DOI: 10.47799/pimr.1401.25.92

Evaluation of Anterior Segment Parameters by Ultrasound Biomicroscopy (UBM) in Patients with Refractive Errors - A Hospital Based Observational Study

Priyanka Sodani[1], Shivani Sharma[2*], Kamna Singh[3], Satinder Kumar[4]

[1]Associate Professor, Department of Ophthalmology, GMC Kathua, Jammu & Kashmir, India
[2]Senior Resident, Department of Ophthalmology, GMC Kathua, Jammu & Kashmir, India
[3]Assistant professor, GMC Udhampur, Jammu & Kashmir, India
[4]Ex-senior resident, GMC Kathua, Jammu & Kashmir, India

[*]*Corresponding Author:*
Shivani Sharma
E-MAIL: shivani71rajesh@gmail.com

Date of Submission: 28-12-2025 **Date of Review: 12-01-2026** **Date of Acceptance: 20-03-2026**

ABSTRACT

Background: Ultrasound biomicroscopy (UBM) enables high-resolution cross-sectional imaging of the anterior segment and provides quantitative biometric data not readily obtainable by optical techniques when media opacity exists. Anterior chamber depth (ACD), anterior chamber angle (ACA), and central corneal thickness (CCT) are parameters of established clinical importance in pre-operative assessment for refractive surgery and glaucoma risk stratification. **Methods:** A hospital-based observational study was conducted over one year in the Department of Ophthalmology, Government Medical College, Kathua. One hundred and fifty consecutive eyes from 150 participants (one eye per participant) aged >10 years with myopia, hypermetropia, or astigmatism and nuclear sclerosis grade <II were included. Anterior segment imaging was performed by a single masked observer using a 50-MHz UBM transducer. ACD, ACA, and CCT were each measured in triplicate; mean values were used for analysis. **Results:** Of 150 eyes, 68 (45.3%) were myopic, 33 (22.0%) hypermetropic, and 49 (32.7%) astigmatic. The mean age was 43.3 ± 13.8 years; 74 (49.3%) participants were male and 76 (50.7%) females. Overall mean (±SD) values were: ACD 3.11 ± 0.35 mm (95% CI 3.05–3.16), ACA 38.02 ± 8.13° (95% CI 36.72–39.33), and CCT 495.55 ± 54.54 µm (95% CI 486.82–504.28). Myopic eyes had the deepest ACD (3.40 ± 0.20 mm) and widest ACA (43.08 ± 7.62°), followed by astigmatic and hypermetropic eyes. One-way ANOVA demonstrated statistically significant differences in ACD ($F = 164.85$, $p < 0.001$) and ACA ($F = 44.23$, $p < 0.001$) across refractive groups; all pairwise comparisons remained significant after Bonferroni correction. No significant inter-group difference was observed for CCT ($F = 0.139$, $p = 0.870$). **Conclusion:** Myopic eyes exhibited significantly deeper anterior chambers and wider angles, while hypermetropic eyes demonstrated shallower chambers and narrower angles. CCT did not differ significantly across refractive groups. These biometric estimates may provide useful reference values for pre-surgical planning in refractive surgery and glaucoma risk stratification in comparable clinical settings.

KEYWORDS: Ultrasound biomicroscopy (UBM); Anterior chamber depth; Anterior chamber angle; Central corneal thickness; Myopia; Hypermetropia; Astigmatism; Anterior segment biometry; Refractive errors

INTRODUCTION

Ultrasound biomicroscopy (UBM) is a real-time, high-frequency imaging modality that produces cross-sectional images of the anterior segment at near-microscopic resolution. The technique was pioneered by Pavlin and Foster at the University of Toronto, Canada in the early 1990s, who evaluated transducers operating at 50, 80, and 100 MHz and concluded that the 50-MHz probe offers the optimal balance between axial resolution (~40 µm) and depth of penetration (~4–5 mm), making it suitable for imaging the full anterior segment from cornea to the posterior chamber[1, 2]. Unlike anterior segment optical coherence tomography (AS-OCT), UBM is independent of optical transparency and can delineate structures

obscured by corneal oedema, dense pigmentation, or cataract[3].

UBM provides quantitative measurements of key anterior segment biometric parameters: the anterior chamber angle (ACA), anterior chamber depth (ACD), and central corneal thickness (CCT). These parameters hold substantial clinical importance. The ACA is the primary determinant of aqueous humour outflow dynamics; narrow angles are a well-established risk factor for primary angle-closure glaucoma (PACG), a condition carrying a disproportionate burden of irreversible blindness, particularly in Asian populations[4, 5]. The ACD reflects the axial length of the anterior segment compartment and correlates with the refractive status of the eye, with deeper chambers associated with myopia and shallower chambers with hypermetropia[6, 7]. CCT is an independent risk factor for the conversion of ocular hypertension to glaucoma and influences the accuracy of applanation tonometry[8].

Refractive errors are among the most prevalent causes of visual impairment worldwide. In India, population-based studies have reported a high burden of refractive errors across all age groups, with myopia increasingly prevalent in younger urban population and hypermetropia remaining common in older rural populations[9, 10]. Myopic eyes typically have longer axial lengths, deeper anterior chambers, and wider iridocorneal angles, while hypermetropic eyes exhibit shorter axial lengths, shallower anterior chambers, and predisposition to angle-closure[6, 7, 11]. Astigmatism, particularly corneal astigmatism, may be associated with alterations in anterior chamber architecture, though its specific relationship with ACA and ACD has been less systematically characterised[12].

Despite the established clinical relevance of UBM-based anterior segment biometry, data quantifying ACD, ACA, and CCT specifically across refractive error subgroups using UBM remain limited, particularly from the Indian subcontinent where ethnic, environmental, and demographic factors may produce biometric profiles distinct from Western or East Asian populations. Elfalah *et al*. (2022) provided UBM-derived anterior segment normative biometric data in a Middle Eastern population but did not stratify parameters by refractive subgroup[3]. Most existing studies examining the relationship between ACD and refraction have employed optical biometers (IOLMaster) or immersion A-scan ultrasonography rather than UBM, precluding direct angle measurement[6, 7]. The relationship between CCT and refractive error remains contested, with some investigators reporting a significant association[13] and others finding none[14].

The present study was designed to measure ACD, ACA, and CCT using 50-MHz UBM in a hospital-based population of patients with refractive errors so we can develop locally applicable biometric reference values that may assist in pre-operative planning for refractive interventions and in glaucoma risk stratification in this patient population.

MATERIALS AND METHODS

Study Design and Setting

This prospective hospital-based observational study was conducted in the Department of Ophthalmology, Government Medical College and Associated Hospital, Kathua, Jammu & Kashmir, India, over a one-year period. The study was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines[15].

Ethical Approval and Consent

Approval was obtained from the Institutional Ethics Committee, Government Medical College, Kathua (IEC/GMCK/46 dated 21/8/2021). Written informed consent was obtained from all eligible adult participants prior to enrolment. For participants aged <18 years, written consent was obtained from parents or legal guardians, with assent documented from the participant.

Study Population and Sampling

Participants were recruited consecutively from patients attending the ophthalmology outpatient department who had received a diagnosis of refractive error and who fulfilled the pre-specified eligibility criteria. One eye per participant was included to avoid the statistical dependency inherent in bilateral data; where both eyes were eligible, the eye with the greater magnitude of refractive error was selected.

Eligibility Criteria

Inclusion criteria: Age >10 years; diagnosis of myopia (spherical equivalent ≤ −0.50 D), hypermetropia (spherical equivalent ≥ +0.50 D), or astigmatism (cylinder ≥ 0.50 D with plano spherical equivalent) based on post-cycloplegic refraction; and nuclear sclerosis grade <II (Lens Opacities Classification System III, LOCS-III).

Exclusion criteria: Active anterior corneal pathology (corneal ulcer, keratitis, or dystrophy); diagnosed or suspected glaucoma; history of previous intraocular surgery; ocular trauma; intraocular neoplasm; active ocular or adnexal infection; globe perforation; mature or

intumescent cataract; mixed astigmatism; and nuclear sclerosis grade ≥II.

Sample Size

The sample size was estimated using the formula for precision-based estimation of a mean: $n = (z^2 \times \sigma^2) / d^2$, where z = 1.96, σ = 0.36 mm (expected standard deviation for ACD based on published data[3]), and d = 0.06 mm (acceptable absolute precision). This yielded a minimum required sample of 138 eyes; a target of 150 eyes was set to account for potential data loss.

Ophthalmic Examination

All participants underwent a standardised ophthalmic evaluation comprising: best-corrected visual acuity (BCVA) using a Snellen chart; cycloplegic refraction (cyclopentolate 1% instilled twice, 30 minutes apart, refraction performed 45 minutes after the second instillation); slit-lamp biomicroscopy; Goldmann applanation tonometry; and dilated fundus examination with a +90 D non-contact lens. Refractive classification was based on the post-cycloplegic spherical equivalent.

Ultrasound Biomicroscopy Protocol

Anterior segment imaging was performed using a UBM device equipped with a 50-MHz transducer (manufactured by Appaswamy Associates at Chennai, INDIA; Model is MARVELII AB -SCAN with UBM). The examination was conducted with the participant in the supine position. Topical anaesthesia was administered with proparacaine hydrochloride 0.5% (two instillations, three minutes apart). A sterile, disposable eye cup was positioned between the eyelids and filled with 2% methylcellulose as the acoustic coupling medium. The transducer probe was oriented perpendicular to the structure under examination. To ensure primary gaze fixation, the participant was instructed to fixate on a target affixed to the ceiling directly above. All examinations were performed by a single trained observer. The scleral spur was identified as the primary anatomical landmark for angle measurements[3].

Biometric Measurements

Anterior Chamber Angle (ACA): Measured using the three-point technique. One point was placed at the iris recess (angle apex), a second at the trabecular meshwork 500 µm anterior to the scleral spur, and a third on the anterior iris surface at the same meridional plane. Measurements were obtained in the superior, inferior, nasal, and temporal quadrants; the mean of all four quadrant values was used as the representative ACA for analysis.

Anterior Chamber Depth (ACD): Measured as the perpendicular distance from the corneal endothelium to the anterior lens surface at the central corneal apex (endothelium-to-lens convention).

Central Corneal Thickness (CCT): Measured from the anterior to the posterior corneal surface perpendicularly at the corneal centre.

All three parameters were measured in triplicate at each session; the mean of three readings was used for analysis. Intra-session repeatability was quantified by the coefficient of variation (CV), which remained <5% for all parameters across the study period.

Statistical Analysis

Data were entered into Microsoft Excel (Microsoft Corp., USA) and analysed using IBM SPSS Statistics v25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were assessed for normality using the Shapiro–Wilk test. Data are presented as mean ± standard deviation (SD) with 95% confidence intervals (CI) for normally distributed variables; categorical variables are reported as absolute frequencies and percentages. Comparison of ACD, ACA, and CCT across the three refractive error groups was performed using one-way analysis of variance (ANOVA). Post-hoc pairwise comparisons were conducted with the Bonferroni correction to control the family-wise error rate. Where normality could not be confirmed, the Kruskal–Wallis test was applied as a non-parametric sensitivity analysis. A two-tailed p-value <0.05 was considered statistically significant for all comparisons.

RESULTS

Demographic and Clinical Characteristics

A total of 150 eyes from 150 participants were enrolled. The mean age was 43.3 ± 13.8 years (range: 13–84 years). There were 74 male (49.3%) and 76 female (50.7%) participants. The largest age group were those aged 31–40 years and 41–50 years, each comprising 41 participants (27.3%), reflecting the predominantly middle-aged outpatient population [Table. 1].

Age Group (years)	No. of Eyes (n)	Percentage (%)
11–20	10	6.7
21–30	14	9.3
31–40	41	27.3
41–50	41	27.3
51–60	28	18.7
61–70	12	8.0
>70	4	2.7
Total	150	100.0

Table 1:Age Group Distribution of Study Participants (n = 150)

Age distribution of the 150 study eyes included in the analysis.

The distribution of refractive errors was: myopia in 68 eyes (45.3%), hypermetropia in 33 eyes (22.0%), and astigmatism in 49 eyes (32.7%), as shown in [Table. 2]. Female predominance was noted in myopia (52.9%) and astigmatism (55.1%), while male predominance was observed in hypermetropia (60.6%).

Refractive Error	Males, n (%)	Females, n (%)	Total, n (%)
Myopia	32 (47.1)	36 (52.9)	**68 (45.3)**
Hypermetropia	20 (60.6)	13 (39.4)	**33 (22.0)**
Astigmatism	22 (44.9)	27 (55.1)	**49 (32.7)**
Total	**74 (49.3)**	**76 (50.7)**	**150 (100.0)**

Table 2: Distribution of Refractive Errors by Gender (n = 150)

Values expressed as number (percentage). Column percentages shown within each refractive error group.

Overall Anterior Segment Biometric Parameters

The overall mean (±SD) biometric values for all 150 eyes were: ACA 38.02 ± 8.13° (95% CI 36.72–39.33), ACD 3.11 ± 0.35 mm (95% CI 3.05–3.16), and CCT 495.55 ± 54.54 µm (95% CI 486.82–504.28) [Table. 3].

Parameter	Mean ± SD	95% CI
Anterior Chamber Angle (ACA) in Degrees (°)	38.02 ± 8.13	36.72 – 39.33
Anterior Chamber Depth (ACD) in mm	3.11 ± 0.35	3.05 – 3.16
Central Corneal Thickness (CCT) in mm	495.55 ± 54.54	486.82 – 504.28

Table 3:Overall Anterior Segment Biometric Parameters for the Study population (n = 150)

ACA = anterior chamber angle; ACD = anterior chamber depth; CCT = central corneal thickness; CI = confidence interval; SD = standard deviation.

Anterior Segment Parameters by Refractive Error Group

Myopic eyes demonstrated the deepest mean ACD (3.40 ± 0.20 mm) and the widest mean ACA (43.08 ± 7.62°), followed by astigmatic eyes (ACD 3.00 ± 0.20 mm; ACA 35.91 ± 6.24°), and hypermetropic eyes (ACD 2.68 ± 0.17 mm; ACA 30.75 ± 3.49°). One-way ANOVA demonstrated highly significant inter-group differences for both ACD ($F = 164.85$, $p < 0.001$) and ACA ($F = 44.23$, $p < 0.001$).

Parameter	Myopia (n=68) Mean ± SD	Hypermetropia (n=33) Mean ± SD	Astigmatism (n=49) Mean ± SD	F-value (ANOVA) p-value
ACA (°)	**43.08 ± 7.62**	30.75 ± 3.49	35.91 ± 6.24	**F = 44.23 p < 0.001***
ACD (mm)	**3.40 ± 0.20**	2.68 ± 0.17	3.00 ± 0.20	**F = 164.85 p < 0.001***
CCT (µm)	495.04 ± 54.42	499.79 ± 56.18	493.39 ± 54.58	F = 0.139 p = 0.870

Table 4: Anterior Segment Parameters by Refractive Error Group with Inter-Group Comparisons

** Statistically significant ($p < 0.001$). Post-hoc Bonferroni correction: all pairwise differences for ACA and ACD significant at corrected $p < 0.001$ for each comparison (myopia vs hypermetropia, myopia vs astigmatism, hypermetropia vs astigmatism). CCT showed no significant pairwise difference between any two groups (all $p > 0.60$). ACA = anterior chamber angle; ACD = anterior chamber depth; CCT = central corneal thickness; SD = standard deviation.*

Post-hoc Bonferroni testing confirmed that all pairwise comparisons among the three refractive groups were statistically significant for both ACD and ACA (all corrected $p < 0.001$). No statistically significant difference in CCT was found across refractive groups ($F = 0.139$, $p = 0.870$), and the Kruskal–Wallis non-parametric sensitivity analysis yielded a concordant result ($p = 0.872$) as given in [Table. 4].

DISCUSSION

The main finding of this study was that myopic eyes had significantly deeper anterior chambers and wider angles than hypermetropic and astigmatic eyes, with CCT showing no significant inter-group variation.

Anterior Chamber Depth and Refractive Error

The mean ACD in this study was 3.11 ± 0.35 mm, which is consistent with the UBM-derived reference values reported by Elfalah *et al*. (2022) in a Middle Eastern population, where mean ACD was 2.91 ± 0.41 mm[3]. The small positive difference between this study and theirs is likely attributable to the higher proportion of myopic eyes in our sample (45.3%), which systematically elevates the group mean given the well-established positive association between axial elongation and ACD in myopia[6, 16].

Myopic eyes in our study had a mean ACD of 3.40 ± 0.20 mm. Tañá-Rivero *et al*. (2023) reported mean ACD values of 3.61 ± 0.29 mm and 3.62 ± 0.31 mm using IOLMaster 500 and 700 optical biometers, respectively, in a myopic Spanish population[6]. The slightly higher values in that study are consistent with the known systematic overestimation of ACD by optical biometers, which measure from the corneal epithelium to the lens surface, adding approximately 0.1–0.25 mm compared with the UBM convention measuring from the corneal endothelium[3]. Alrasheed and Aldakhil (2022) demonstrated, in a Saudi Arabian population using optical biometry, that myopic eyes had a significantly deeper ACD (3.70 ± 0.27 mm) compared with hyperopic eyes (3.28 ± 0.32 mm; $p = 0.0001$)[7], a directional finding fully concordant with our results, though their absolute values are higher for the same methodological reasons and their hypermetropia group is distinctly less shallow than ours, which could be a difference possibly attributable to ethnic and sampling variations.

The mean ACD in our hypermetropic group was 2.68 ± 0.17 mm. A shallow anterior chamber is a well-recognised anatomical correlate of hypermetropia and a risk factor for angle-closure; the physiological basis lies in the relatively shorter axial length and anteriorly positioned lens characteristic of hypermetropic eyes[4, 5]. Our astigmatic group (ACD 3.00 ± 0.20 mm) had intermediate values, consistent with the mixed refractive aetiology of this group, which comprised corneal and mixed lenticular astigmatism. To our knowledge, no comparable UBM-based stratification of ACD by astigmatic subtype has been published in the Indian context, making this a potentially useful baseline.

Anterior Chamber Angle and Refractive Error

Overall mean ACA of this study was 38.02 ± 8.13°, with a pronounced divergence between refractive groups: 43.08± 7.62° in myopia versus 30.75 ± 3.49° in hypermetropia. Elfalah *et al*. (2022) reported a mean ACA of 34.1 ± 12.1° by UBM in their general biometry group[3], consistent with our overall value and lending cross-population validity to our measurements.

Schuster *et al*. (2016), in the large population-based Gutenberg Health Study (n = 14,703), quantified the distribution of ACA width using gonioscopy and Scheimpflug imaging, identifying a mean ACA of 32.6± 5.5° and establishing hyperopic refraction as a statistically independent risk factor for narrow angles and angle-closure glaucoma after adjustment for age, sex, and anterior chamber depth[17]. Our hypermetropic subgroup value of 30.75± 3.49° is below this population mean, aligning with the expected propensity for anatomically narrower angles in hypermetropic eyes. Conversely, the wider angles observed in our myopic subgroup (43.08± 7.62°) corroborate the established protective effect of myopia against primary angle-closure glaucoma, as has been demonstrated in epidemiological data from Asian populations where myopia and PACG coexist with markedly different geographic distributions[4, 5].

The notably lower SD for ACA in hypermetropic eyes (3.49° vs 7.62° in myopia) points to a more uniform iridocorneal angle architecture in this group, consistent with the anatomically crowded anterior segment characteristic of shorter, hypermetropic eyes. The wider dispersion in the myopic group is consistent with the broader spectrum of myopic severity in this category, ranging from low to high myopia, each associated with different degrees of axial elongation and anterior segment expansion[11].

Central Corneal Thickness and Refractive Error

The mean CCT in our study was 495.55 ± 54.54 µm overall, without a statistically significant difference across refractive error groups (F = 0.139, p = 0.870). This null finding is concordant with Chen et al. (2014), who reported no significant association between CCT and refractive status in a Taiwanese population (p = 0.445)[14], and with Touzeau *et al*. (2003), who similarly found no significant correlation between refraction and ocular biometric parameters including corneal thickness in a French population[18].

In contrast, Navyasree and Satapathy (2024) reported statistically significant differences in CCT between emmetropes (529.12 ± 28.31 µm), hypermetropes (535.38 ± 30.51 µm), and myopes (522.97 ± 29.42 µm; p < 0.001) using specular microscopy/pachymetry[13]. The discrepancy with our results may reflect differences in measurement methodology (UBM versus optical pachymetry), sample composition, age range, and the exclusion of nuclear sclerosis ≥grade II in our study. The large Indian population-based studies like Nangia et al. (2010) from the Central India Eye and Medical Study (mean CCT 514 ± 33 µm)[19] and Vijaya *et al*. (2008) from the Chennai Glaucoma Study (511.4 ± 33.5 µm)[20] reported somewhat higher mean CCT values than our study, attributable to their use of ultrasound pachymetry on large unselected community samples, which include a broader range of corneal phenotypes compared with our hospital-based population where concurrent corneal pathology was an explicit exclusion criterion. Prasad *et al*. (2011) additionally demonstrated that CCT decreases with age and has a weak positive association with hypermetropia[21], though this relationship was not statistically significant in our data, possibly due to the modest sample size within the hypermetropic subgroup (n = 33).

Comparison with Prevalence and Demographic Findings

The distribution of refractive errors in our hospital-based sample with myopia 45.3%, astigmatism 32.7%, hypermetropia 22.0%, should not be interpreted as reflecting population-level prevalence, given the inherent referral and sampling bias of a tertiary ophthalmology outpatient department. Krishnaiah *et al*. (2009), in the Andhra Pradesh Eye Disease Study, reported community-based prevalence data demonstrating a peak of refractive errors in middle-aged adults and a female predominance for myopia[9]. Joseph *et al*. (2018) similarly identified female predominance in myopic refraction in a southern Indian adult community[10].

Limitations

Several limitations must be acknowledged. First, the hospital-based consecutive sampling method introduces referral bias; the biometric estimates reflect a clinical patient population rather than a community sample and should not be interpreted as population-level normative data. Second, the relatively small hypermetropic subgroup (n = 33) may limit the statistical power for detecting modest differences in CCT. Third, this study did not stratify by severity of refractive error (e.g., low, moderate, and high myopia sub-strata) or by corneal versus lenticular components of astigmatism, which would have enabled more granular analysis. Fourth, angle parameters were recorded as a single mean across four quadrants; quadrant-specific asymmetry in angle width, which has clinical relevance for gonioscopic grading, was not separately analysed. Fifth, additional UBM parameters of established utility such as angle opening distance (AOD) and trabecular–iris space area (TISA) were not measured, limiting the comprehensiveness of the anterior segment characterisation. Future studies should prospectively enroll larger samples including age- and sex-matched emmetropic controls, incorporate full-quadrant analysis with AOD and TISA, and stratify by refractive error severity to establish more detailed biometric profiles.

CONCLUSION

This hospital-based observational study demonstrates that anterior chamber depth and anterior chamber angle, as measured by 50-MHz ultrasound biomicroscopy, differ significantly across refractive error categories, with the consistent pattern of myopia > astigmatism > hypermetropia for both parameters. Myopic eyes have the deepest anterior chambers and widest iridocorneal angles, while hypermetropic eyes exhibit the shallowest chambers and narrowest angles. These findings are of relevance to glaucoma risk stratification and preoperative refractive surgical planning. Central corneal thickness did not differ significantly across refractive groups in this study. These hospital-derived biometric estimates may serve as clinically useful reference values for anterior segment assessment in comparable patient populations, although there is need for population-based studies with larger stratified samples for definitive normative characterisation.

DECLARATIONS

Availability of Data and Materials: The anonymised dataset supporting the conclusions of this article is available from the corresponding author upon reasonable request and following institutional data-sharing approval.

Competing Interests: The authors declare no competing interests.

Funding: This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions: [Author 1]: Conceptualisation, data acquisition, manuscript drafting, and critical revision. [Author 2]: Data analysis, statistical interpretation, and manuscript revision. [Author 3]: UBM imaging, measurement, data collection, and manuscript revision. All authors read and approved the final version of the manuscript.

Declaration of Generative Artificial Intelligence Use: The authors used a large language model (ChatGPT and Claude) to assist with manuscript editing, structural formatting, and language refinement during the preparation of this article. The AI tool was not involved in study conceptualisation, data collection, statistical analysis, interpretation of findings, or clinical decision-making. All data were independently analysed and verified by the authors using IBM SPSS Statistics v25.0. All AI-assisted text was critically reviewed, checked for accuracy, and revised by the authors, who take full responsibility for the integrity and accuracy of the work as published. The use of this tool is disclosed in accordance with the editorial policies of this journal and the recommendations of the International Committee of Medical Journal Editors (ICMJE).

Acknowledgements: The authors thank the staff of the Department of Ophthalmology, GMC Kathua, for their support during data collection.

References

1. Pavlin CJ, Harasiewicz K, Sherar MD, Foster FS. Clinical Use of Ultrasound Biomicroscopy. Ophthalmology. 1991; 98 (3) :287-295 . Available from: https://doi.org/10.1016/s0161-6420(91)32298-x
2. Pavlin CJ, Foster FS. Ultrasound Biomicroscopy of the Eye. 1st ed.. 1995; . Available from: https://doi.org/10.1007/978-1-4612-2470-9
3. Elfalah M, Mohammad M, Toro MD, Abu-Yaghi N, Rejdak R, Yousef YA. Anterior Ocular Biometrics as Measured by Ultrasound Biomicroscopy. Healthcare. 2022; 10 (7) :1188 . Available from: https://doi.org/10.3390/healthcare10071188
4. Congdon N, Wang F, Tielsch JM. Issues in the epidemiology and population-based screening of primary angle-closure glaucoma. Survey of Ophthalmology. 1992; 36 (6) :411-423 . Available from: https://doi.org/10.1016/s0039-6257(05)80022-0
5. Foster PJ, Buhrmann R, Quigley HA, Johnson GJ. The definition and classification of glaucoma in prevalence surveys. British Journal of Ophthalmology. 2002; 86 (2) :238-242 . Available from: https://doi.org/10.1136/bjo.86.2.238
6. Tañá-Rivero P, Tello-Elordi C, Orts-Vila P, Tañá-Sanz P, Tañá-Sanz S. Agreement of Corneal Diameter and Anterior Chamber Depth Measurements with the IOLMaster 500 and the IOLMaster 700 Optical Biometers in Myopic Eyes. Clinical Ophthalmology. 2023; 17 :1245-1253 . Available from: https://doi.org/10.2147/opth.s409132

7. Alrasheed S, Aldakhil S. Corneal Curvature, Anterior Chamber Depth, Lens Thickness, And Vitreous Chamber Depth: Their Intercorrelations With Refractive Error In Saudi Adults. The Open Ophthalmology Journal. 2022; 16 (1) . Available from: https://doi.org/10.2174/18743641-v16-e2209300

8. Gordon MO, Beiser JA, Brandt JD, Heuer DK, Higginbotham EJ, Johnson CA, *et al*. The Ocular Hypertension Treatment Study. Archives of Ophthalmology. 2002; 120 (6) :714-720 . Available from: https://doi.org/10.1001/archopht.120.6.714

9. Krishnaiah S, Srinivas M, Khanna RC, Rao GN. Prevalence and risk factors for refractive errors in the South Indian adult population: the Andhra Pradesh Eye Disease Study. *Clinical Ophthalmology*. 2009;3:17–27.

10. Joseph S, Krishnan T, Ravindran RD, Maraini G, Camparini M, Chakravarthy U, *et al*. Prevalence and risk factors for myopia and other refractive errors in an adult population in southern India. Ophthalmic and Physiological Optics. 2018; 38 (3) :346-358 . Available from: https://doi.org/10.1111/opo.12447

11. Goss DA, Van Veen HG, Rainey BB, Feng B. Ocular Components Measured by Keratometry, Phakometry, and Ultrasonography in Emmetropic and Myopic Optometry Students. Optometry and Vision Science. 1997; 74 (7) :489-495 . Available from: https://doi.org/10.1097/00006324-199707000-00015

12. Grosvenor T, Goss DA. Role of the Cornea in Emmetropia and Myopia. Optometry and Vision Science. 1998; 75 (2) :132-145 . Available from: https://doi.org/10.1097/00006324-199802000-00017

13. Navyasree C, Satapathy J. Correlation of Central Corneal Thickness with Refractive Error, Corneal Curvature, and Axial Length: An Observational Study. TNOA Journal of Ophthalmic Science and Research. 2024; 62 (1) :75-79 . Available from: https://doi.org/10.4103/tjosr.tjosr_78_23

14. Chen YC, Kasuga T, Lee HJ, Lee SH, Lin SY. Correlation between central corneal thickness and myopia in Taiwan. The Kaohsiung Journal of Medical Sciences. 2014; 30 (1) :20-24 . Available from: https://doi.org/10.1016/j.kjms.2013.08.008

15. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. The Lancet. 2007; 370 (9596) :1453-1457 . Available from: https://doi.org/10.1016/s0140-6736(07)61602-x

16. Scott R, Grosvenor T. Structural model for emmetropic and myopic eyes. Ophthalmic and Physiological Optics. 1993; 13 (1) :41-47 . Available from: https://doi.org/10.1111/j.1475-1313.1993.tb00424.x

17. Schuster AK, Pfeiffer N, Nickels S, Schulz A, Höhn R, Wild PS, *et al*. Distribution of Anterior Chamber Angle Width and Correlation With Age, Refraction, and Anterior Chamber Depth—The Gutenberg Health Study. Investigative Opthalmology & Visual Science. 2016; 57 (8) :3740-3746 . Available from: https://doi.org/10.1167/iovs.16-19600

18. Touzeau O, Allouch C, Borderie V, Kopito R, Laroche L. Correlation entre refraction et biométrie oculaire [Correlation between refraction and ocular biometry]. *Journal Français d'Ophtalmologie*. 2003;26(4):355–363.

19. Nangia V, Jonas JB, Sinha A, Matin A, Kulkarni M. Central Corneal Thickness and Its Association with Ocular and General Parameters in Indians: The Central India Eye and Medical Study. Ophthalmology. 2010; 117 (4) :705-710 . Available from: https://doi.org/10.1016/j.ophtha.2009.09.003

20. Vijaya L, George R, Baskaran M, Arvind H, Raju P, Ramesh SV, *et al*. Prevalence of Primary Open-angle Glaucoma in an Urban South Indian Population and Comparison with a Rural Population. Ophthalmology. 2008; 115 (4) :648-654.e1 . Available from: https://doi.org/10.1016/j.ophtha.2007.04.062

21. Prasad A, Fry K, Hersh PS. Relationship of Age and Refraction to Central Corneal Thickness. Cornea. 2011; 30 (5) :553-555 . Available from: https://doi.org/10.1097/ico.0b013e3181fb880c

How to cite this article: Sodani P, Sharma S, Singh K, Kumar S. Evaluation of Anterior Segment Parameters by Ultrasound Biomicroscopy (UBM) in Patients with Refractive Errors - A Hospital Based Observational Study. Perspectives in Medical Research 2026; 14(1):22-28 DOI: 10.47799/pimr.1401.25.92