

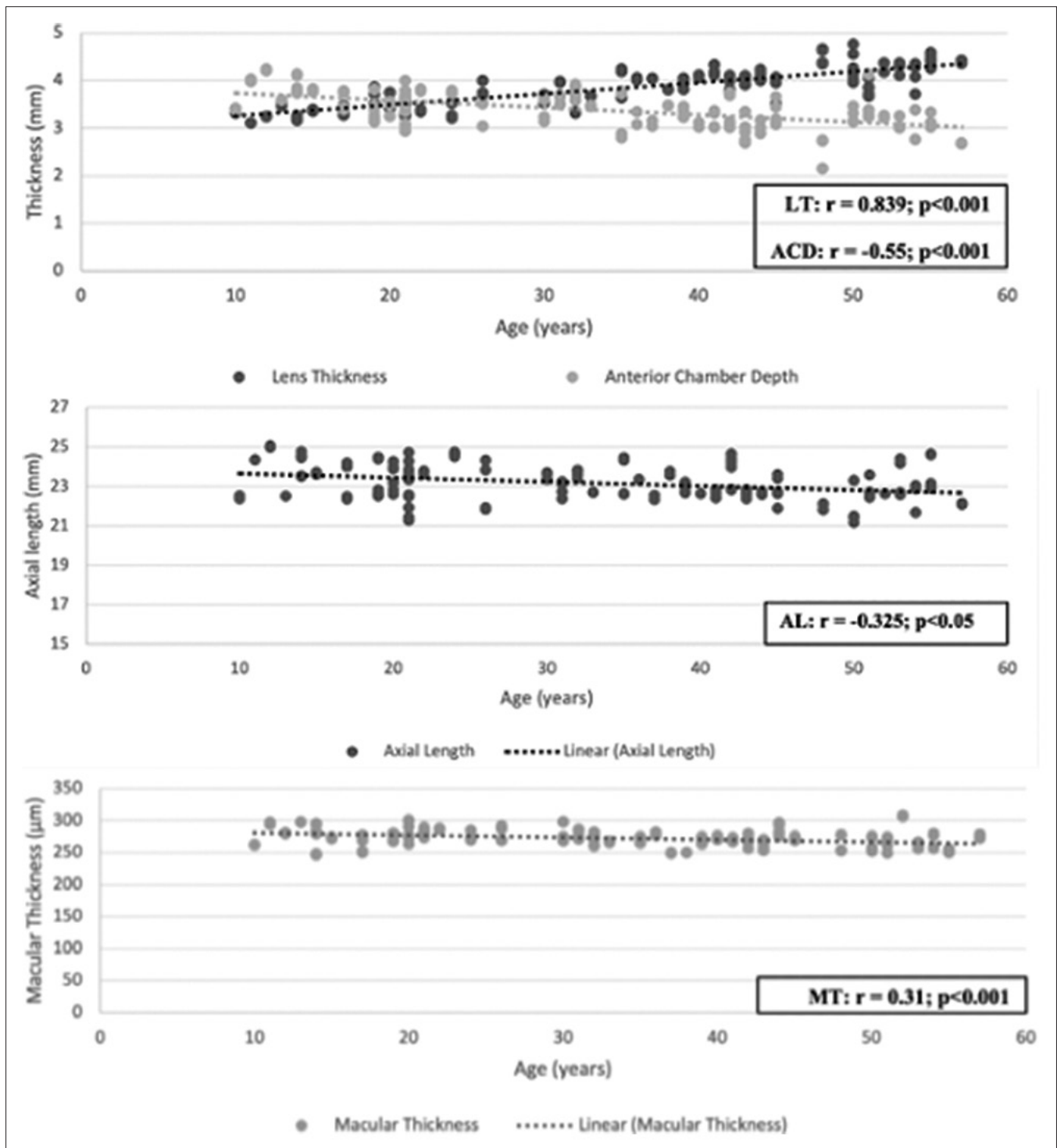
## Anterior and posterior ocular measurements in healthy South Indian eyes

Dear Editor

Normative data is data that characterizes what is usual in a defined population at a specific point or period and can be of enormous importance to physicians in all spheres of medical sciences. Such data seek to describe rather than explain phenomena. There is a paucity of normative data related to ocular parameters originating from different regions of India. In any case, most of the studies describing normative data that are available in the literature are either in the Caucasian population<sup>[1-4]</sup> or describe exclusively either anterior segment<sup>[5]</sup> or posterior segment findings.<sup>[6-8]</sup> Yet others have reported biometry in conditions such as cataract<sup>[9]</sup> and keratoconus<sup>[10]</sup> within the remit of their study design, comparing one or several parameters in diseased conditions. We collected decade-wise normative data prospectively from 156 eyes of healthy subjects of South-Indian origin between the age group of 10–60 years, encompassing both anterior and posterior segments, using the latest available technology. The central corneal thickness (CCT) and anterior and posterior corneal curvatures (ACC and PCC) were measured using WaveLight Oculyzer II (Alcon, Tx, USA), axial length (AL). Lens thickness (LT) and anterior

chamber depth (ACD) were measured using Lenstar LS 900 (Haag Streit, Bern, Switzerland), and the retinal nerve fiber layer thickness (RNFLT), macular thickness (MT), and peripapillary and subfoveal choroidal thickness (CT) were measured using swept-source OCT (SS-OCT) by using Triton Dri OCT Plus (Topcon Inc, NJ, USA). The mean ACC and PCC were  $7.66 \pm 0.26$  mm and  $6.37 \pm 0.27$  mm, respectively. CCT, ACD, LT, and AL were  $536.05 \pm 29.95$   $\mu$ m,  $3.37 \pm 0.38$  mm,  $3.81 \pm 0.38$  mm, and  $23.16 \pm 0.90$  mm, respectively. LT correlated positively with age ( $P < 0.001$ ); ACD and AL correlated negatively with age ( $P < 0.001$  and  $0.05$ , respectively) [Fig. 1-top and center]. We obtained an annual increase in LT by 0.023 mm and ACD decreased by 0.014 mm. An age-related increase in LT further shallows the AC, which decreases with age. Recognizing a shallow AC is important as such individuals are not only at risk of developing angle-closure glaucoma but may also present challenges during cataract surgery,<sup>[11-13]</sup> particularly in pseudoexfoliation eyes.<sup>[11]</sup>

Average peripapillary and subfoveal CT were  $325.76 \pm 146.82$   $\mu$ m and  $352.90 \pm 118.25$   $\mu$ m, respectively. Average RNFLT and MT were  $106.25 \pm 34.1$   $\mu$ m and  $272.51 \pm 13.17$   $\mu$ m, respectively. Though we established RNFL thinning by 0.11  $\mu$ m per year, the average RNFLT did not correlate significantly with age. MT decreased by 0.37  $\mu$ m per year and correlated negatively with age ( $P < 0.001$ ) [Fig. 1, bottom].



**Figure 1:** Correlation of ocular parameters with age Top: Correlation of lens thickness (LT) and anterior chamber depth (ACD) with age Center: Correlation of axial length (AL) with age Bottom: Correlation of macular thickness (MT) with age

Table 1 shows the decade-wise measurements obtained from the anterior-to-posterior segment in mean  $\pm$  SD. Table 2 shows the quadrant-wise and decade-wise distribution of RNFLT thickness in microns; the difference is not statistically significant, except for the inferior and temporal thickness when the second decade is compared to the sixth.

OCT technology has progressed at a rapid pace; values obtained from these generational OCTs differ for CT<sup>[14]</sup>

as well as RNFLT.<sup>[15]</sup> However, Mansoori *et al.*<sup>[8]</sup> obtained RNFLT in Indian eyes with spectral-domain OCT (SD-OCT) and the results were somewhat similar to ours. In contrast, Appukuttan *et al.*<sup>[7]</sup> reported normative values for Indians for RNFLT (and MT) by the Spectralis SD-OCT and the superior and inferior RNFLT appears to be thinner when compared to SS-OCT measurements. The foveal macular thickness was reported as  $260.1 \pm 18.19 \mu\text{m}$ , and it appeared

**Table 1: Mean values of ocular parameters in each decade and the average of all decades**

Mean±SD	10-19 (n=30)	20-29 (n=32)	30-39 (n=30)	40-49 (n=34)	50-60 (n=30)	10-60 (n=156)
Age (years)	15.33±3.0	21.81±2.0	34±3.15	43.41±2.23	52.73±2.18	33.56±13.84
Anterior Corneal Curvature (mm)	7.69±0.21	7.65±0.27	7.72±0.17	7.66±0.298	7.58±0.308	7.66±0.26
Posterior Corneal Curvature (mm)	6.46±0.32	6.27±0.27	6.43±0.21	6.36±0.24	6.31±0.26	6.37±0.27
Central Corneal Thickness (µm)	532.7±33.6	538.40±34.01	537.5±19.91	536.79±25.99	543.3±35.20	536.05±29.95
Anterior Chamber depth (mm)	3.69±0.3	3.48±0.28	3.44±0.28	3.10±0.37	3.17±0.36	3.37±0.38
Lens Thickness (mm)	3.37±0.19	3.56±0.19	3.79±0.22	4.07±0.23	4.21±0.27	3.81±0.38
Axial Length (mm)	23.57±0.92	23.32±1.03	23.27±0.55	22.89±0.80	22.78±0.92	23.16±0.90
Average peripapillary choroidal thickness (µm)	331.05±108.01	353.71±80.88	338.48±127.42	270.05±89.46	340.66±116.45	325.76±146.82
Sub-Foveal Choroidal Thickness (µm)	355.93±81.33	373.78±80.88	372.83±76.79	304.97±80.65	362±69.98	352.90±118.25
Average RNFL Thickness (µm)	106.84±34.65	106.95±34.95	108.04±35.65	106.3±32.58	103.05±33.06	106.25±34.1
Macular Thickness (µm)	275.43±14.57	280.06±8.72	271.49±12.46	270.35±10.26	265.04±14.93	272.51±13.17

**Table 2: Quadrant-wise and decade wise thickness of retinal nerve fibre layer in microns**

	10-19 years (A)	20-29 years (B)	30-39 years (C)	40-49 years (D)	50-60 years (E)	P A vs. B	P A vs. C	P A vs. D	P A vs. E
Inferior Mean±SD	140.4±15.1	137.0±16.1	139.7±21.3	137.6±11.8	130.9±19.5	0.429	0.401	0.429	0.036
Superior Mean±SD	136.3±14.3	136.7±24.9	135.8±24.5	134.2±12.9	129.9±26.9	0.143	0.22	0.316	0.135
Nasal Mean±SD	80.5±13.9	83.9±14.0	88.8±14.7	82.6±14.5	82.2±12.3	0.109	0.06	0.077	0.129
Temporal Mean±SD	70.2±11.3	70.2±11.6	67.9±7.5	70.7±11.2	65.9±9.7	0.448	0.131	0.312	0.023
Total Mean±SD	106.8±34.6	106.9±31.9	108.1±35.6	106.3±32.6	103.1±33.1	0.386	0.468	0.452	0.151

to be somewhat underestimated as compared to SS-OCT measurements.

To summarize, we established normative values of anterior and posterior ocular biometric parameters over five decades by using cutting-edge technology in an exclusive cohort of Indians of South India. An age-related change was seen in some of these ocular parameters.

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#### Conflicts of interest

There are no conflicts of interest.

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