THE PREVALENCE OF REFRACTIVE ERRORS OF PATIENTS ATTENDING SHAHID DR ASO EYE TEACHING HOSPITAL IN SULAIMANIA GOVERNORATE

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ABSTRACT

Background

Refractive error means that the shape of the eyes does not bend light correctly, resulting in a blurred image. The main types of refractive errors are myopia, hyperopia and astigmatism.

Objectives

To determine the prevalence of refractive errors in patients that visited Shahid Dr Aso Eye Teaching Hospital in Sulaimania.

Methods

A descriptive cross-sectional study of patients examined at Shahid Aso Eye Teaching Hospital from Feb. to Oct. 2018. Subjects whom have considered had best corrected visual acuity by standardized subjective refraction of 6/12 or better. The refractive errors were classified by the spherical equivalent (SE): sphere+½ cylinder. Myopia were put in groups of as a SE more than−0.50 D, hyperopia as a SE more than+0.50 D, and emmetropia as a SE between −0.50 and +0.50, both included. Astigmatism equal or higher than 0.25 D in minus cylinder form was used. Exclusion criteria are patients with documented history of cataract extraction (pseudophakia or aphakia), amblyopia, refractive surgery or other corneal/ocular surgery.

Results

A total of 355 randomly selected subjects of different age (10-80 year mean 33.90) were included. The estimated prevalence (95%, confidence interval) among all subjects were astigmatism (63.9%), myopia (18.8%), hyperopia (9.1%) and emmetropia (8.2%). The mean age of myopia was (27.12±15.7) year, hyperope was (50.8±7.5) year and astigmatism was (33.6±16.6) year. Compound myopic astigmatism was the most common type of astigmatism and against-the-rule astigmatism increasing with age.

Conclusions

Astigmatism is the most common refractive error in all age group and compound myopic astigmatism constitutes about half of it. Further programs and studies must be developed to address the refractive errors needs of the population in Sulaimania.

Keywords: *Refractive error, Spherical Equivalent and Aging.*

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INTRODUCTION

Interplay among corneal power, lens power, anterior chamber depth, and axial length determines an individual's refractive status. All 4 elements change continuously as the eye grow. On average, babies are born with about 3.00 D of hyperopia. In the first few months of life, this hyperopia may increase slightly, but it then declines to an average of about 1.00 D of hyperopia by the end of the first year because of marked changes in corneal and lenticular powers, as well as axial length growth. By the end of second year, the anterior segment attains adult proportions; however, the curvatures of the refracting surfaces continue to change measurably[(1)] .

Myopia increases steadily with increasing age. In the United States, the prevalence of myopia has been estimated at 3% among children aged 5-7 years, 8% among those aged 8-10 years, 14% among those aged 11-12 years and 25% among adolescents aged 12-17 years [(2)].

Juvenile-onset myopia, defined as myopia with an onset between 7 years and 16 years of age, is due to growth of axial length. Risk factors include esophoria, against-the-rule astigmatism, premature birth, family history, and intensive near work. Adult-onset myopia begins at about 20 years of age, and extensive near work is a risk factor. The etiological factors concerning myopia are complex, involving both genetic and environmental factors. Identical twins separated at birth and having different work habits do not show significant differences in refractive error. Some forms of severe myopia suggest dominant, recessive, and even sex-linked inheritance pattern [(3)].

Less is known about the epidemiology of hyperopia than that of myopia. There appears to be an increase in the prevalence of adult hyperopia with age that is separate from the development of nuclear sclerotic cataract. Nuclear sclerosis is usually associated with a myopic shift. In Caucasians, the prevalence of hyperopia increases from about 20% among those in their 40s to about 60% among those in their 70s. In contrast to myopia, hyperopia has been associated with lower educational achievement [(4)].

Uncorrected refractive errors are a common cause of visual impairment worldwide that can be prevented [(5)]. It has been shown that refractive errors such as hyperopia and astigmatism increase with age and are most frequent in Whites than Hispanics, Blacks or Asians [(6)]. Wang et al. described the prevalence of refractive errors in a population of adult Americans. Adults from 43 to 84 years of age living in Beaver Dam, Wisconsin were evaluated in five-year intervals. They concluded that in the study group hyperopia was more frequent than myopia. They also found that the prevalence of hyperopia increased and myopia decreased with increased age [(7)]. In 2009, Anton et al. determined the prevalence of refractive errors in adults older than 40 years of age in Segovia, Spain, using the spherical equivalent. They found the mean of hyperopia and astigmatism increased with age ($P<0.01$), hyperopia being more frequent (43.6%) than myopia (25.5%) in older population. Munoz et al. estimated the prevalence of blindness and uncorrected refractive errors in a population-based study composed of Mexicans Americans older than 40 years of age. Visual loss was higher in their population than in whites, but comparable to African-Americans. Of those with visual loss 73% were related to uncorrected refractive errors [(8)].

METHODS

This study is a descriptive cross-sectional study to estimate the prevalence of refractive errors in patients visited Shahid Aso Eye Teaching Hospital in Sulaimania Governorate/Iraq between Feb. to Oct 2018. Refraction information from those patients was selected for the study: 355 patients were selected randomly to generate a sample representative of the study. Each patient obtained and completed a consent, and use of information authorization form during the examination process.

Refractive Error Criteria

The refractive assessment was based on subjective refraction with visual acuity assessment using a Snellen chart at 6 m. Subjects considered had best corrected visual acuity by standardized subjective refraction of 6/12 or better at 6 m in both eyes. The refractive errors were classified by the spherical equivalent (SE): sphere+½ cylinder. Myopia was classified as a spherical equivalent>−0.50 D, hyperopia as a spherical equivalent>+0.50 D, and emmetropia as spherical equivalent between −0.50 and +0.50. Moderate myopia was defined as a spherical equivalent between −0.50 and −3.00 D, and moderate hyperopia as a spherical equivalent between +0.50 and +3.00. High myopia was defined as a spherical equivalent more than −5.00 D, and high hyperopia more than +5.00 D. Astigmatism in minus cylinder form was used. Astigmatism against the

rule (ATR) was defined as axis 90◦±30◦, astigmatism with the rule (WTR) from 0◦ to 30◦ and 150◦ to 180◦ and oblique astigmatism (O) 31◦ to 59◦ and 121◦ to 149◦. All refractive errors were obtained at the time of the visit using a trial set with a range from −20.00 D to +20.00 D and cylinder range −0.25 to −6.00 D. Patients with documented history of cataract extraction (pseudophakia or aphakia), refractive surgery or other corneal/ocular surgery, amblyopia or any ocular disease were excluded from the study. Descriptive statistics was used for data analysis. The statistical analysis program SPSS 20 was used to perform the calculation.

RESULTS

Sample distribution by sex, employment, residency and mean age is shown in Table (1).

Distribution of refractive errors among total population revealed that in right and left eye (8.2 and 9.3%) had emmetropia, (18.8 and 18%) were myopic, (9.1 and 9.3%) were hyperopic and the prevalence of astigmatism was (63.9 and 62.8%). Distribution of types of astigmatism were in both eyes as follows simple myopic astigmatism was (27.1 and 29.1%), compound myopic astigmatism was (56 and 50.2%), (4.4 and 7.2%) had simple hyperopic astigmatism, compound hyperopic astigmatism was present in (9.3 and 9.4%) and mixed astigmatism was (3.1 and 4%) these shown in Table (2).

Refractive error according to the gender and occupations determined as in Table (3)

Distribution of refractive errors, types of astigmatism and rules of astigmatism according to the mean ages is shown in Table (4).

Distribution of refractive errors in different age groups as in Figure (2).

Table 1. Socio-demographic characteristics of the participants.

Socio-demographic characteristics	Frequency	Percentage
Gender		
Male	134	37.7
Female	221	62.3
Total	355	100.0
Occupation		
Unemployed	114	32.1
Employed	111	31.3
Student	130	36.6
Total	355	100.0
Residence		
Inside Sulaimani	280	78.9
Outside Sulaimani	75	21.1
Total	355	100.0
Age (Year) **Minimum: 10** **Maximum: 79** **Mean: 33.9** **Std. Deviation: 16.8**		

Table 2. Distribution of refractive errors among total populations.

Diagnosis	Frequency	Percentage
Diagnosis (Right eye)		
Emmetrope	29	8.2
Myope	66	18.8
Hyperope	32	9.1
Astigmatism	225	63.9
Total	352	100.0
Diagnosis (Left eye)		
Emmetrope	33	9.3
Myope	64	18.0
Hyperope	35	9.9
Astigmatism	223	62.8
Total	355	100.0
Type of Astigmatism (Right eye)		
Simple myopic astigmatism	61	27.1
Compound myopic astigmatism	126	56.0
Simple hyperopic astigmatism	10	4.4
Compound hyperopic astigmatism	21	9.3
Mixed astigmatism	7	3.1
Total	225	100.0
Type of Astigmatism (Left eye)		
Simple myopic astigmatism	65	29.1
Compound myopic astigmatism	112	50.2
Simple hyperopic astigmatism	16	7.2
Compound hyperopic astigmatism	21	9.4
Mixed astigmatism	9	4.0
Total	223	100.0

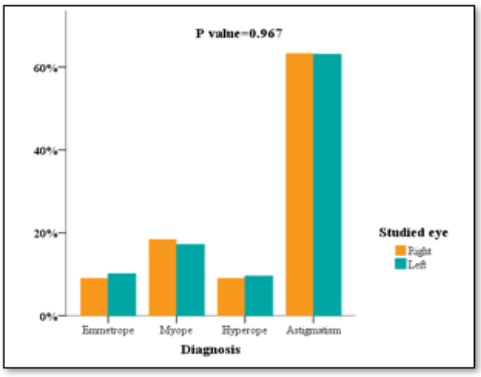

Figure 1. Distribution of refractive errors in both eyes.

Table 3. Distribution of refractive errors according to the occupation and gender.

Variables	Diagnosis				P values
	Emmetrope N(%)	Myope N(%)	Hyperope N(%)	Astigmatism N(%)	
Right Eye					
Occupation					
Unemployed	6(5.4)	8(7.1)	22(19.6)	76(67.9)	<0.001
Employed	15(13.5)	17(15.3)	10(9.0)	69(62.2)	
Student	8(6.2)	41(31.8)	0(0.0)	80(62.0)	
Left eye					
Occupation					
Unemployed	7(6.1)	16(14.0)	19(16.7)	72(63.2)	0.001
Employed	13(11.7)	15(13.5)	14(12.6)	69(62.2)	
Student	13(10.0)	33(25.4)	2(1.5)	82(63.1)	
Right Eye					
Gender					0.607
Male	13(9.8)	21(15.9)	11(8.3)	87(65.9)	
Female	16(7.3)	45(20.5)	21(9.5)	138(62.7)	
Left eye					
Gender					0.400
Male	17(12.7)	23(17.2)	13(9.7)	81(60.4)	
Female	16(7.2)	41(18.6)	22(10.0)	142(64.3)	

Table 4. Distribution of refractive errors, astigmatism and rule of astigmatism according to mean age.

Diagnosis	Age (Years) Mean±S. D	P values
(Right eye)		
Emmetrope	32.9±15.5	
Myope	27.12±15.7	<0.001
Hyperope	50.8±7.5	
Astigmatism	33.6±16.6	
(Left eye)		
Emmetrope	34.2±16.2	
Myope	28.8±16.6	<0.001
Hyperope	45.6±11.7	
Astigmatism	33.4±16.9	
Type of Astigmatism		
Simple myopic astigmatism	31.1±15.1	
Compound myopic astigmatism	31.9±15.7	0.001
Simple hyperopic astigmatism	44.7±20.8	
Compound hyperopic astigmatism	45.7±16.4	
Mixed astigmatism	32.4±20.9	
Type of Astigmatism		
Simple myopic astigmatism	31.3±14.8	
Compound myopic astigmatism	30.7±15.8	<0.001
Simple hyperopic astigmatism	41.0±19.3	
Compound hyperopic astigmatism	48.3±17.2	
Mixed astigmatism	35.3±19.7	
Rule (Right eye)		
With-rule astigmatism	27.6±12.7	<0.001
Against-rule astigmatism	42.6±17.1	
Oblique	37.9±19.5	
Rule (Left eye)		
With-rule astigmatism	28.0±14.7	<0.001
Against-rule astigmatism	42.1±14.8	
Oblique	36.4±20.2	

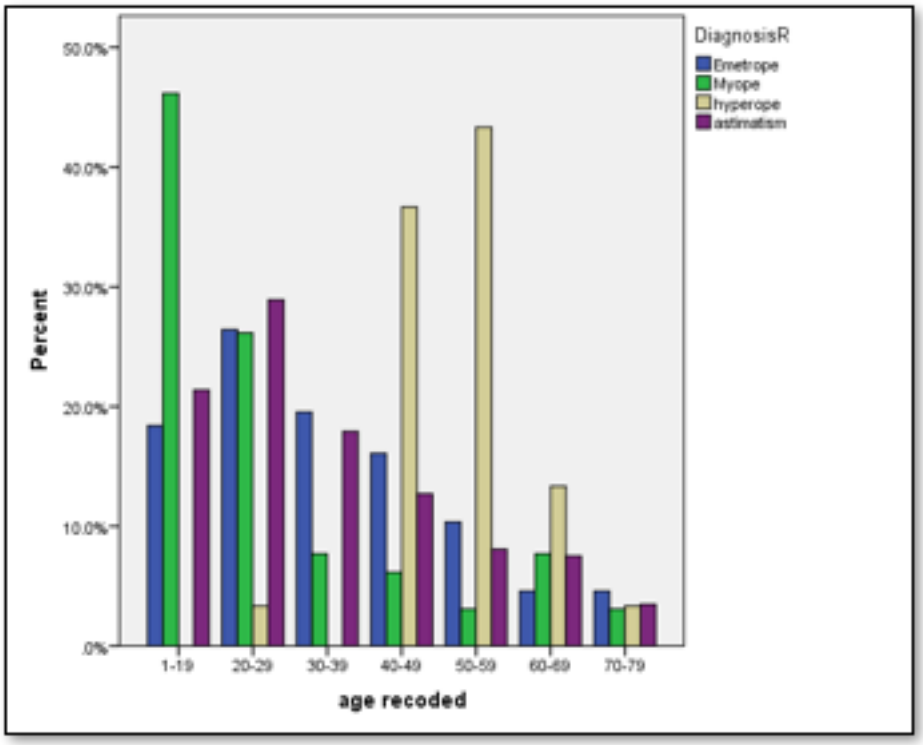

Figure 2. Age versus percentage of population with different diagnosis for right eye.

DISCUSSION

The study results provided an understanding of the prevalence of refractive errors in patient that seek examination because they have refractive errors in. No previous study has been performed to determine the distribution of refractive conditions among patients that attend Shahid Dr. Aso Eye Teaching hospital in Sulaimania.

It is important to consider that prevalence of refractive errors between different ethnic groups and geographical regions are difficult to be compared as a result of differences between criteria and methodological process. This study defined myopia as a spherical equivalent larger than -0.5 and hyperopia larger than +0.50 similar to other studies [5, 6, 7, 8, 9, 13].

This study describes refractive errors in patients of different age group from 10 to 80 years old with mean of (33.9), it provides for the first time data concerning the distribution of refractive errors and their characteristics for the region. Our study shows a high prevalence of astigmatism with a mean age of (33.6±16.6) year. According to the findings throughout the population studied the most common refractive condition is astigmatism (63.9% and 62.8%) followed by myopia (18.8% and 18%) then hyperope (9.1% and 9.9%) and lastly emmetrope (8.2% and 9.3%). To compare these results with other studies it is important to take into consideration that the age of the population varies among studies affecting the comparison with our results because we have wide range age group [12].

According to the findings throughout the clinical population studied prevalence of refractive errors in relation to the mean age of population as follows: mean age of hyperopia (50.8±7.5), myopia (27.12±15.7) and astigmatism (33.6±16.6). Our study correlate to those of other studies as in the Los Angeles latino eye study that myopia high in young and decrease with age [5]. A decrease in with-the-rule astigmatism with an increase in against-the-rule is observed as the population aged [9] .This finding can also be explained as a result of crystalline lens changes during the aging process.

Our study shows an increased prevalence of hyperopia with a decreased prevalence of myopia with increased age and decrease of astigmatism in middle age population. Our result are similar to other studies performed in general populations in united states, Western Europe Australia and Spain [10].

In our results myopia is common in adolescent and young adult whose near work employee mostly students this indicate effect of near work on refractive change.

The increase in hyperopia has been attributed to accommodation loss followed by an increase in manifest hyperopia [3]. The myopic shift in older persons can be attributed to lens opacities. Direct comparison to other studies is not possible due to different definitions of refractive conditions and age ranges among studies.

Other studies have demonstrated a decrease in the prevalence of myopia and an increase in the prevalence of hyperopia and astigmatism with increasing age [11].

Frequency of refractive conditions in our study according to gender statistically was not significant, while myopia was found more frequently in males in most of the studies [7].

Other studies reported no statistically significant differences between genders. Our results concur with those studies even though our study is not population-based [13].

In conclusions, The results reveal that the frequency of refractive errors among patients attending Shahid Dr. Aso Eye Teaching Hospital, high percentage of astigmatism was present among all age groups, compound myopic astigmatism was common type of astigmatism and against-the-rule astigmatism increasing with age, it has been postulated that a decrease in axial length, changes in the ciliary body and a decreased index of refraction at the lens cortex contribute to the shift toward hyperopia. Further studies are needed to address and describe the most common preventable cause of visual impairment in the Sulaimani.

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