Ocular biometry and determinants of refractive error in rural Myanmar: the Meiktila Eye Study

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ABSTRACT

Objective: To describe the ocular biometry and determinants of refractive error in an adult population in Myanmar.

Methods: A cross-sectional, population-based survey of the inhabitants 40 years of age and over from villages in the Meiktila District was performed; 2481 eligible participants were identified, and 2076 participated in the study. Biometric components including axial length (AL), anterior chamber depth (ACD), vitreous chamber depth (VCD), lens thickness (LT) and corneal curvature (CC) were measured. Lens opalescence was measured using the Lens Opacity Grading System III. Non-cycloplegic refraction was measured with an autorefractor.

Results: Complete biometric, refractive and lenticular data were available on 1498 participants. Men had longer ALs, ACDs, VCDs and steeper CCs than women. There was an increase in LT, nuclear opalescence (NO) and myopic shift with increasing age, with no significant change in AL with age. In the 40–59 year age group, VCD was a significant predictor of refractive error, but LT ($p<0.001$) and NO ($p<0.001$) were stronger predictors. In the 60+ age group, NO ($p<0.001$) was also the dominant predictor of refractive error.

Conclusion: This Burmese population, particularly women, has a relatively short AL and ACD. NO is the strongest predictor of refractive error across all age groups in this population.

Uncorrected refractive error, particularly myopia, is a major cause of visual impairment in Asia.[1] In the recently conducted Meiktila Eye Study (MES) in central Myanmar, the prevalence of myopia (>1.0 D) was relatively high (42.7% in the population 40 years and of age over)[2] and was responsible for 75% of the refractive error-related visual impairment.[3] Understanding the age-specific underlying optical cause of myopia has important implications for treatment. For example, if cataract is the principal cause of the myopia, then cataract extraction and intraocular lens implantation is a better option than spectacle correction in the face of ongoing myopic shift and cataract-induced visual impairment. A number of studies have reported that the rates of myopia are highest in the young with a subsequent hyperopic shift, but that there is a tendency to myopia in older age.[4–13] This has generally been attributed to both a cohort effect and cataract-induced myopic shift in old age. The underlying reason for the cohort effect has been unclear, but recent ophthalmic surveys which have included biometry in the data collection have helped address this question.[9 11 13 14] In both the Los Angeles Latino Eye Study (LALES) and the Tanjong Pagar Study, longer axial lengths (ALs) were the most important determinant of myopia in the younger age group, and cataract was the most important in the oldest age groups.[9 11 13 14] Many studies have noted that myopia is associated with increased education and near work[4–6 9 12 13 15–19] and recent population-based biometric data indicate that this is related to increased AL.[9 13 14]

Here, we report data from the MES pertaining to the relationship between refraction, biometric variables and lens opalescence, with a view to understanding the age-specific cause of refractive errors in this population.

METHODS

Sampling procedure

The Meiktila Eye Study (MES) was a population-based, cross-sectional ophthalmic survey of the inhabitants of rural villages in central Myanmar. The study was conducted within the Mandalay Division, an area encompassing 34253 km^2 divided into seven second-order administrative Districts of approximately equal size. The township of Meiktila (population approx 251 000) located at 20°53′N, 95°53′ E lies centrally in the Meiktila District, and is the only urban region in this entire District. The District is arbitrarily divided by the Ministry of Health (MOH) into six zones served by a centrally located eye hospital in Meiktila.

Participants were selected using a randomised, stratified, cluster sampling process. A sampling frame consisting of the list of all villages in the Meiktila District with their populations was obtained from the MOH. Villages were arbitrarily stratified as large (population >825) or small (population ⩽825), with small villages in each of the six zones within the Meiktila District constituting six separate strata. For logistical reasons, sampling was restricted to villages within a 3 h drive from Meiktila (an area encompassing approximately 80% of the District). All persons 40 years and over within each selected village were eligible for inclusion. Healthcare workers from Meiktila township enumerated the selected villages (and advertised and promoted the survey) prior to commencement of the survey. Six small villages (one from each zone) and four large villages were enumerated, providing a total sample population of 2481 people. All of the participants were self-identified as belonging to the Burman ethnic group.

Data collection

Data collection occurred at the end of the rainy season in November 2005. A single survey team conducted the entire study. Each team member was assigned specific tasks and was well trained in