Chapter 3

Causes of Blindness and Visual impairment in the interior Maroon population in Suriname

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Part of this chapter has been published as:

Abstract

**Background/Aims:** To assess the causes of blindness and visual impairment (VI) in the interior Maroon population living along the Upper Suriname River. The data obtained will be used to optimize preventive and therapeutic eye care programmes.

**Methods:** All of the approximately 23,000 inhabitants were invited for eye examination. Individuals expected to be blind or visually impaired were actively recruited. Data were collected on the basis of the World Health Organization Eye Examination Record version III (WHO/PBL).

**Results:** Thirty-eight (6%) of the 578 participants were either blind (visual acuity (VA) <3/60 in the better eye with available correction) or severely visually impaired (VA <6/60). The number of visually impaired patients (VA<6/18 and ≥6/60) was more than two-fold higher (102 (17.6%)). Cataract was the leading cause of blindness and severe visual impairment (SVI, 60%). Other major causes were glaucoma (16%) and idiopathic optic atrophy (10%). A few patients were blind due to phthisis bulbi, aphakia, corneal opacities, retinitis pigmentosa, and toxoplasmosis.

**Conclusion:** The number of visually impaired patients in the Upper Suriname River area seemed relatively high and most causes were avoidable. This indicates a need of blindness prevention programmes in these populations with emphasis on effective treatment of cataract and strategies for early detection and treatment of glaucoma.

Introduction

The Republic of Suriname, an independent state situated on the northeast coast of South America (Figure 1), is an example of a developing country where avoidable and treatable blindness remains an important public health problem. Suriname has a population of approximately 530,000. [1] Around 90% of the population lives in the capital city Paramaribo and in other cities located in the narrow coastal zone in the northern part of the country. [2] The remaining 10% inhabits the interior, which comprises more than three-quarters of Suriname’s land surface and consists largely of tropical rain forest.[2] Specialized ophthalmic care in Suriname is mainly concentrated in the Suriname Eye Centre (SEC) in the Academic Hospital Paramaribo (AZP). Every day, new patients from the city and surrounding districts visit the SEC presenting with severe, sometimes end-stage eye disease. Unfortunately, the hinterland population is not always able to reach the SEC and little is known about the ophthalmic situation in these remote areas.

The hinterland population consists almost exclusively of Maroon and Indigenous (Amerindian) tribes. The Maroons are descendants from runaway slaves shipped from West Africa between the 16th and 19th century who have established a fairly large number of small communities along the Upper Suriname River. [3] They originated from the Gold Coast and the Slave Coast of West Africa, a region that now encompasses Ghana, Togo and Nigeria. [4] Unlike the Creoles in the urban areas of Suriname and other parts of the Caribbean, the interior Maroon population has hardly mixed with other ethnic groups. The Maroons live relatively isolated but are offered primary health care by the Medical Mission, a non-profit health care organization subsidized by the government. The Medical Mission has set up a system of rural clinics, dispensaries, and transport systems to urban hospitals, but does not provide secondary health care. This includes care for eye diseases. As a consequence, the burden of blindness and visual impairment (VI) is expected to be high among Maroons. When considering their African origin and the tropical environment they live in, it is likely that cataract and glaucoma will be identified as important causes of blindness and VI in the interior Maroon population.[5-7]

So far, no standardized surveys about the scale and causes of blindness and VI in this area have been conducted. The lack of information makes it difficult to plan preventive and other therapeutic eye care programmes. Therefore, the SEC initiated a population-based survey to assess the causes of blindness and VI in the Maroon population along the Upper Suriname River. The data obtained will be used to opti-
mize preventive and therapeutic eye care programmes in these populations and to design national blindness programmes in Suriname and in other countries with predominantly populations of African descent.

Materials and methods

The survey was conducted in several villages along the Upper Suriname River (Figure 1) between December 2011 and June 2012. All off the approximately 23,000 inhabitants live in a rural setting and were invited for examination. There were no specific inclusion or exclusion criteria. To make sure that the majority of visually impaired patients were included, those suspected to be blind or visually impaired were actively recruited for eye examination by co-workers of the Medical Mission.

The medical team consisted of two ophthalmologists, a medical doctor specifically trained in basic eye examination, and two trained eye nurses. The team was locally supported by co-workers of the Medical Mission who also functioned as interpreter (the majority of the elder Maroons are illiterate and speak only their native tribal language). Systematic ophthalmic examination was performed using the WHO Eye Examination Record version III developed for the Prevention of Blindness Programme (PBL).[8] The data per person were coded and systematically recorded.

Ophthalmic examination

Presenting distance visual acuity (VA) was tested using the Snellen E chart in full daylight by the assistants with the help of the local co-workers. Tests involving counting fingers, hand movements, and light perception were used for those unable to read the top line at half the test distance. Each eye was tested separately with available correction; in the case of a VA <6/18 a pinhole VA test was performed. Bilateral blindness was defined following WHO criteria as presenting VA <3/60 in the better eye with available correction, severe VI (SVI) as presenting VA <6/60 to ≥3/60, and

Figure 1. Map of the Republic of Suriname. Circle in top left: Suriname’s location in South America. Circle in red: Upper Suriname River area.
VI (VI) as VA <6/18 to ≥6/60. Relative afferent pupil defect (RAPD) was examined using the swinging flashlight method. All subjects were examined by an ophthalmologist at the local medical post using a slit lamp, a(n) (in)direct ophthalmoscope, and a portable applanation tonometer (Icare, Finland Oy). In subjects with diabetes mellitus (DM), a presenting distance VA <6/18 or an intraocular pressure of 25 and higher, the pupil was dilated for diagnosis. In the case of patients presenting with a VA <6/18 in either eye, the WHO/PBL eye examination record recommends to consider the major cause as the disorder most amenable to treatment or prevention.[8] Automatic refraction (Retinomax K-plus, Righton) was only performed in visually impaired participants without other underlying eye disease.

Results

Five hundred seventy-eight of the 586 examined participants completed the protocol. Table 1 presents the age and sex distribution of the study population. The median age was 56 years (range 5-92 years) and the male-to-female ratio was approximately 1:4.

Table 1 Age and sex distribution of the sample

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-39</td>
<td>22 (3.8)</td>
<td>88 (15.2)</td>
</tr>
<tr>
<td>40-49</td>
<td>24 (4.2)</td>
<td>94 (16.3)</td>
</tr>
<tr>
<td>50-59</td>
<td>14 (2.4)</td>
<td>81 (14.0)</td>
</tr>
<tr>
<td>60-69</td>
<td>28 (4.8)</td>
<td>94 (16.3)</td>
</tr>
<tr>
<td>70-79</td>
<td>22 (3.8)</td>
<td>62 (10.7)</td>
</tr>
<tr>
<td>≥80</td>
<td>15 (2.6)</td>
<td>34 (5.9)</td>
</tr>
<tr>
<td>Total</td>
<td>125 (21.6)</td>
<td>453 (78.4)</td>
</tr>
</tbody>
</table>

Presenting visual acuity

Table 2 presents the distribution of unilateral and bilateral blindness, SVI, and VI. Monocular blindness was more than twice as common as binocular blindness. The total number of blind and severely visually impaired patients in our study population increased with increasing age from 1 patient (0.2%) in the age group between 40 and 49 years, to 12 patients (2.1%) aged 80 years or older. The highest percentage of visual impairment was noted in the 60 to 69-age group (5.5%). Furthermore, 8.8% of the male and 6.0% of the female study population was blind or severely visually impaired. On the other hand, VI was more common in females than in males (11.2% versus 19.4%).

Table 2 Blinding and VI in one or both eyes according to WHO criteria and gender in the upper Suriname River area*

<table>
<thead>
<tr>
<th>Categories of VI</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 125 n (%)</td>
<td>N = 453 n (%)</td>
<td>N = 578 n (%)</td>
</tr>
<tr>
<td>Bilateral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blindness</td>
<td>6 (1.0)</td>
<td>20 (3.5)</td>
<td>26 (4.5)</td>
</tr>
<tr>
<td>SVI</td>
<td>5 (0.9)</td>
<td>7 (1.2)</td>
<td>12 (2.1)</td>
</tr>
<tr>
<td>VI</td>
<td>14 (2.4)</td>
<td>88 (15.2)</td>
<td>102 (17.6)</td>
</tr>
<tr>
<td>Unilateral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blindness</td>
<td>19 (3.3)</td>
<td>46 (8.0)</td>
<td>65 (11.2)</td>
</tr>
<tr>
<td>SVI</td>
<td>6 (1.0)</td>
<td>5 (0.9)</td>
<td>11 (1.9)</td>
</tr>
<tr>
<td>VI</td>
<td>17 (2.9)</td>
<td>40 (6.9)</td>
<td>57 (9.9)</td>
</tr>
</tbody>
</table>

*Blindness = VA <3/60; SVI = VA <6/60 to ≥3/60; VI = VA <6/18 to ≥6/60

Causes of blindness and VI

Cataract and glaucoma were the most important causes of blindness and SVI, responsible for more than 75% of cases (Figure 2). Idiopathic optic atrophy was the third most frequent single cause(s) of blindness and SVI, accounting for 10% of blind and severely visually impaired patients. The remaining 14% of patients was blind or severely visually impaired as a result of uncorrected aphakia, xerophthalmia, phthisis bulbi, retinitis pigmentosa, or toxoplasmosis.

Cataract was also the leading cause of VI, accounting for more than 60% of visually impaired patients (Figure 3). Refractive error was the second most common cause of VI (14%). Eight percent of visually impairment was due to optic atrophy (5%) or glaucoma (3%). Other posterior segment diseases (such as diabetic retinopathy (DR), toxoplasmosis, albinism, and retinitis pigmentosa) accounted for another 5% of cases. Extending pterygium caused three percent and the remaining 1% was due to posterior capsule opacification.
(PCO). In five patients no cause was identified. Sixty-five percent of blindness and SVI, and 82% of those of VI involved avoidable causes, including uncorrected and corrected cataracts, PCO, refractive error, corneal scars, extending pterygium, and phthisis/no globe caused by trauma.

Discussion
This survey investigated the causes of visually impairing diseases in a Maroon population living along the Upper Suriname River in Suriname. We identified cataract and glaucoma as the most important causes of blindness and SVI. Both conditions were the leading causes of blindness in more than 75% of bilaterally blind and severely visually impaired patients. These results are in line with those from a population-based epidemiologic study in individuals of African descent in Barbados, indicating that cataract and glaucoma were responsible for the majority of bilaterally blind patients in that country.[7] Another important cause of blindness in both our survey and the Barbados Eye Study (BES) was idiopathic optic atrophy.[7] Notwithstanding differences in methodology and definitions, the similarity in target population speaks in favour of the consistency of our results with those of the BES. The frequent occurrence of cataract and glaucoma in Afro-Caribbeans may be of relevance to the planning and delivery of treatment and prevention programmes in the Maroon population of Suriname.

Cataract
Cataract is responsible for more than 90% of disability-adjusted life-years in low- and middle-income countries.[9] The burden of blindness and SVI caused by cataract could be substantially reduced by providing cataract surgery. Since 2007, the SEC has started cataract surgical missions to the Upper Suriname River area.[10] However, long-term outcomes after the first cataract surgical missions in the Maroon population might be relatively poor (unpublished data) due to pre-existing ocular pathologies and surgical complications such as PCO, which is partly related to the use of hydrophilic IOLs during the first cataract missions. In all, our data suggest that the SEC should dedicate increased efforts to provide high-quality cataract surgery and YAG laser posterior capsulotomy in the Upper Suriname River area. Hydrophobic IOLs are used since 2010,[10], and further improvement in cataract surgical outcome could be accomplished by excluding patients with severe pre-existing ocular pathology, implementing a monitoring system after surgery and post-operative refraction.[11]
Glaucoma

The high number of patients with glaucoma in our patient population is in agreement with the findings from surveys conducted in African countries and Caribbean populations with West African ancestry.[5; 7; 12-14] However, it is difficult to compare our data with those from other surveys because samples were not taken at random and a different definition of glaucoma was used. Furthermore, it remains challenging to diagnose glaucoma without computerized visual field testing.

Open angle glaucoma has an early onset and progresses rapidly. In most patients in developing countries, the disease leads to massive loss of visual field because of late diagnosis and lack of treatment possibilities.[12] Chronic treatment of glaucoma with medication is often unsuccessful in developing countries where individuals do not have easy access to secondary health care, as holds true for the Maroons. Medication is expensive, its availability is limited, and people have to travel long distances for follow-up examination.[12] In all, this leads to poor compliance. Argon laser therapy has a limited role because of unsatisfactory results as well as the performance of trabeculectomy, which is related to poor patient acceptance and difficulties in post-operative care.[12] Subjects diagnosed with glaucoma during our survey were advised to visit the AZP for evaluation. Unfortunately, many patients, including patients aged less than 30 years old, were already severely visually impaired. Our results again confirm the need of an efficient, cost-effective procedure to resolve the problem of glaucoma in comparable populations of African descent.[12; 15]

Diabetic retinopathy

Type II DM is more common in African-Americans than in whites and there is evidence to suggest that black people are more prone to develop DR because of underlying risk factors such as hypertension [16-18] and poor glycaemic control.[19-21] Based on this information, the absence of DR in Maroons living in Suriname’s interior was remarkable, particularly when compared to Maroons living in villages closer to the urban areas in whom DR was (much) more common (expert opinion JP, unpublished data). As obesity was also more common in the latter less isolated and more westernized population, their higher DR prevalence may tentatively be attributed to (urban-rural) differences in lifestyle and dietary habits. Obviously, this supposition must be confirmed in future studies.

Optic atrophy

The high percentage of blindness caused by idiopathic optic atrophy was in agreement with the BES results but higher than that found in comparable population-based studies with black participants.[22-23] Between 1974 and 1977, a retrospective case record and field study was conducted about the occurrence, forms, and aetiology of optic atrophy in Suriname.[24] The results of this study showed that bilateral unexplained optic atrophy was more common in Creole than in Hindustani patients, and that the incidence was highest among males in the Para and Saramacca districts.[24] It was concluded that the Negroid population groups in Suriname might develop optic atrophy because of a hereditary predisposition combined with exogenous factors such as toxic influences.[24] Nutritional cyanide intake in various cassava products had been suggested as a possible intoxicator [24], but the exact cause is still unknown. Thus, more detailed studies should be carried out to understand the aetiology of optic atrophy in populations of African descent.

Strengths and limitations of the study

To reduce the time of the survey, refraction was not included in the ophthalmic examination. Instead, a pinhole and automatic refractive measurement was used as a proxy for best corrected VA and diagnosis of refraction error. Another limitation of the study was the self-created selection bias to make sure that all blind and visually impaired individuals were included. The sample was not taken at random, which is essential to get insight into the exact prevalence of diseases. Also, strikingly more women than men were included in the survey,
probably due to the fact that the number of females living along the Upper Suriname River is higher than the number of males. Males are often absent because of work elsewhere.

On the other hand, patients were examined by a standardized methodology in which an indirect ophthalmoscope was used to identify the causes of posterior segment diseases. In most surveys, a direct ophthalmoscope is used to reduce the time and cost of the survey. A more detailed methodology to assess posterior segment disease becomes more important when the prevalence of cataract decreases.[25] In addition, the problem of presbyopia was assessed in the majority of individuals aged over 45 years (data not shown). Presbyopia does not lead to blindness, but can lead to substantial concerns. Still, this easily treatable condition is not included in the standardized methodology of several surveys [25] or in blindness prevention programmes. In our experience, the delivery of reading glasses was one of the most efficient and successful aspects of our screening mission.

Conclusion

This study reveals a relatively high burden of blindness and VI in the Maroon population along the Upper Suriname River. As the causes are most probably avoidable and treatable, the prevalence of these conditions can be reduced. This assessment of the prevalent ophthalmic diseases provides useful baseline information for the planning of preventive and therapeutic eye care programmes and indicates the necessity of a representative national blindness survey for the development of national blindness prevention programmes.
References


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