DOI:10.34108/eujhs.1509103

SAĞLIK BİLİMLERİ DERGİSİ
JOURNAL OF HEALTH SCIENCES
Erciyes Üniversitesi Sağlık Bilimleri Enstitüsü Yayın Organıdır

Araştırma 2024; 33(3): 296-301

COMPARISON OF ANATOMICAL EYE MEASUREMENTS IN PEDIATRIC AGE GROUPS
ANATOMİK GÖZ ÖLÇÜMLERİNİN PEDİATRİK YAŞ GRUPLARINDA KARŞILAŞTIRILMASI

Hacı KELES[1], Kursad Ramazan ZOR[2], Gamze YILDIRIM BICER[2], Erkut KUCUK[2], Ali Turker CIFTCI[3]

[1]*Niğde Ömer Halisdemir University, Faculty of Medicine, Department of Anatomy, Niğde, Türkiye*
[2]*Niğde Ömer Halisdemir University, Faculty of Medicine, Department of Ophthalmology, Niğde, Türkiye*
[3]*Niğde Ömer Halisdemir University, Faculty of Medicine, Department of Biostatistics and Medical Informatics, Niğde, Türkiye*

ABSTRACT
Abnormal changes during ocular development can affect ocular biometric parameters, which are important for diagnosis and surgical planning. The aim of this study was to determine how ocular biometric measurements of pediatric subjects in different age groups change with ocular growth. Study population consisted of 99 volunteers attending the ophthalmology outpatient clinic for routine controls. Healthy subjects aged 4-15 years with best-corrected visual acuity of 20/20 according to Snellen chart and intraocular pressure between 10-21 mmHg were included in study. Axial length, central corneal thickness, humor aquosus depth, anterior camera depth, lens thickness, limbus diameter, corpus vitreum length were measured.
Independent-t test was used to compare two different groups and ANOVA method was used to compare more than two groups. As a result of study, no significant difference was found between right and left eye biometry. Humor aquosus depth, anterior camera depth, lens thickness and axial length differed significantly different between age groups.
Axial length, humor aquosus depth, anterior camera depth, anterior camera depth, lens thickness and corpus vitreum length were found to significantly different between the age groups of boys. There were significant differences in humor aquosus depth and anterior camera depth parameters between age groups of girls. In this study, we investigated how biometric measurements of the eye change with age in pediatric Turkish population. It was found that anterior camera depth and humour aquosus depth increased with age, while lens thickness decreased in subjects. However, axial length and corpus vitreum length increased with increasing age in boys.
Keywords: Axial length, lens thickness, ocular biometrics

ÖZ
Göz gelişimi sırasında anormal değişiklikler, tanı ve cerrahi planlama için önemli olan oküler biyometrik parametreleri etkileyebilir. Bu çalışmanın amacı farklı yaş gruplarında yer alan pediatrik bireylere ait oküler biyometri ölçümlerinin oküler büyüme ile nasıl değiştiğini ortaya çıkarmaktır. Çalışmanın popülasyonunu göz polikliniğine rutin kontroller için baş vuran 99 gönüllü oluşturmuştur. Araştırmaya 4-15 yaş aralığındaki en iyi düzeltilmiş görme keskinliği Snellen eşeline göre 20/20 ve göz içi basıncı 10-21 arası mmHg olan sağlıklı bireyler dahil edilmiştir. Çalışma kapsamında aksiyel uzunluk, santral kornea kalınlığı, humour aquosus derinliği, ön kamera derinliği, lens kalınlığı, limbus çapı, corpus vitreum uzunluğu ölçümleri gerçekleştirilmiştir.
Çalışmada iki farklı grubu karşılaştırmak için Independent-t testi, ikiden fazla grubu karşılaştırmak için ANOVA yöntemi kullanılmıştır. Çalışma sonucunda göz biyometrisi açısından sağ ve sol arasında anlamlı bir fark bulunmamıştır. Humour aquosus derinliği, ön kamera derinliği, lens kalınlığı ve aksiyel uzunluk parametrelerinin yaş grupları arasında anlamlı farklılık gösterdiği bulunmuştur.
Erkeklerin yaş grupları arasında aksiyel uzunluk, humour aquosus derinliği, ön kamera derinliği, lens kalınlığı ve corpus vitreum uzunluğu parametrelerinin anlamlı farklılığa sahip olduğu görülmüştür. Kadınların yaş grupları arasında ise humour aquosus derinliği ve ön kamera derinliği parametreleri arasında anlamlı farklılık mevcuttur. Mevcut çalışmada pediatrik Türk popülasyonunda yaş ile gözün biyometrik ölçümlerinin nasıl değiştiği incelenmiştir. Bireylere ait ön kamera derinliği ve humour aquosus derinliği yaş ile arttığı, lens kalınlığının ise azaldığı bulunmuştur. Bununla birlikte erkeklerde yaşın artışı ile aksiyel uzunluk ve corpus vitreum uzunluğu artış göstermiştir.

Anahtar kelimeler: Aksiyel uzunluk, lens kalınlığı, oküler biyometri

Corresponding Author: Assist. Prof. Hacı KELES, hacikeles@ohu.edu.tr, 0000-0002-0770-8269, Niğde Ömer Halisdemir University, Faculty of Medicine, Department of Anatomy, Central Campus, Bor Yolu Üzeri, Niğde, Türkiye

Authors: Assoc. Prof. Kursad Ramazan ZOR, kursadzor@hotmail.com, 0000-0002-3233-7906
Assist. Prof. Gamze YILDIRIM BICER, gmz_y_06@hotmail.com, 0000-0003-3058-6308
Assoc. Prof. Erkut KUCUK, erkutkucuk@yahoo.com, 0000-0002-1474-9237
Res. Asst. Ali Turker CIFTCI, turker_ciftci_42@hotmail.com 0000-0002-0227-5273

Makale Geliş Tarihi : 02.07.2024
Makale Kabul Tarihi: 09.10.024

INTRODUCTION

The eyeball (Bulbus oculi) is an organ with an anterior posterior diameter of about 2.5 cm and weighing 10-12 g, surrounded by a tenon capsule in the orbital cavity. The eyeball has a slightly flattened shape from top to bottom, resembling two spheres of different diameters intertwined, with a small sphere in front and a large sphere in the back. The small transparent sphere in front (1/6 of the eyeball) is called the cornea and the large non-transparent sphere in the back (5/6 of the eyeball) is called the sclera. The most protruding part of the eyeball at the front is called the polus anterior and the most protruding part at the back is called the polus posterior. The axis connecting the polus anterior and polus posterior is called axis bulbi.[1,2]

To enhance our comprehension of the pathophysiological mechanisms connected to vision, it is crucial to examine the development of the human eye. There are many factors that influence the growth of the eyeball. The most important of these are genetic causes. During development, non-physiological changes in ocular tissues can cause refractive errors, nervous system disorders and many pathological eye diseases. One of the earliest eye pathologies is a change in normal axial length. A decrease in axial length is associated with diseases such as nanophthalmos, microphthalmia and retinoblastoma, while an increase in axial length is associated with many diseases such as congenital glaucoma.[3-5]

Studies have shown that the axial length of the eye rapidly increases within the first two years following birth. Thereafter, this increase continues until adolescence. There is a great deal of variability in refractive errors stemming from the expansion of the eye and the related factors that cause this are not fully understood.[6] Various types of refractive errors can occur in children aged less than six years. Until the age of six, a mechanism called emmetropization can be observed. This mechanism controls eye growth to make the eyes emmetropic or slightly hyperopic. After the age of six years, this situation varies in many populations.[7] Studies have shown that most of the biometric changes in the eye occur between the ages of 5 and 15 years.[8-10] However, thanks to the developing technology, modern biometric devices need to look at more parameters and more studies are needed in different ethnic, environmental and genetic differences.[11]

The purpose of our study was to establish how anatomical eye measurements change with ocular growth in pediatric subjects of different age groups.

MATERIALS AND METHODS

The research involved 99 volunteers (49 boys, 50 girls) who came to Niğde Ömer Halisdemir University Eye Polyclinic for routine controls. The participants of the study were healthy children aged 4-15 years with best corrected visual acuity of 20/20 according to Snellen and intraocular pressure (IOP) between 10-21 mmHg. Subjects with refractive errors, corneal disease, retinal disease, uveitis, glaucoma, tumor, trauma, history of ocular surgery and systemic diseases were not included. Measurements were performed using the IOL Master 500 Biometer (Carl Zeiss AG, Oberkochen, Germany).

Measurements

Axial length (AL): Distance between the anterior and posterior ends of the eye.

Central corneal thickness (CCT): Distance between the inner and outer faces of the center of the cornea.

Humouraquosus depth (AD): Distance between the corneal endothelium and the anterior surface of the lens.

Anterior camera depth (ACD): Distance from the corneal epithelium to the front surface of the lens.

Lens thickness (LT): Distance between the most bumpy points anterior and posterior to the center of the lens.

Limbus diameter (LD): Distance between the junction of the iris and sclera.

Corpus vitreum length (VCL): Distance from the posterior surface of the lens to the macula (Figure 1).

Statistical Analysis

The Shapiro Wilk test was used to examine whether the numerical variables conformed to normal distribution. Numerical variables were summarized with Mean±Standard Deviation and Minimum-Maximum

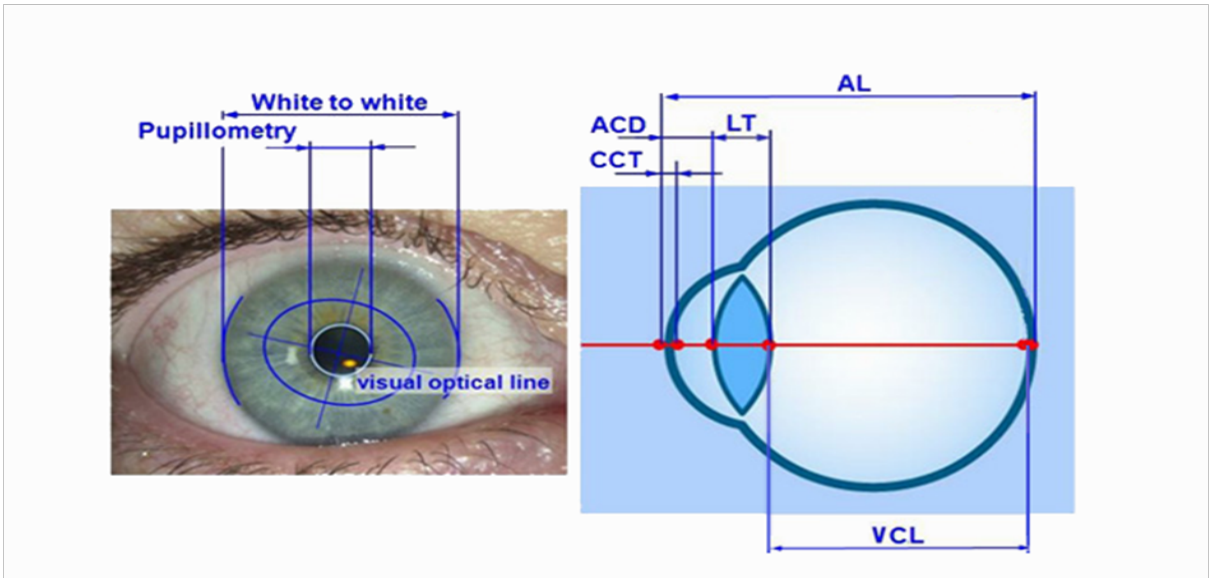

Figure 1: Eye measurements. ACD. Anterior Camera depth,AL. Axial length, CCT.Central corneal thickness, LT. Lens thickness, VCL. Corpus vitreum length.

values. For comparisons of three or more groups, one-way analysis of variance (ANOVA) was used and Tukey HSD test, which is a Post-Hoc tests, was used to see which one of the groups caused the difference between the groups. Analyses were performed with IBM SPSS version 22 (SPSS, Inc., Chicago, IL, USA). p<0.05 was accepted as statistical significance level.

RESULTS

We collected data from a total of 120 participants aged between 4 and 15 years. After implementing the inclusion criteria, we assessed the data from 99 subjects. The mean age was 8.95±3.04 years (8.61±2.99 for boys and 9.28±3.07 for girls). Since there was no significant difference between the right and left eyes in terms of ocular biometry in the data we obtained from the participants, we present our data obtained from the right eyes in the tables.

Comparison of anatomical eye measurements given based on age groups in Table 1. According to Table 1, there was a statistically significant difference between age groups in terms of mean AD (p<0.001). The reason for this difference was due to the difference between the 13-15 age group and the other groups and also between the 4-6 age group and the 10-12 age group (p<0.05). A statistically significant difference was found between age categories concerning ACD averages (p<0.001). The reason for this difference was between the 13-15 age group and the other groups (p<0.05) (Table 1). In the comparison between age groups in terms of LT value, a statistically significant difference was found in the mean values (p<0.001). The reason for this difference was between the 4-6 age group and the other groups (p<0.05) (Table 1).

When male age groups were compared regarding axial length, a statistically significant difference was found in terms of mean AL (p=0.015). The reason for this difference was between the 4-6 age group and 10-12 age groups (p<0.05) (Table 2). According to the results in Table 2, a statistically significant difference was determined between age groups in terms of AD parameter in males (p=0.001). The reason for this difference was between the 4-6 age group and other age groups (p<0.05). In males, a statistically significant difference was observed in the mean ACD value between age groups (p<0.001). This difference was due to the difference between the 4-6 age group and other age groups (p<0.05) (Table 2). In Table 2, a statistically significant difference was observed in the mean of the LT parameter according to the evaluation results between the age groups of the boys (p=0.001). The reason for this difference was due to the difference between the 4-6 age group and other age groups (p<0.05). When the corpus vitreum length (VCL) in the eyes of males was compared between the age groups, it was found statistically significant in terms of mean value (p=0.013). This difference was due to the difference between 4-6 and 10-12 age groups (p<0.05).

Table 3 shows that there was a statistically significant difference in the mean value of AD in the age groups among girls (p<0.001). The reason for this difference is due to the age groups of 4-6, 10-12 and 13-15 (p<0.05). When the age groups of girls were compared in terms of ACD values, a statistically significant difference was found in terms of ACD averages (p<0.001). The reason for this difference was between the 13-15 age group and other age groups (p<0.05).

DISCUSSION

It was observed that AD and ACD values increased with increasing age in both girls and boys. The LT parameter decreased with age increase in both boys and girls.

Table 1. Evaluation of measurements according to age groups

	Age groups								
Measurements	4-6 Age Group (N=26)		7-9 Age Group (N=21)		10-12 Age Group (N=36)		13-15 Age Group (N=13)		p
	Mean±SD	*Min-Max*	*Mean±SD*	*Min-Max*	*Mean±SD*	*Min-Max*	*Mean±SD*	*Min-Max*	
AL (mm)	22.72±0.79	21.24-24.18	22.9±0.88	21.04-24.46	23.10±0.67	22.02-24.6	23.35±0.65	21.81-24.07	0.059
CCT(µm)	549.76±32.48	483-597	550.95±24.49	508-597	546.69±32.82	488-622	552.08±51.75	477-656	0.951
AD (mm)	2.85±0.25	2.34-3.32	2.99±0.25	2.45-3.38	3.05±0.18	2.72-3.52	3.28±0.19	3.02-3.56	**<0.001**
ACD(mm)	3.39±0.24	2.91-3.91	3.54±0.26	2.95-3.95	3.60±0.19	3.28-4.14	3.84±0.16	3.57-4.08	**<0.001**
LT (mm)	3.7±0.29	3.31-4.38	3.52±0.19	3.19-3.89	3.47±0.16	3.13-3.83	3.42±0.19	3.21-3.76	**<0.001**
LD (mm)	12.3±0.45	11.55-13.36	12.38±0.45	11.07-13	12.10±0.38	11.23-12.81	12.26±0.31	11.61-12.83	0.075
VCL (mm)	15.64±0.73	14.31-16.91	15.84±0.83	14.29-17.34	16.04±0.65	14.82-17.83	16.14±0.77	14.32-17.24	0.116

ACD, Anterior Camera depth; AD, Humour Aquosus depth; AL, Axial length; CCT, Central corneal thickness; LT, Lens thickness; Max, Maximum; Min, Minimum; N, Number of participants; SD, Standard Deviation; LD, Limbus diameter; VCL, Corpus vitreum length

Table 2. Evaluation of measurements in boys according to age groups

	Age groups (Among boys)								
Measurements	4-6 Age Group (N=18)		7-9 Age Group (N=9)		10-12 Age Group (N=17)		13-15 Age Group (N=5)		p
	Mean±SD	*Min-Max*	*Mean±SD*	*Min-Max*	*Mean±SD*	*Min-Max*	*Mean±SD*	*Min-Max*	
AL (mm)	22.97±0.72	21.68-24.18	23.54±0.59	22.86-24.46	23.54±0.54	22.78-24.60	23.71±0.34	23.28-24.07	**0.015**
CCT (µm)	549.83±32.63	485-597	550.22±21.23	516-582	549.00±36.01	488-622	535.40±58.98	477-627	0.866
AD (mm)	2.90±0.27	2.34-3.32	3.15±0.14	2.99-3.38	3.08±0.08	2.92-3.17	3.26±0.21	3.02-3.50	**0.001**
ACD (mm)	3.43±0.25	2.91-3.91	3.70±0.13	3.56-3.95	3.63±0.09	3.41-3.74	3.80±0.17	3.57-4.02	**<0.001**
LT (mm)	3.70±0.26	3.34-4.38	3.43±0.16	3.19-3.60	3.46±0.12	3.28-3.68	3.35±0.13	3.22-3.51	**0.001**
LD (mm)	12.40±0.47	11.58-13.36	12.58±0.27	12.22-13	12.22±0.31	11.80-12.81	12.33±0.14	12.20-12.51	0.131
VCL (mm)	15.84±0.61	14.63-16.91	16.41±0.64	15.39-17.34	16.46±0.57	15.72-17.83	16.57±0.47	16.06-17.24	**0.013**

ACD, Anterior Camera depth; AD, Humour Aquosus depth; AL, Axial length; CCT, Central corneal thickness; LT, Lens thickness; Max, Maximum; Min, Minimum; N, Number of participants; SD, Standard Deviation; LD, Limbus diameter; VCL, Corpus vitreum length

Table 3. Evaluation of measurements in girls according to age groups

Measurements	Age groups (Among girls) 4-6 Age Group (N=18) Mean±SD	Min-Max	7-9 Age Group (N=9) Mean±SD	Min-Max	10-12 Age Group (N=17) Mean±SD	Min-Max	13-15 Age Group (N=5) Mean±SD	Min-Max	p
AL (mm)	22.33±0.79	21.24-23.54	22.42±0.75	21.04-23.31	22.71±0.52	22.02-23.78	23.12±0.71	21.81-23.78	0.061
CCT (µm)	549.64±33.83	483-595	551.50±27.61	508-597	544.63±30.54	502-615	562.50±47.75	523-656	0.663
AD (mm)	2.78±0.20	2.49-3.19	2.87±0.26	2.45-3.26	3.03±0.23	2.72-3.52	3.30±0.19	3.06-3.56	**<0.001**
ACD (mm)	3.33±0.20	3.02-3.73	3.42±0.28	2.95-3.86	3.57±0.24	3.28-4.14	3.86±0.15	3.72-4.08	**<0.001**
LT (mm)	3.70±0.34	3.31-4.38	3.59±0.20	3.24-3.89	3.48±0.18	3.13-3.83	3.47±0.22	3.21-3.76	0.079
LD (mm)	12.15±0.38	11.55-12.72	12.23±0.51	11.07-12.84	12.00±0.42	11.23-12.74	12.21±0.38	11.61-12.83	0.438
VCL (mm)	15.32±0.83	14.31-16.69	15.38±0.67	14.29-16.47	15.66±0.48	14.82-16.51	15.84±0.82	14.32-16.45	0.295

ACD, Anterior Camera depth; AD, Humour Aquosus depth; AL, Axial length; CCT, Central corneal thickness; LT, Lens thickness; Max, Maximum; Min, Minimum; N, Number of participants; SD, Standard Deviation; LD, Limbus diameter; VCL, Corpus vitreum length

However, this decrease was statistically significant in boys and not statistically significant in girls. AL and VCL parameters were observed to increase with increasing age in both boys and girls, but this increase was statistically significant in boys and not statistically significant in girls.

The etiology of refractive errors has been an important research topic in ophthalmology for many years. The imbalance in the development of ocular biometric components during emmetropization is the main cause of refractive errors.[11] Measurements of ocular biometric parameters have an important role in various clinical and research applications in ophthalmology. By way of example, the AL parameter is a fundamental value for intraocular lens (IOL) evaluation in cataract surgery and refractive lens exchange. CCT, an additional ocular biometric measure, can be utilized to detect contact lens-induced edema and diagnose corneal diseases including keratoconus and glaucoma.[12] Looking at the relationship between ocular biometric parameters and age, Hashemi et al. calculated AL (mean 23.13 mm), ACD (mean 3.01 mm), LT (mean 3.58 mm), CD (LD) (mean 12.34 mm) and CCT (mean 549.33 µm) values in a total of 638 participants aged 6-18 years.[11] Gobeka and Baysal measured AL (mean 23.06±0.71 mm), LT (mean 3.55±0.21 mm), VCL (mean 15.92±0.69 mm), ACD (mean 3.67±0.26 mm), CCT (mean 547.29±26.45 µm) and LD (mean 12.17±0.50 mm) in 36 healthy children with a mean age of 9.11±2.75 years.[13] When evaluated in terms of the same parameters, our study is consistent with the data found by Hashemi et al. and Gobeka and Baysal (Table 1).[11,13] Hashemi et al. found that AL and ACD increased with age and LT decreased with age,[11] while CD (LD) and CCT had no relationship with age In a study executed by Zhang et al. in 508 participants aged 3-6 years, it was found that AL and ACD parameters increased with age, LT parameter decreased with age, and CCT increased with age but was not statistically significant.[14] The findings of our study indicated that AD and ACD values grew with age, whereas LT decreased, while AL, CCT, CD (LD) and VCL increased with age, but this was not statistically significant. The data found by Hashemi et al., and Zhang et al., for ACD, LT and CCT values are consistent with the data of our study.[11,14] AL value was found to increase significantly with age in these two studies, but in our study, AL value increased with age, but this was statistically insignificant. When these values were analyzed separately for boys and girls, it was observed that the AL value increased in both of them, which was statistically significant in boys and insignificant in girls. We think that this difference in terms of AL value is owing to the sample size. Shi et al., calculated AL, ACD and WTW (LD) parameters (4.77±0.95 mm, 42.77±1.29 mm and 42.77±1.29 mm, respectively) in 110 healthy children aged 10.69±2.81 years with the IOL-Master 500 device.[15] The AL, ACD and WTW (LD) parameters in the age group appropriate for this study (10-12 age group) overlapped with the data calculated by Shi et al.[15] In a study by Huang et al., in 100 healthy children aged 7-14 years (mean age 10.37±1.81 years), AL (24.7±1.07 mm), CCT (552.27±33.6 µm), ACD (3.76±0.24 mm), LT (3.38±0.15 mm) and WTW (LD) (12.28±0.43 mm) parameters were measured with the IOL-Master 700 device.[16] The parameters of our study and the study of Huang et al., were very close to each other, but there was a slight difference between them.[16] We believe that this difference is due to the difference between the devices used in the measurements. In the study of Gopalakrishnan et al., in 1382 children aged between 5-16 years, AL, ACD and LT parameters were examined.[17] The study was planned by dividing into 10 groups according to age. Age groups were divided into 5.67±0.47, 6.84±0.37, 7.94±0.24, 9.02±0.98, 10.05±0.21, 10.70±0.50, 11.68±0.54, 12.64±0.59, 13.97±0.28 and 14.71±0.50 years. 50 years and AL (22.46±0.65, 22.55±0.62, 22.86±0.66, 22.90±0.70, 22.96±0.76, 23.27±0.85, 23.35±0.79, 23.39±0.93, 23.50±0.89 and 23.58±0.87 mm), ACD (3.32±0.23, 3.37±0.23, 3.45±0.22, 3.45±0.22, 3.45±0.24, 3.50±0.26, 3.56±0.24, 3.53±0.25, 3.57±0.28, 3.59±0.26 and 3.56±0.29 mm) and LT (3.82±0.20, 3.75±0.19, 3.69±0.20, 3.67±0.22, 3.61±0.25, 3.60±0.23, 3.60±0.23, 3.62±0.22, 3.62±0.21 and 3.60±0.22 mm, respectively, according to age groups) parameters were calculated.[17] In terms of AL, ACD and LT parameters, although the data of this study and our study in the South Indian population are close to each other, it is seen that there are racial differences. In addition, Gopalakrishnan et al., reported that AL and ACD data increased with age and LT decreased.[17] These results are consistent with our study. In a study conducted by Zhao et al., in 1528 children aged 4-9 years, AL, ACD and CD (LD) parameters were divided into 6 groups and the groups were compared with each other.[18] In terms of AL, ACD and LT parameters, although the data of this study and our study in the South Indian population are close to each other, it is seen that there are racial differences.[18] In addition, Gopalakrishnan et al., reported that AL and ACD data increased with age and LT decreased.[18] These results are consistent with our study. In a study conducted by Zhao et al., in 1528 children aged 4-9 years, AL, ACD and CD (LD) parameters were divided into 6 groups and the groups were compared with each other.[18] These groups were divided in to 4,5,6,7,8, and 9 age groups and AL (respectively 22.19±0.61, 22.43±0.63, 22.65±0.67, 22.76±0.71, 23.24±0.77 and 23.64±0.87mm), ACD (respectively 2.82±0.27, 2.87±0.26, 2.91±0.24, 2.93±0.23, 3.00±0.23 and 3.11±0.24 mm) and CD (LD) (12.00±0.43, 12.02±0.43, 12.04±0.44, 12.04±0.41, 12.03±0.4 and 12.05±0.42 mm) values were calculated.[18] When the parameters of the study by Zhao et al., and our study are compared, it is seen that the parameters are close but different from each other.[18] We think that this is due to differences between races. In addition, Zhao et al., reported that AL and ACD increased with increasing age, while CD (LD) did not change much with age.[18] These results seem to be compatible with our study parameters.

CONCLUSION

In conclusion, this study revealed how the biometric measurements of the eye are affected by age in the pediatric Turkish population. It was observed that ACD and AD increased and LT decreased with increasing age in healthy boys and girls pediatric subjects. It was also observed that AL and VCL increased with age in males.

Ethics Committee Approval: Ethics committee approval was received for this study from the Non-Interventional Clinical Research Ethics Committee of Niğde Ömer Halisdemir University (Date: 14/05/2024, Number: 2024/60).
Informed Consent: Written and/or verbal consent was obtained from children who participated in the study were asked both from themselves and from their parents.
Peer-review: Externally peer-reviewed.
Author Contributions: Concept- HK; Design- HK, KRZ; Supervision-HK, KRZ; Resources-HK, KRZ; Materails-HK, KRZ; Data Collection and/or Processing-KRZ, GYB, EK; Analysis and/or Interpretation- HK, ATÇ; Literature Search- HK, KRZ; GYB, EK; Writing Manuscript- HK, KRZ; ATÇ; Critical Review- HK, KRZ; GYB, EK.
Declaration of Interests: There is no conflict of interest for the authors in this study.
Funding: No financial support has been received for this study.

Etik Komite Onayı: Bu çalışma için Niğde Ömer Halisdemir Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulundan (Tarih: 14/05/2024, Sayı: 2024/60) onay alınmıştır.
Bilgilendirilmiş onam: Çalışmaya katılan çocukların hem kendilerinden hem de ebeveynlerinden yazılı ve/ veya sözlü onam alınmıştır.
Hakem Değerlendirmesi: Dış bağımsız.
Yazar Katkıları: Fikir- HK; Tasarım-HK, KRZ; Denetleme-HK, KRZ; Kaynaklar-HK, KRZ; Malzemeler-HK, KRZ; Veri Toplanması ve/veya işlenmesi-KRZ, GYB, EK; Analiz ve/veya yorum-HK, ATÇ; Literatür taraması-HK, KRZ; GYB, EK Yazıyı yazan - HK, KRZ; ATÇ; Eleştirel inceleme-HK, KRZ; GYB, EK.
Çıkar Çatışması: Yazarlar arasında herhangi bir çıkarç atışması yoktur.
Finansal Destek: Herhangi bir kurum ya da kuruluştan finansal bir destek alınmamıştır.

REFERENCES

1. Arıncı K, Elhan A. *Anatomi First Volume*. 7th ed. İstanbul: Güneş Tıp Kitapevi; 2020:354-361. ISBN:9789752777934
2. Arifoğlu Y. *Her Yönüyle Anatomi*. 3rd ed. İstanbul: İstanbul Tıp Kitabevleri; 2021:665-669. ISBN:978 6256820562
3. Tadros D, Trivedi RH, Wilson ME, Davidson JD. Ocular axial growth in pseudophakic eyes of patients operated for monocular infantile cataract: a comparison of operated and fellow eyes measured at surgery and 5 or more years later. *J AAPOS*. 2016;20(3):210-213. doi:10.1016/j.jaapos.2016. 01.011.
4. Shen L, You QS, Xu XL et al. Scleral and choroidal volume in relation to axial length in infants with retinoblastoma versus adults with malignant melanomas or end-stage glaucoma. *Graefes Arch Clin Exp Ophthalmol*. 2016;254(9):1779-1786. doi:10.1007/s00417-016-3345-7.
5. Bach A, Villegas VM, Gold AS, Shi W, Murray TG. Axial length development in children. *Int J Ophthalmol.* 2019;12(5):815-819. doi:10.18240/ijo. 2019.05.18.
6. Oke I, Nihalani BR, VanderVeen DK. Axial length and corneal curvature of normal eyes in the first decade of life. *Eur J Ophthalmol.* 2023;33(6):2217-2221. doi:10.1177/11206721231167643.
7. Truckenbrod C, Meigen C, Brandt M et al. Longitudinal analysis of axial length growth in a German cohort of healthy children and adolescents. *OPO*. 2021;41(3):532-540. doi:10.1111/opo.12817.
8. Garner LF, Yap MK, Kinnear RF, Frith MJ. Ocular dimensions and refraction in Tibetan children. *Optom Vis Sci*. 1995;72:266-271. doi:10.1097/000 06324-199504000-00007.
9. Zadnik K, Manny RE, Yu JA et al. Ocular component data in schoolchildren as a function of age and gender. *Optom Vis Sci.* 2003;80:226-236. doi:10.1097/00006324-200303000-00012.
10. Twelker JD, Mitchell GL, Messer DH et al. Children's ocular components and age, gender, and ethnicity. *Optom Vis Sci*. 2009;86:918-935. doi:10.1097/opx.0b013e3181b2f903.
11. Hashemi H, Jafarzadehpur E, Ghaderi S et al. Ocular components during the ages of ocular development. *Acta Ophthalmol*. 2015;93(1):74-81. doi:10. 1111/aos.12498.
12. Huang J, Zhao Y, Savini G et al. Reliability of a new swept-source optical coherence tomography biometer in healthy children, adults, and cataract patients. *J Ophthalmol*. 2020;2020:8946364. doi:10.1155/2020/8946364.
13. Gobeka HH, Baysal Z. The cross-sectional case-control integrated analysis of vitreous chamber length, corneal volume, and globe biometry in pediatric beta-thalassemia major. *Turkiye Klinikleri J Ophthalmol*. 2023;32(1):52-59. doi:10.5336/ ophthal.2022-93829.
14. Zhang Y, Su M, Liang L et al. The Guiding Significance of Ocular Biometry in Evaluating the Refractive Status of Preschool Children. *Ophthalmic Res.* 2023;66(1):1213-1221. doi:10.1159/000533782.

15. Shi Q, Wang GY, Cheng YH, Pei C. Comparison of IOL-Master 700 and IOL-Master 500 biometers in ocular biological parameters of adolescents. *Int J Ophthalmol.* 2021;14(7):1013-1017. doi:10.18240/ijo.2021.07.08.
16. Huang J, Zhao Y, Savini G, et al. Reliability of a new swept-source optical coherence tomography biometer in healthy children, adults, and cataract patients. *J Ophthalmol.* 2020;8946364. doi:10.1155/2020/8946364.
17. Gopalakrishnan A, Hussaindeen JR, Chaudhary R, et al. Results of the school children ocular biometry and refractive error study in South India. *Turk J Ophthalmol.* 2022;52(6):412-420. doi:10.4274/tjo.galenos.2021.90008
18. Zhao MH, Song Y, Liu JL, et al. Investigation of ocular biometry in 4–to 9-year-old Chinese children. *BMC Ophthalmol.* 2023;23(1):225. doi:10.1186/s12886-023-02975-5.