatitis (lichenification, loss of skin elasticity, atrophy, and/or depigmentation)

Conclusion

The findings of this study suggest that the prevalence of onchocerciasis has gone down since the introduction of APOC in this region when compared with the general prevalence of the country. However, onchocerciasis is more prevalent in rural parts of the province as compared with urban areas where it has been largely controlled.[15] Senile cataract is less prevalent because of low life expectancy. However, congenital cataract is common. It is important to note that onchocerciasis is no more a public health problem in most of the other countries currently. The condition still poses a major health problem in these backward and resource-poor locations.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Daniel EM. VISION 2020: Update on onchocerciasis. Comm Eye Heal 2001;14:19-21.
2. Evans TG. Socioeconomic consequences of blinding onchocerciasis in west Africa. Bull World Health Organ 1995;73:495-506.
3. Hougard JM, Yaméogo L, Sékétéli A, Boatin B, Dadzie KY. Twenty-two years of blackfly control in the onchocerciasis control programme in West Africa. Parasitol Today 1997;13:425-31.
4. Remme JHF. The African programme for onchocerciasis control: Preparing to launch. Parasitol Today 1995;11:403-6.
5. Onchocerciasis and its control. Report of a WHO Expert Committee on Onchocerciasis Control. World Health Organ Tech Rep Ser 1995;852:1-104.
6. Newland HS, White AT, Greene BM, Murphy RP, Taylor HR. Ocular manifestations of onchocerciasis in a rain forest area of west Africa. Br J Ophthalmol 1991;75:163-9.
7. Umeh RE, Chijioke CP, Okonkwo PO. Eye disease in an onchocerciasis-endemic area of the forest-savanna mosaic region of Nigeria. Bull World Health Organ 1996;74:95-100.
8. Anderson J, Fuglsang H, de C. Marshall TF. Studies on onchocerciasis in the United Cameroon Republic: III. A four year follow-up of 6 rain-forest and 6 Sudan-Savanna villages. Trans R Soc Trop Med Hyg 1976;70:362-73.
9. Frentzel-Beyme R. The prevalence of onchocerciasis and blindness in the population of the Bong Range, Liberia. Z Tropenmed Parasitol 1973;24:339-57.
10. Frentzel-Beyme RR. Visual impairment and incidence of blindness in Liberia and their relation to onchocerciasis. Tropenmed Parasitol 1975;26:469-88.
11. Whitworth JA, Gilbert CE, Mabey DM, Morgan D, Foster A. Visual loss in an onchocerciasis endemic community in Sierra Leone. Br J Ophthalmol 1993;77:30-2.
12. Schwartz EC, Huss R, Hopkins A, Dadjim B, Madjitoloum P, Hénault C, *et al*. Blindness and visual impairment in a region endemic for onchocerciasis in the Central African Republic. Br J Ophthalmol 1997;81:443-7.
13. Abiose A, Murdoch I, Babalola O, Cousens S, Liman I, Onyema J, *et al*. Distribution and aetiology of blindness and visual impairment in mesoendemic onchocercal communities, Kaduna State, Nigeria. Kaduna collaboration for research on onchocerciasis. Br J Ophthalmol 1994;78:8-13.
14. Umeh RE. The causes and profile of visual loss in an onchocerciasis-endemic forest-savanna zone in Nigeria. Ophthalmic Epidemiol 1999;6:303-15.
15. Dadzie KY. Onchocerciasis control: The APOC strategy. Afr Health 1997;19:13-5.