WORLD VIEW

# Optimal single intraocular lens power for the Nepali population

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**Aim:** To evaluate optimal standard intraocular lens power for Nepalese eye camp cataract patients.
**Method:** A retrospective case series of 5109 preoperative cataract patients.
**Results:** Average axial length of 23.08 (SD 1.26). Average dioptre intraocular lens power 21.37 (3.04).
**Conclusion:** An increase in the intraocular lens power used at Nepalese eye camps from +21.0 to 22.5 dioptres would improve overall visual outcome.

Cataracts are the leading cause of blindness worldwide and the incidence is on the rise with increasing population and longevity. Surveys in developing countries demonstrate few people with visually significant cataracts are getting surgical treatment. In parts of India only half of the population blind from cataracts received surgery; in China and Nepal 46–48% of those in need had cataracts removed.[1] The percentage of curable blindness resulting from cataracts in Nepal is 80%.[2 3] Several developing countries have very limited medical financial resources and in Nepal a large proportion of the population is located in remote mountainous terrain mostly inaccessible by road. Thus, it is not financially or practically feasible to provide the technologically advanced refractive measurements, including keratometry and A-scan and B-scan ultrasonography, allowing for custom fitted intraocular lenses (IOLs), which are the standard in developed countries. Rather, at the minimum, the goal is to provide adequate refraction sufficient for the activities of daily living, which enables a patient to cease being a burden to the community. In order to treat the vast numbers of cataract patients in a cost effective manner, it is necessary to use a single power IOL for all patients which will give optimal refraction to the majority of the patients erring on the side of undercorrection. The single IOL power used by the Himalayan Cataract Foundation in remote eye camps has in the past been based on measurements of the average North American axial length. This study has determined the distribution of IOL power required for emmetropia in a cross section of the Nepali population affected by cataracts differs from the currently used IOL power.

## METHODOLOGY

In all, 5109 consecutive preoperative cataract patients were pulled from the files of the Tilganga Eye Centre and studied retrospectively as a case series. The study pulled consecutive records from 1 May 1998 to 20 January 2000 and recorded the patient's age, sex, eye examined, K1, K2, axial length, and the IOL power used. IOL power was calculated according to the SRK II formula of: Power (D) = A − 0.9(0.5K1 + 0.5K2) − 2.5 (axial length). The A constant of the Fred Hollow lens is 118.30. All patients were examined with the same equipment (an Alcon Ocu-Scan ultrasonography device and a Haag-Streit Berm (Javal-Schiotz) keratometer) by one of

Table 1 Patient details

| | Age | Sex | Eye | K1 | K2 | Axial length | IOL(D) | K1-K2 |
|---|---|---|---|---|---|---|---|---|
| Average | 61.93 | | | 43.84 | 43.55 | 23.08 | 21.37 | 0.28 |
| SD | 16.48 | | | 1.77 | 1.83 | 1.26 | 3.04 | 1.25 |
| Max | 111 | | | 59 | 55 | 33.69 | 37 | 11.5 (post-PK) |
| Min | 2 | | | 34 | 35.5 | 15.75 | −5.5 | −14.5 (post-PK) |
| Mode | 65 (372 patients) | | | 44 (527 patients) | 43 (472 patients) | 22.84 (41 patients) | 22 (671 patients) | 0.5 (878 patients) |
| Females | | 2682 (52.50%) | | | | | | |
| Males | | 2427 (47.50%) | | | | | | |
| Right | | | 2714 (53.12%) | | | | | |
| Left | | | 2395 (46.89%) | | | | | |
| Emmetropia | | | | | | | | 512 patients (10.0%) |
| With rule | | | | | | | | 1531 patients (30.0%) |
| Against rule | | | | | | | | 3066 patients (60.0%) |

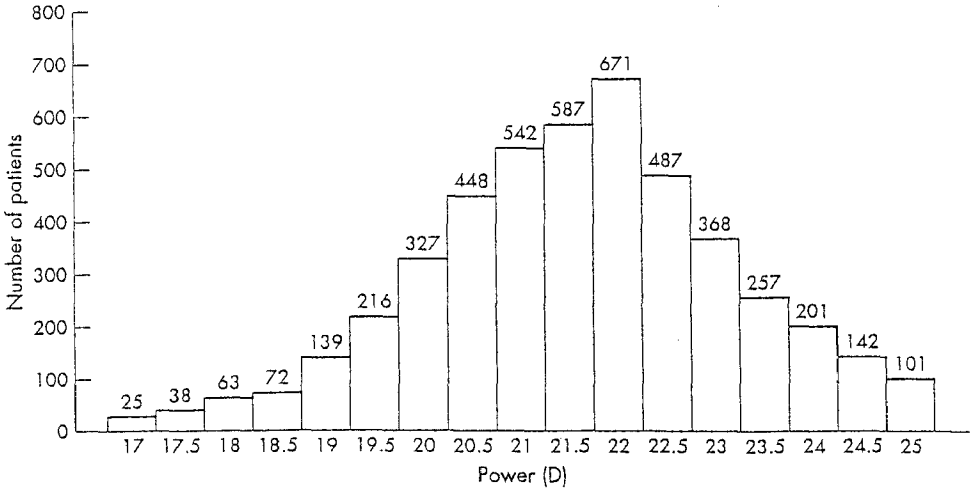


**Figure 1** Distribution of IOLs between 17–25 D.

two ophthalmic assistants, LL or MS. The patients' data were then recorded manually into a logbook and it was from this logbook that the data were pulled, entered into an Excel database, and analysed.

## RESULTS

The results are given in table 1 and figure 1.

## DISCUSSION

Worldwide an estimated 17 million people are blind from cataracts,[4] the subsequent loss of jobs and increase in custodial care in developing countries creates a large economic impact. Cataract surgery is thus a very cost effective treatment. It is not practical or financially feasible to individually measure refraction and purchase a unique IOL for each patient in developing countries, such as Nepal, where the cost of supplies and transport of equipment are prohibitive. By providing a single power IOL which can be used by each patient undergoing extracapsular cataract extraction, an effective economical solution is attained with each Fred Hollow lens costing only US$5.

A previous study of 1000 consecutive Nepalese patients with cataracts who underwent biometric testing for lens power at the Tilanga Eye Centre demonstrated that 74.1% of postoperative patients had visual acuity (VA) of at least 20/60 (combined corrected and uncorrected) compared to pre-operative VA where 71.1% of patients had VA ranging from 20/400 to light perception only.[5] A standard lens power of +21.0 dioptre was chosen based on the average North American axial length. This Tilganga study shows that 92.7% of patients required a lens power between +19.0 and +23.0 dioptres with a mean of +21.36 dioptres and a mode of +22. When taking into account that these measurements will be used to have available a single IOL power to optimise visual results to the population it is important to aim for slight myopia as hyperopia is poorly tolerated. With this skew towards slight myopia more patients will have emmetropia or myopia as their visual outcome. While the results are not perfect by the standards of developed nations, it is true that the large majority of people had vast improvement of their VA with the single power IOL at a fraction of the cost. This enables a much larger number of patients to be treated. In a country like Nepal where social services do not exist the blind are a large burden on society, often requiring a family or community member to guide them and look after their needs. Restoring functional vision to a large patient population has great positive ramifications both for the individual and the society.

When comparing this study with other studies it can be concluded that intraocular lens power may differ by ethnicity. In the study done by La Nauze in the Vietnamese population (n = 346), the mean predicted IOL power using the SRK/T formula for emmetropia was 21.44 dioptres (SD 2.77) (range 10.87–27.25), median 21.56 dioptres when determined with an "A" constant of 118.3.[6] In a study conducted by Riley at the University of Auckland, New Zealand, axial length was a mean of 23.14 (1.03) mm with ethnicity including 72% European, 8% Maori, 10% Pacific Islander, 4% Asian, 3% Indian, and 3% other ethnic origins.[7] Congdon *et al* published data comparing axial length by sex and white, black, and Chinese races, which found no appreciable difference existed by race; however, there was a difference by sex.[8] When comparing this Tilganga study with other studies one can see there is not a single IOL power that has consistently been found to give optimal visual results in a variety of ethnic populations.

This study done in Nepal demonstrates that an IOL of +22.5–23.0 dioptre power would leave more Nepalese post-operative cataract patients with better vision than the current +21.0 dioptre lens. To truly prove distinct ethnic groups have unique mean refraction, further and more extensive studies comparing mean power required for emmetropia and axial lengths could be done in a variety of ethnic populations.

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