ORIGINAL ARTICLE

Frequency of Anisometropia and Associated Factors among Adult Patients Attending Tertiary Eye Hospital, Karachi

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Abstract

Background: Anisometropia is a variation in ocular refraction between both eyes. A 1 diopter difference in the refractive power of the two eyes creates a 2% difference in the size of the two retinal images.

Objective: To find out the frequency of Anisometropia and related factors among adult patients visiting the tertiary eye hospital, Karachi.

Methodology: A cross-sectional study was conducted from June 2023 to August 2023 in the refraction department of Al-Ibrahim Eye Hospital, Karachi. The sample was collected through non-probability, convenience sampling. Patients underwent a detailed examination, and both objective and subjective refractions were performed. Near and distance visual acuity were taken, and the spherical equivalent was also computed. The data were analysed using SPSS Version 26.0.

Results: A total of 410 patients were included in the study. Mean age was 23.35±3.56 years. The majority of participants were female, 64.6% (n=265). The frequency of Anisometropia was 23.65% (n= 97). Anisometropia was commonly found in the high age groups (26-30 years old) in 49.5% (n=48). Females were found to be more prone to Anisometropia than males (OR: 1.52,95% CI: 1.26–2.78). The odds of having Anisometropia are 1.881 times higher in hyperopia patients (OR: 1.881, 95% CI: 0.088–3.425), whereas patients with myopia are 3.50 times more at risk of Anisometropia (OR: 3.50, 95% CI: 1.513–5.891) compared to Emmetropia.

Conclusion: Our study concludes that the frequency of Anisometropia is 23.65%. Among other refractive statuses, myopia is found to be the most common associated factor for the presence of Anisometropia.

Keywords: *Anisometropia, cross-sectional studies, myopia, prevalence, refractive error.*

INTRODUCTION

Anisometropia is a variation in ocular refraction between both eyes [1]. A variation in retinal imaging of up to 5% between the two eyes is well tolerated. Anisometropia is well tolerated up to 2.5 diopters and can be tolerated between 2.5 and 4 diopters depending on individual sensitivity [2]. The ocular component axial length was the most significant contributing factor to Anisometropia in 68 anisometropic patients. A variation in axial length between the two eyes was noted in 97% of the instances, particularly in patients with Anisometropia higher than 5D [3]. In most cases, trauma, glaucoma, cataract, and even some eye surgeries can cause acquired Anisometropia in old age [4]. This condition can occur in any situation involving refractive errors, such as myopia, hypermetropia, or astigmatism [5].

There are various obstacles in determining the prevalence of Anisometropia. To begin with, the measurement of refractive error can vary from one measurement to the next. Second, several variables have been used to describe Anisometropia, and the distinction between Anisometropia and isometropia depends on how they are defined [6]. Epidemiological studies of various data have revealed the prevalence of Anisometropia worldwide. A study conducted in a rural Korean adult population indicates that the prevalence of Anisometropia was 13.8% [7]. A study conducted in Ghana showed a prevalence of 5.97%, with 5.26% of the cases being male and 6.90% being female [8]. A population-based study in the Middle East region found the prevalence of Anisometropia in the adult population equal to or greater than 1.00 D to be 7.7% [9]. In the adult population of mainland China [10] and India (Bhopal) [11], the prevalence of Anisometropia is 29.62% and 16.5%, respectively. Recently, most of the work has been done on the frequency of Anisometropia in school-age children, but no local literature is available if we wish to examine the related factors for the presence of Anisometropia.

Therefore, in the present study, we want to know the frequency and associated factors of Anisometropia in adults. The majority of previous studies have been conducted on school-going children in Asian countries and older age groups, but no such studies have been done in the adult age group.

METHODOLOGY

A cross-sectional study was conducted from June 2023 to August 2023 in the Refraction Department of Al-Ibrahim Eye Hospital. After taking approval from the Hospital's research ethics committee, the sample

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size was collected. The ethical committee granted the study protocol number REC/IPIO/2023/14. Patients were recruited through non-probability convenience sampling.

Patients who visited the refraction department within the above-mentioned duration and between the ages of 17 and 30 years were included in the study. Patients suffering from any anterior or posterior segment ocular pathology and any trauma were excluded from the study.

After obtaining cosnent for participation into the study, the patient's history was taken, followed by a detailed examination that included auto-refraction, near and distance visual acuity (with and without correction, and with a pinhole). Subjective refraction was used to confirm the refraction, and the spherical equivalent was also computed. Anisometropia was defined as the difference in cycloplegic inter-eye spherical equivalent or cylinder degree of≥1.00 Diopter, respectively [12, 13].

Data were analysed using SPSS version 26. After checking the normality of the data through the Shapiro-Wilk test, it was found to be normally distributed. Mean ± standard deviation was calculated for continuous variables. All categorical variables were presented in frequency and percentages. The differences between categorical groups, such as gender and refractive status, were compared using the chi-square test [14], and an independent sample t-test was used to compare continuous groups, such as age [15]. To examine the association between factors and Anisometropia, bivariate logistic regression was employed. For p-value <0.2, the variables were entered into a multiple logistic regression model [16]. P-value <0.05 was considered statistically significant.

RESULTS

A total of 410 patients were involved in the study. Mean age was 23.35±3.56 years (range:17-30). The majority of participants, 64.6% (n=265), were female. The frequency of Anisometropia was 23.5% (n=97). Anisometropia was commonly found in high age groups, specifically in those aged 26-30, in 49.5% (n=48), followed by 34% (n=33) and 16.5% (n=16) in the age groups 22-25 and 17-21 years, respectively. The frequency of Anisometropia was significantly associated with refractive status (p<0.05). The baseline characteristics are depicted in Table **1**. Different types of Anisometropia were presented in **Fig. (1)**.

The results showed that females were at a higher risk of Anisometropia than males (OR: 1.52, 95% CI: 1.26–2.78). In comparison with the 17-21 year age group, the risk of Anisometropia is 1.614 times higher in the 26-30 year age group (OR: 1.614, 95% CI: 0.611–3.322). Patients with hyperopia suffered more from Anisometropia (OR: 1.881, 95% CI: 0.088–3.425) as compared to Emmetropia. Similarly, patients with myopia were 3.50 times more at risk of Anisometropia (OR: 3.50, 95% CI: 1.513–5.891) than Emmetropia. In comparison with the 17-21 year age group, the risk of Anisometropia is 1.614 times higher in the 26-30 year age group (OR: 1.614, 95% CI: 0.611–3.322) (**Table 2**).

DISCUSSION

The present study focused on the frequency and related factors of Anisometropia. This study is unique in the sense that no such literature is available for the age group (17-30). The main findings of the study were that Anisometropia increases with age and is associated with refractive status. These findings will undoubtedly help not only clinicians to take essential steps but also the general public, so that they prioritise regular eye checkups from an early age.

Different countries reported various prevalence rates of Anisometropia. In a study from Australia, it was found that the burden of Anisometropia was 2.7% [17]. In another study from Australia, the prevalence of Anisometropia was found to be only 1.6% in children [18]. A recent study conducted in China showed an

Table 1: Baseline characteristics of study participants.

Variables	Total (n=410)	With Anisometropia (n=97)	Without Anisometropia (n=313)	p-value
Age (Mean±S.D)	23.35±3.56	24.56±2.45	22.88±4.41	0.001
Gender, n(%)				
Male	145 (35.3)	30 (30.9)	115 (36.7)	0.082
Female	265 (64.6)	67 (69.1)	198 (63.2)	
Refractive Status, n(%)				
Emmetropia	102 (24.8)	10 (10.3)	92 (29.4)	0.001
Hyperopia	53 (12.9)	5 (5.1)	48 (15.3)	
Myopia	255 (62.1)	82 (84.5)	173 (55.2)	

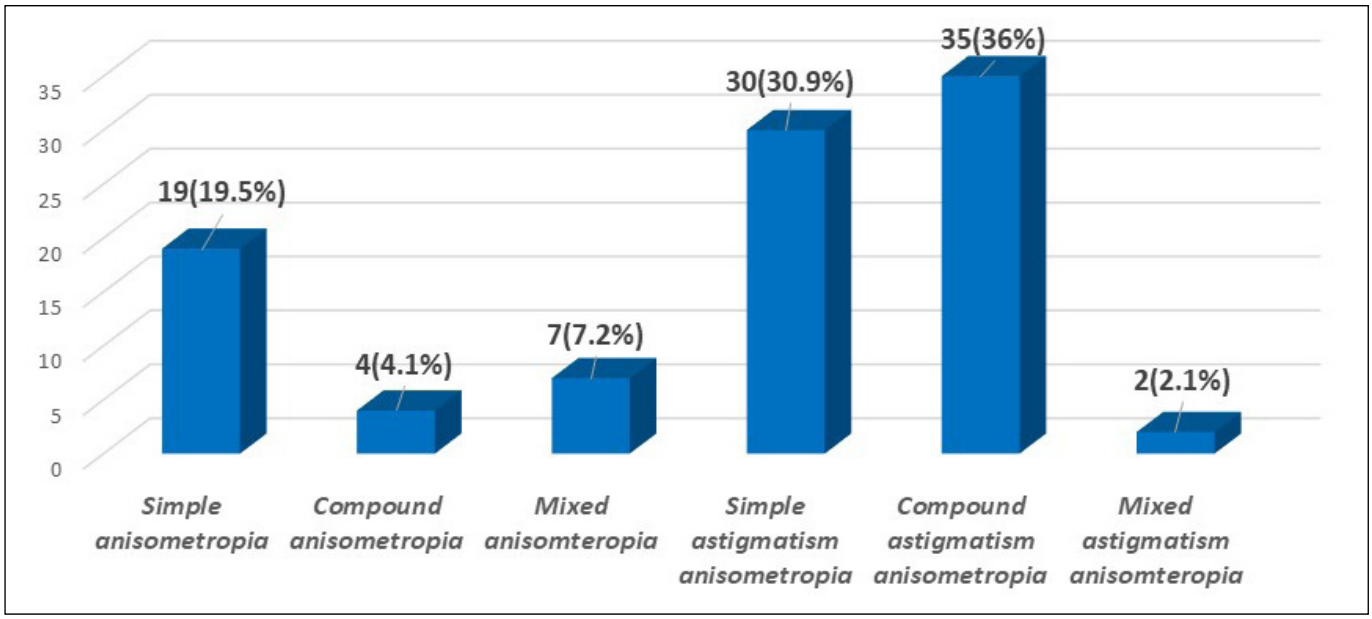

Fig. (1): Types of Anisometropia (n=97).

increase in prevalence to 13.2% [19]. The present study reported that the frequency of Anisometropia is 23.65%.

However, the frequency of Anisometropia varies with age, as we found in our study. The age group 26-30 years has the highest frequency of Anisometropia, at 49.5%. Similar findings were reported in a study from Portugal [20], where children aged 6-7 years had an 8.5% prevalence of Anisometropia, and those aged 12-13 years had a 9.4% prevalence. Another study conducted in the adult rural Korean population aged 40 years and older found that 13.8% of subjects had Anisometropia of more than 1.0 Diopter [7].

A study from Singapore [21] showed age was significantly linked with Anisometropia (OR: 1.19, 95% CI: 0.92-1.55, p<0.05). Same findings were seen in the present study, where Anisometropia was associated with high age groups (OR: 1.614, 95% CI: 0.611-3.322, p<0.05).

A study from Pakistan [22] reported astigmatic Anisometropia has the highest frequency (48%) among other types. Similar findings were observed in the present study, as 36% of patients were found to have compound astigmatism and Anisometropia. The effect of Anisometropia on gender is divisive. Another study from Singapore [23] showed a high frequency of Anisometropia among female high school students. Similarly, a study from Bangladesh [24] conducted among individuals aged ≥30years showed similar results. A study conducted in China [10] found that the likelihood of Anisometropia was higher in females than in males (OR: 1.25, 95% CI: 1.13-1.39, p<0.001). A similar finding was observed in our study (OR: 1.52, 95% CI: 1.26-1.78, p<0.05).

A study by Tong *et al*. [21] conducted among Singaporean children found that myopia is independently related to

Table 2: Factors associated with Anisometropia.

Factors	cOR(95% CI)	p-value	aOR(95% CI)	p-value
Gender				
Male	Reference	-	Reference	-
Female	1.40(1.11-2.31)	0.001	1.52(1.26-2.78)	0.001
Age (years)				
17-21	Reference	-	Reference	-
22-25	1.219(0.576-2.579)	0.031	1.45 (0.723-2.915)	0.001
26-30	1.393(0.390-4.977)	0.025	1.614 (0.611-3.322)	
Refractive Status, n(%)				
Emmetropia	Reference	-	Reference	-
Hyperopia	2.251(1.112-5.127)	0.032	1.881(0.088-3.425)	0.001
Myopia	5.521(0.141-8.845)	0.001	3.50(1.513-5.891)	

Where CI: Confidence interval, cOR: Crude odds ratio, aOR: Adjusted odds ratio

Anisometropia (OR: 4.60, 95% CI: 3.50-6.05, p<0.05). Similar findings were observed in the present study, indicating that myopia is associated with the presence of Anisometropia (OR: 3.50, 95% CI: 1.513-1.5.891, p<0.05).

LIMITATIONS

Due to limited resources and time constraints, we did not consider other factors that may be associated with Anisometropia. We did not generalise our findings as it is a single-centre study.

CONCLUSION

Our study concludes that the frequency of Anisometropia is 23.65%. Among other refractive statuses, myopia is found to be the most common associated factor for the presence of Anisometropia.

RECOMMENDATIONS

Free eye screening tests should be given priority at the initial level, such as schools, colleges, and other institutions, to diagnose the presence of Anisometropia at an early age.

ETHICAL APPROVAL

Ethical approval was obtained from the Research Ethical Committee of Al-Ibrahim Eye Hospital, Isra Postgraduate Institute of Ophthalmology, Karachi (REF letter No. REC/IPIO/2023/14 Dated: 16th May 2023). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and the Helsinki Declaration.

CONSENT FOR PUBLICATION

Written informed consent was taken from the patients.

AVAILABILITY OF DATA

The data set may be acquired from the corresponding author upon a reasonable request.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORS' CONTRIBUTION

SU: Design the study and write up of the introduction

ASK: Write up of discussion and data collection

TM: Write up of results, statistical analysis and final review

SG: Write up of methodology and data collection

YA: Facilitate writing the introduction and data collection

SU: Literature search and editing of a manuscript

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