Prevalence of Cataract in Rural Indonesia

Rahat Husain, MRCOphth,[1,2,3] Louis Tong, FRCS (Ed), DM (Nott),[1,3] Alan Fong, MBBS,[1,3]
Jin F. Cheng, MRCS (Ed),[1,3] Alicia How, MRCS (Ed),[1,3] Wei-Han Chua, MRCS (Ed),[1,3]
Llewelyn Lee, MBBS,[1,3] Gus Gazzard, FRCOphth,[2,3] Donald T. Tan, FRCS (Ed), PhD,[1,3]
David Koh, MBBS, PhD,[4] Seang M. Saw, MBBS, PhD[3,4]

Purpose: To describe the prevalence of cataract in adults in rural Sumatra, Indonesia.

Design: Population-based cross-sectional study.

Participants: A random sample of all adults aged 21 years or older living in 3 rural villages in central Sumatra was assessed. Nine hundred nineteen of 1089 (84.4%) eligible adults participated.

Methods: A team of 7 ophthalmologists examined the anterior segment of both eyes using a portable slit lamp after pupil dilatation. Lens opacity was graded according to the Lens Opacities Classification System III (LOCS III). A structured questionnaire was used to collect data on education level and income.

Main Outcome Measures: Cataract was defined as either a LOCS III nuclear region score of ≥ 4.0, cortical ≥ 4.0, or posterior subcapsular (PSC) cataract ≥ 2.0, in either eye.

Results: Two hundred one (21.9%) of 919 subjects were found to have cataract. The age-adjusted prevalence rate of cataract (including cataract surgery) was 23.0% (95% confidence interval, 20.8–25.2). The most common type of cataract for both genders (adjusted for age) was mixed (13%) followed by nuclear only (5.7%), and cortical only (4%). The prevalence rate of any cataract for adults aged 21 to 29 was 1.1%, increasing to 82.8% for those aged older than 60 years. Similar trends with age were noted for nuclear, cortical, and PSC cataract. Women had higher prevalence rates than men for all types of cataract except cortical. There was a trend of increasing prevalence of all types of cataract with decreasing education ($P<0.001$).

Conclusions: Cataract prevalence in adults aged 21 years and older in rural Indonesia is among the highest reported in Southeast Asia. Despite this, there are inadequate resources available to manage this treatable disease. Allocation of resources to tackle the present burden of cataract would likely have large personal, social, and economic benefits. *Ophthalmology 2005;112:1255–1262 © 2005 by the American Academy of Ophthalmology.*

It has been estimated that cataract is responsible for more than half the world's 38 million blind.[1] Even in those not classified as blind, cataract is associated with visual disability and decreased quality of life.[2] Southeast Asia has a disproportionate burden of blindness, with one quarter of the global population residing in this region yet contributing one-third to the world's blind.[3]

The World Health Organization (WHO) estimates Indonesia's population to be more than 210 million people, the most populous country in Southeast Asia. The ethnic origins of Indonesia's population are also similar to Malays in Malaysia and Singapore. A recent survey in rural Indonesia found an age-adjusted bilateral blindness rate of 2.2% in adults aged 21 years or older, with cataract being the main cause of both bilateral blindness and low vision.[4] A survey of 1510 individuals older than 40 years of age in 1989 in an area of rural West Sumatra found a cataract prevalence of 25.1%.[5] Cataract was defined qualitatively using a classification established by the Japanese Co-operative Cataract Epidemiology Study Group. The same group studied the prevalence of cataract in 3 towns in Japan using identical methods and found that the prevalence of nuclear cataract was significantly higher in Indonesia than in the areas surveyed in Japan.[6]

The purpose of this study is to describe the prevalence of cataract in a rural population of adults aged 21 years and older in Sumatra, Indonesia, using the internationally recognized objective lens grading system, the Lens Opacities Classification III (LOCS III).[7]

Materials and Methods

This population-based survey was conducted in 3 rural villages, Rantau Baru, Sering, and Pelalawan in central Sumatra, Indonesia, during July and August 2003. The 3 villages are situated alongside the Kampar River and have a tropical climate, being located only 1° north of the equator. The nearest large city is Pekan Baru, capital of Riau province. These villages were chosen because they

Table 1. Comparison of Survey Data with Those of Rural Indonesia by Age and Gender

| | Rural Indonesia Data* | | Survey Data | |
Age Range	%	Female/Male Ratio	%	Female/Male Ratio
21–29	31.4	1.1	29.7	1.7
30–39	25.7	1.0	24.9	0.8
40–49	17.1	1.0	20.7	1.0
50–59	12.9	1.0	11.9	1.2
60+	12.9	1.1	12.7	1.3

*United Nations Statistics division—common database, 1990. Available at: http://unstats.un.org/unsd/cdbdemo/cdb_advanced_data_extract_fm.asp?HSrID=14890&HCrID=360&HYrID=1990&ofID=r&txtSS=New+Selection+Name. Accessed January 1, 2005.

were located near a paper and pulp manufacturing plant that was providing assistance for a larger community study on the effect of pollution. The villages were fairly representative of rural Indonesia in terms of age distributions and gender ratios, with the exception of a higher proportion of women to men in the 20- to 29-year age group (Table 1).

A random sample of all adults aged 21 years or older living in the 3 villages was assessed. All houses in the villages were individually mapped and assigned a number by an enumeration team. A 1-stage cluster sampling strategy of 190 randomly selected houses per village was adopted, whereby the sampling unit was the housing unit, and all houses in the 3 villages were part of the sampling frame. Because Rantau Baru had only 152 houses, all were selected. Membership of a household was defined as habitual occupation with a presence in that house for at least 2 weeks of the preceding 4 weeks.

One thousand eighty-nine adults 21 years of age and older were selected to take part in this study. Examinations were performed on 919, a participation rate of 84.4%. Nonparticipants included non-contactibles (despite visits to the house on 3 separate occasions) and refusals. These numbered 64 and 106 persons, respectively.

Nine hundred fourteen subjects provided data for analysis. Of the 5 subjects who did not provide data, 3 did not undergo pupillary dilatation because of the presence of occludable angles on gonioscopy, and 2 subjects had missing data. Three hundred fifty-two of 919 (38%) were from Pelalawan, 324 of 919 (35%) from Sering, and 243 of 919 (26%) from Rantau Baru.

Informed written consent was obtained from all subjects, and all were treated in accordance with the tenets of the Declaration of Helsinki. Approval for the study was obtained from the ethics committee of the Singapore Eye Research Institute.

Ocular Examinations

The anterior segment of both eyes was examined by an ophthalmologist using a portable slit lamp (SL-14, Kowa, Tokyo, Japan), and the depth of the anterior chamber at the limbus was estimated. If this was less than 25% of the corneal thickness, gonioscopy was performed (Goldmann 2-mirror lens, Haag-Streit, Berne, Switzerland) without indentation and in darkened conditions and low ambient illumination. If the angle was found to be occludable (defined as inability to see the posterior trabecular meshwork for <90° of the angle circumference), pupillary dilatation was not performed because of the risk of provoking acute angle closure. The pupils of all other subjects were dilated with topical 1% tropicamide (Alcon-Couvruer, Puurs, Belgium) and 2.5% phenylephrine hydrochloride (Alcon Laboratories, Fort Worth, TX) until

the pupil diameter was at least 6 mm. The study ophthalmologists then examined the lens using the portable slit lamp. Nuclear opalescence and brunescence were assessed with a narrow slit beam, and cortical and posterior subcapsular (PSC) opacities were assessed with retroillumination. Lens opacity was graded according to modified LOCS III charts, using the standard color photographs for comparison.

A team of 7 ophthalmologists was trained 2 weeks before the study's commencement on assessment of lens opacity using the LOCS III. The ophthalmologists were standardized between themselves such that the weighted κ score was not <0.7 for any 2 investigators.

Diagnostic Definitions

A decimal grade ranging from 0.1 to 5.9 (for cortical and PSC) or 6.9 (for nuclear), using 0.1-unit intervals was assigned to each region of the lens. Nuclear cataract was defined as a LOCS III score of 4.0 or more for nuclear opalescence or 4.0 or more for nuclear color, a LOCS III score of 2.0 or more for cortical cataract, and a LOCS III score of 2.0 or more for PSC cataract. Any cataract or cataract surgery was defined as the presence in either eye of any cataract in any region (as preceding) or a history of previous cataract surgery. These definitions have been used previously.[8] We analyzed any cataract in a person as follows: any nuclear, any cortical, any PSC. We also analyzed distinct types of cataract in the right eye: nuclear only, cortical only, PSC only, or mixed. Right eye data were used, because results from left eye data were similar. If a person had cataract surgery in 1 eye or an ungradable lens, the LOCS III score of the fellow eye was used to determine person-based rates.

Questionnaire

The questionnaire was translated into Bahasan Indonesian and back-translated into English. Any discrepancies between the original and translated versions were resolved. Household interviews were conducted in Bahasan Indonesian by trained interviewers conversant in Indonesian and English. Information obtained from the individual questionnaire included total family income and highest level of education for that individual. Total family income per month was divided into 6 categories: <200,000, 200,000 to 500,000, 500,000 to 1 million, 1 to 2 million, 2 to 3 million, and >3 million Indonesian rupiah. Highest education level was classified as no formal education, primary education (defined as having attended school for the compulsory 9 years), secondary education (schooling for more than 9 years), and higher (university or polytechnic). Main occupation was defined as the job the subject performed that provided the greater part of their income on the basis of 15 different categories in the questionnaire.

Data Analysis

The prevalence rates and 95% confidence intervals of any cataract were estimated, allowing for clustering by villages and households. The prevalence rates were estimated for adults of different gender, age groups, and socioeconomic status. Logistic regression models, allowing for household clustering, were used to estimate the effects of different risk factors for cataract, adjusting for potential confounders. The *P* values quoted are 2-sided; they are considered statistically significant when values are <0.05. Data analysis was conducted using STATA version 7.0. A sample size of 833 was needed to detect a prevalence rate of cataract of 25.0% and allowable difference of 2.5%, if the type I error, α, was 0.05.