Prevalence of exfoliation syndrome in central Sri Lanka: the Kandy Eye Study

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ABSTRACT

Aims: To report the prevalence and correlates of exfoliation syndrome (XFS) in central, rural Sri Lanka.

Methods: A population-based, cross-sectional ophthalmic survey of inhabitants 40 years of age and over from villages in the Kandy District was conducted. Selection was randomised using a cluster sampling process. 1721 eligible participants were identified, 1375 participated. A detailed ophthalmic history and examination including ocular biometry was made of each participant.

Results: The prevalence of XFS was estimated to be 1.1% (95% CI 0.5 to 1.5%; 22 eyes). XFS was bilateral in eight subjects, unilateral in six subjects. Univariate analysis demonstrated a significant association between XFS and increasing age ($p<0.001$), increasing intraocular pressure (odds ratio 1.2; 95% CI 1.09 to 1.27; $p<0.001$), nuclear cataracts (odds ratio 1.92; 95% CI 1.47 to 2.51; $p<0.001$), visual impairment (odds ratio 9.72; 95% CI 3.01 to 31.44; $p<0.001$) and a history of hypertension (odds ratio 3.89; 95% CI 1.14 to 13.16; $p = 0.030$).

Conclusion: XFS in this Sri Lankan population was associated with advanced age, raised intraocular pressure, nuclear cataracts, hypertension and visual impairment.

Exfoliation syndrome (XFS) is an age-related disease common to many populations, but there is a significant geographic and racial variation in its prevalence.[1] It is characterised by the progressive accumulation of white, fibrillogranular material within the anterior segment of the eye.[2] XFS is a major risk factor for the development of glaucomatous optic neuropathy (GON), especially when it is associated with elevated intraocular pressures.[3] Glaucoma associated with XFS, as the Early Manifest Glaucoma Trial demonstrated, is also associated with more aggressive disease progression than primary open-angle glaucoma (POAG).[3]

Recent differential proteomic and genetic studies have significantly advanced our understanding of the molecular pathophysiology of XFS glaucoma, not least of which is a genome-wide association study of Icelandic and Swedish patients with glaucoma and XFS.[4] Thorleifsson *et al* identified two non-synonymous single nucleotide polymorphisms in the lysyl oxidase-like 1 gene (*LOXL1*) with a strong association with XFS. However, the high-risk haplotype, as subsequent studies demonstrated, had a similar prevalence in communities with, proportionally, a much lower incidence of XFS.[5] The implication of this work is that other factors, whether genetic or environmental, affect the penetrance of the *LOXL1* sequence variants.

The World Health Organization's (WHO) initiative to eliminate preventable blindness—Vision 2020—identified the importance of collecting accurate ophthalmic epidemiological data from Asia in order to optimise the use of limited resources.[6] Recent studies from neighbouring communities in Southern India have reported relatively high rates of XFS, and shown an association with glaucoma, cataract and visual morbidity.[7-9] Data regarding the Sri Lankan community are not available. The Kandy Eye Study (KES) was created with the intention of providing a robust epidemiological survey with respect to the Sri Lankan community. As a part of the KES, this study aims, first, to determine the prevalence of XFS in rural Sri Lanka. Second, it aims to describe the correlates of XFS in this community.

MATERIALS AND METHODS

The KES was a population-based, cross-sectional ophthalmic survey of the inhabitants of rural villages in central Sri Lanka. The study was conducted within the rural districts of the Central Province, an area encompassing 5674 km^2. Subjects were randomly selected using a multistage cluster sampling process. A sampling frame consisting of the list of all districts and villages in the Kandy area with their populations was obtained from the 2001 Sri Lankan Census. The city of Kandy was excluded, and three districts were randomly selected from a total of 20 districts; within each district a random sample of villages was taken. Households were then randomly selected from each village and all inhabitants 40 years of age and over were invited to participate. The study sample size of the Kandy Eye Study was calculated to estimate with precision the causes of blindness in the community, not specifically the prevalence of XFS. Data were collected between June 2006 and February 2007. A medical and ophthalmic history was obtained from each participant in their own language by qualified healthcare workers who used a standardised questionnaire. Each participant received a comprehensive vision and eye examination, which included: presenting and best-corrected visual acuity (VA) using a front-illuminated illiterate E logMAR acuity chart; Goldmann applanation tonometry (Haag-Streit AT 900, Koeniz, Swizerland); pupil reflex examination; slit-lamp examination of the eyelids, ocular surface and anterior segment; static and dynamic gonioscopy; ocular biometry (Quantel Medical Axis II PR); pachymetry (Quantel Medical Pocket II); dilatation followed by slit-lamp lens assessment using a Lens Opacities Classification System (LOCS) III grading, and stereoscopic fundus examination.[10] If