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Refractive errors in Thiqar secondary schooling graduate students: prevalence and determinants at 2016

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Background: Refractive error is consider as one of the main health problems of concern, that has real burden on community institutions and individuals

Aim: The aim of this study was to assess the prevalence and subtypes of refractive errors in students want to be enrolled in the universities and institutions after completing of their secondary graduation,

Methodology: A cross sectional analytical comparative study including a total of 4322 students attending the pre-enrollment fitness clinic in public health care center ,extended all over the last four months of the 2016; where routine medical examination before university enrollment underwent visual screening including uncorrected visual acuity, color vision, in addition to a slit-lamp examination. Students with a visual acuity of 6/9 or less in either eye undergo objective refraction and subjective verification to determine the best-corrected visual acuity.

Results: A total of 4322 students were enrolled in this study,2030 males and 2292 females ; refractive error was found in. (35.8%) students, Myopia was the main type of refractive error Astigmatism then Hypermetropia (24.2%, 11.5%, 1.1%) respectively. Age , sex, address, average of suxcess and number of hours of using electronic devices was the main significant independent variables for the error of refraction occurance.

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Conclusion: Refractive error is a one of the common causes of visual impairment among the group of adolescents want to be enrolled for university education in different universities. The study enabled to understand trends of refractive error in Thiqarian students and demonstrated the importance of vision screening in providing timely eye care and identifying visually disabled secondary school students. Myopia is particularly more prevalent than that reported in other regions so early detection and correction is essential to avoid ametropic amblyopia.

Keywords: Refractive errors, Myopia, Hypermetropia, Astigmatism, Thiqar.

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Introduction

The eye function is to see clearly the objects around. The inability of the eye to accurately focus the rays of light coming from distance on the retina is called refractive error. Too short or too long eye in their length resulting in this condition, or because the lens or cornea have not the required power of refraction.[1]

Ametropia (refractive error) is a state of refraction, when parallel rays of light coming from infinity are focused in front or behind the retina after passing through the refractive power of the eye when the accommodation is at rest.[1-2]

Three types of refractive listed below:

Myopia (near-sight): By which the eye is too long and the light is focused in front of the retina resulting in blurring of distant objects but the near objects are seen clearly. The eye has too much optical power and to correct it that is can be reduced by either minus glasses or contact lenses, or by surgical intervention.[3]

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Hypermetropia: which also called as a far sight, A condition by which the light is focused behind the retina and the eye is too short. The eye has less optical power than is needed. When young the eye can use the lens within the eye to compensate, but reading glasses are needed at a relatively early age. Later, distance glasses (plus) are needed as well, such that glasses for distance and near are required.[1-2]

Astigmatism: when the cornea being more curved in one direction than the other in which doesn't focus light evenly on the retina. It either occur lonely (on its own) or may be associated with myopia or hypermetropia.[3]

A significant increase in the prevalance of myopia has been noted. This most probably due to the occurrence of civilizational changes such as the increase in intensive near work − reading, writing and working on a computer.[4] The occurrence of hyperopia among children, however decreases with age [5]. Children are born with physiological hyperopia. With the increase of age, the optical structures in the eyeball change, and hyperopia gradually decreases [6]. Prevalence of astigmatism among schoolchildren remains nearly at the same level of a few percent [7]. The existence of a growing demand for different clinical studies dealing with the development of the eye is based on the increasing use of contact lenses and the performance of corneal refractive surgeries, as well as intraocular lens implantation at the time being.

The World Health Organization's (WHO) categories of visual loss have only used "best corrected" visual acuity (VA), which meant that the magnitude of uncorrected refractive error (RE) could not be estimated from survey data. Recent consultation has recommended modification to this definition, suggesting that "presentingVA" (i.e., with distance spectacles, if usually worn) should be used in surveys as this better reflects the burden of visual impairment [8] and allows the prevalence of visual impairment and blindness due to uncorrected refractive errors to be estimated. The magnitude of visual impairment (<6/18 in the better eye) due to uncorrected RE has recently been estimated by the WHO to be 153 million (range of uncertainty 123 million to

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184 million) making the total number of people presenting with visual impairment from any cause approximately 314 million.[9]

Visual impairment is a global public health problem. Worldwide, an estimated 39 million people are blind, and an additional 246 million have visual impairment.[9] The prevalence of blindness in developing countries is 10–40 times higher than in developed countries, and close to three quarters of the world's blindness is either curable or preventable. The majority of blind people on earth reside in the developing nations of Africa, Asia, and Latin America. [10] There are several studies on the prevalence of visual impairment in the world and Eastern Mediterranean countries. Population-based data on frequency and causes of visual impairment are useful for identifying needs for treatment and rehabilitation services, planning and implementing blindness prevention programs, and determining research priorities for different populations.

Objectives of the study

To estimate the extent and determinants of refractive errors among secondary school adolescent want to be enrolled in universities and to review the school screening and refraction data by assessment of the magnitude of problem in schooling aged population.

Material and method:

This study is a cross-sectional analytical study involving students attending the pre-enrollment ophthalmological examination clinic of public health center in Thiqar. It had been extended through the last four months of 2016.,by which 4322 university pre-enrollment secondary schooling students had been recruited, where most of students were ending their secondary graduation during the last three months, and want to be enrolled in the different types of universities and institutions, some failed to pass the final year but come to the ophthalmologic they aged between 18-23years, lived in a communities of Al-Nasiriyah city, Thi-Qar province- southern Iraq ,The district was geographically classified in to urban, rural. There were pre

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enrollment ophthalmological examinations for the whole students graduated from secondary schooling. These students, were selected for this study taking cost, manpower and time in to consideration. Al-Nasiriyah district had a total population of 525000. About 50% of the population comprises of adult male, (58%) are live in urban area. [11] . Taking in to account the proportion of refractive error in the past related studies in different regions [4-7], margin of error 2.5%, and the design effect 1.5, the calculated sample size was children.

The study population was the whole pre-enrolled students attending the ophthalmology unite in the public health center .

For each eligible students, general information like name, age, gender,, residence, family history, average of success and number of hours that using electronic devices, were recorded before ophthalmic evaluation. The ophthalmic examinations include distance visual acuity measurement, subjective refraction, ocular alignment and motility evaluation, and, anterior segment and fundus examination..

Of 4322 students visual acuity was assessed by using a Snellen's E-chart at 6 m. Visual acuity was measured without correction. Students with visual acuity of 6/9 or less in either eye underwent objective refraction and subjective verification to determine the best-corrected visual acuity; where, subnormal vision was defined as vision of 6/9 or worse in the better eye; visual impairment was defined as vision worse than 6/18 in the better eye. Myopia was considered in refractive error requiring a minus sphere of 0.50 Diopter or more for correction and hyperopia if they need a plus sphere of 1.00 Diopter or more. Amblyopia was diagnosed in students with poor vision which does not improve with refraction and no pathology causing the visual loss. For all pre-enrolled participants, ocular alignment using cover–uncover and alternate cover tests; anterior segment slit-lamp examinations were also performed. Auto-refraction was performed using Auto-Refractometer RM8800 (Topcon Corp., Tokyo, Japan). Patients with other ophthalmic problems such as corneal scars, cataract or previous cataract surgery, and

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retinal disease were excluded from the study. (Results A total of 4322 students (2292 males and 2030 females) were enrolled in this study.

The study was done after approval by Research and Publication Committee of the Department of surgery –Ophthalmology unite, Medical Faculty of ThiQar University. Permission was also obtained from appropriate administrative bodies and stakeholders of the health directorate. Informed consent was obtained from student after explaining the procedure and the purpose of the study

All data were entered into computers using Excel sheet and SPSS (statistical Package of Social Sciences) software version 23 and processed. Statistical tests of significance were conducted using x^2tests or Fisher Exact test or two tailed t- tests as appropriate and p-values less than 0.05 were considered significant. Logistic regression analysis had been done for independent variables.

Ethical considerations

Ethical approval and clearance was sought from the ethical review principles that approved by ethical committee of health directorate of Thi-Qar and College of Medicine, Departments of Public Health and community medicine. Support letter and permission was obtained from the district education office and school administrators. The purpose of the study was explained to students . Verbal consents were also obtained from all eligible students who took part in the study. Students with refractive error underwent full refraction using auto refractor following standard procedure and given prescriptions

Results:

Most of the studied population were of age 19 years, urban residence, moderate and good success average, not wearing glass and nearby equal gender proportions.

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Table (1): Socio-demography of studied population

variable		Female	Male	Total	X^2,P value
Date of Birth	1990-	256,(29.4)	616, (70.6)	872	244.499,0.0001
	1994-	1011(45.0)	1238(55.0)	2249	
	1998andmore	763(63.5)	438(36.5)	1201	
Residence	Rural	112(31.2)	247(68.8)	359	39.097,0.0001
	Urban	1918(48.4)	2045(51.6)	3963	
Success average	Failed	108(35.2)	199(64.8)	307	61.142,0.0001
	Acceptable	255(49.1)	264(50.9)	519	
	Moderate	688(43.7)	886(56.3)	1574	
	Good	470(45.9)	555(54.1)	1025	
	Very good	252(54.5)	210(45.5)	462	
	Excellent	256(59.0)	178(41.0)	434	
Wearing glass	No	1773(45.6)	2117(54.4)	3890	30.214,0.0001
	Yes	257(59.5)	175(40.5)	432	
Total		2030(47.0)	2292(53.0)	4322	

A 4322 students recruited in this study, most of them were of normal visual acuity(63.2%), while the myopia was representing the largest proportion of refractive error population(24.5%), Astigmatism was the second ranking problem (11.5%), lastly the minority were hypermetropic (1.1%) as shown in the figure 1,2.

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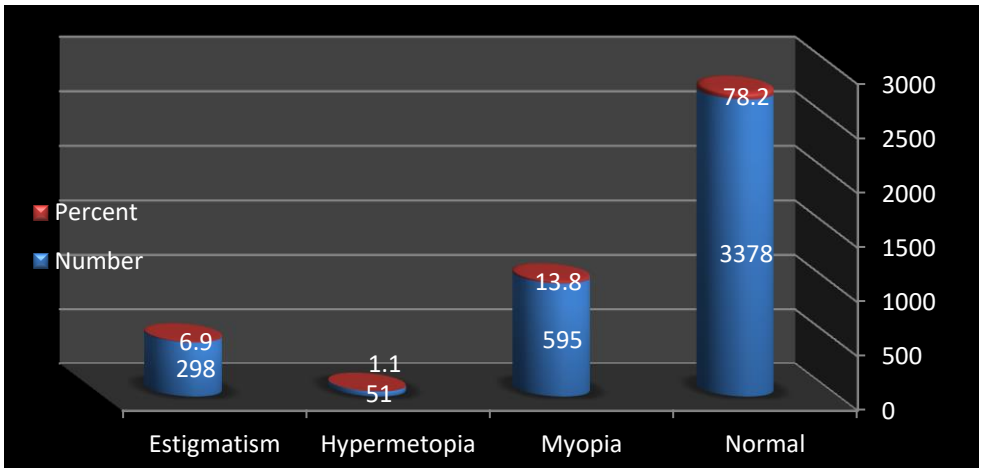

Figure1: distribution of the population according to the refractory error

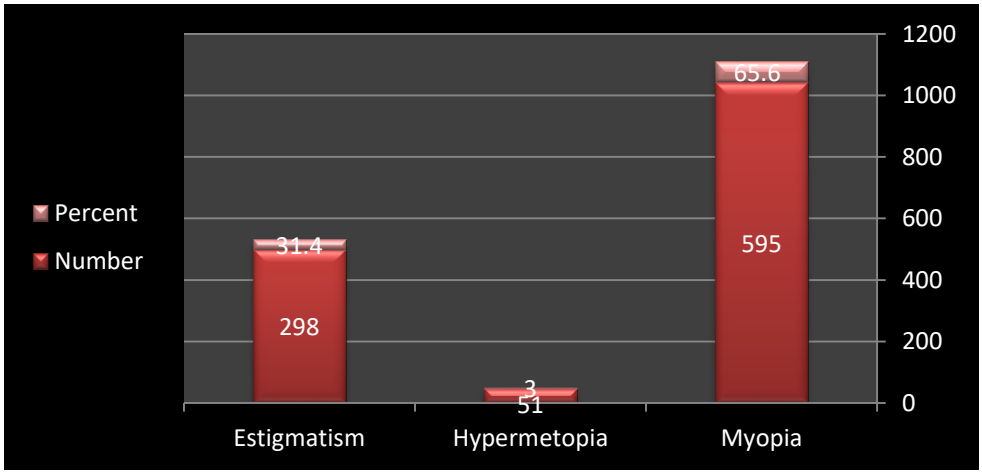

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Figure 2:Distribution of refractory error population

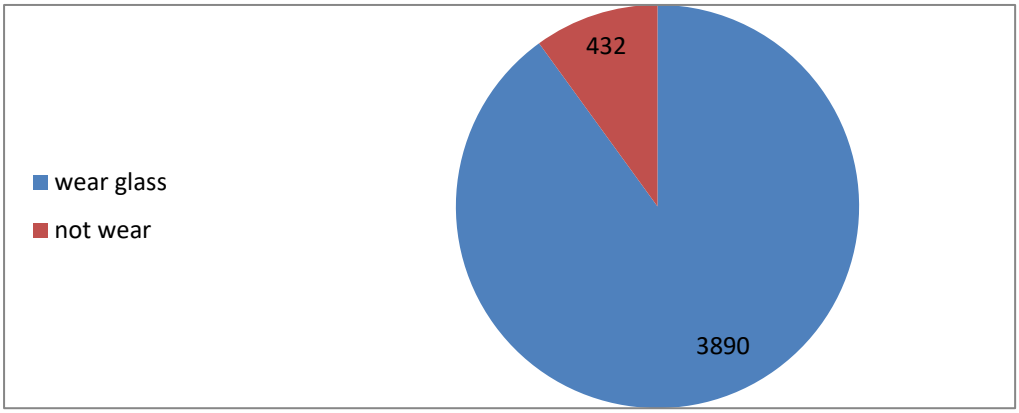

Figure 3: Distribution of population according o glass wearing

Table (2):Distribution of myopia according to the studied determinants.

Variable	Myopia		Total	X^2, P value
Date Of Birth	Absent(No,%)	Present(No,%)		
1990-	786, 90.1	86, 9.9%	872	25.609,0.00
1995-	1950, 86.7%	299, 13.3%	2249	1
1998-	991, 82.5%,	210, 17.5%	1201	
Sex				
Female	1650, 81.3%	380, 18.7%	2030	79.086
Male	2077, 90.6%	215, 9.4%	2292	0.0001
Residence				
Rural	343, 95.5%	16,4.5%	359	28.585,0.001
Urban	3384, 85.4%	579, 14.6%	3963	

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Wear glass				
No	3590, 92.3%	300, 7.7%	3890	1201.788,0.0
Yes	137, 31.7%	295, 68.3%	432	001
Hours of using electronic devices by hours				
0	1311, 88.2%	175, 11.8%	1486	24,214,0.00
1	1098, 87.1%	162, 12.9%	1260	01
2	866, 85.1%	152, 14.9%	1018	
3	383, 82.4%	82, 17.6%	465	
4 and more	69, 74.2%	24, 25.8%	93	
Average of success				
Failed	278, 90.6%	29, 9.4%	307	**47.254,0.00**
Acceptable	464, 89.4%	55, 10.6%	519	**01**
Intermediate	1370, 87.0%	204, 13.0%	1574	
Good	897, 87.5%	128, 12.5%	1025	
Very good	383, 82.9%	79, 17.1%	462	
Excellent	334, 77.0%	100, 23.0%	434	
Total	3727, 86.2%	595, 13.8%	4322,	**100.0%**

most of myopic were of age 19 and above , females, of 1-2 hours using electronic devices and intermediate average of success.

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Table (3): Correlation Coefficient of the myopia with the determinant:

Variables of interest	Myopia CC, Sig	Age	residence	Average of success	wear glass	E. device
Myopia	1.000					
Age	.077**.000	1.000				
Residence	.081**,.000	.062**,.00	1.000			
Recoded average	.086**.000	.285**,.00	.010,.521	1.000		
Wear glass	.539**,.000	.064**,.000	.072**.000	.070**,.000	1.000	
Electronic device	.062**,.000	.064**,.000	.082**,.000	.102**,.000	.074**,.000	1.00
N	4322					

Myopia and age ,address, average of success, wearing glass, using of electronic devices: extremely significant association, but this association is not linear. The whole variable above when intercrossed with other are extremely significant association, but this association is not linear, the only Urban and Average: no significant association.

Table (4): Distribution of students according to hypermetropia

	Hypermetropia		Total	X^2,P value
DOB	Absent	Present		
1990-	862, 98.9%	10, 1.1%	872	.188[a], .910
1995-	2221, 98.8%	28, 1.2%	2249	
1998-	1188, 98.9%	13, 1.1%	1201	

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Sex				
M	2004, 98.7%	26, 1.3%	2030	0.333,0.564
Female	2267, 98.9%	25, 1.1%	2292	
Residence				
Rural	359, 100.0%	0.0%	359	4.675,031
Residence	3912, 98.7%	51, 1.3%	3963	
Wear glass				
No	3862, 99.3%	28, 0.7%	3890	70.687[a]
Yes	409, 94.7%	23, 5.3%	432	.0001
Electronic devices usage by hours/ day				
0	1472, 99.1%	14, 0.9%	1486	2.903
1	1242, 98.6%	18, 1.4%	1260	.574
2	1008, 99.0%	10, 1.0%	1018	
3	458, 98.5%	7, 1.5%	465	
4 and more	91, 97.8%	2, 2.2%	93	
Average of success				
Failed	293, 95.4%	14, 4.6%	307	36.886
Acceptable	516, 99.4%	3, 0.6%	519	0.00001
Intermediate	1554, 98.7%	20, 1.3%	1574	
Good	1019, 99.4%	6, 0.6%	1025	
Very good	456, 98.7%	6, 1.3%	462	
Excellent	432, 99.5%	2, 0.5%	434	

Most of Hypermetropic patients were of date of birth 1995 and above, equal sex destitution, urban residence, using of 1 hour electronic devices and intermediate average of success**.**

Table (5): Correlation Coefficient of the hypermetropia with the determinants

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CC, Sig	Hypermetropia	Age	Average of success	Residence	Wear glass	E. device
Hypermetropia	1					
Age	-.003-, .857	1				
Average	-.052-**, .001	.297**, .000	1			
Residence	.033*, .031	.061**, .000	.016 , .296	1		
Wear glass	.128**.000	.064**, .000	.079**.000	.072**.000	1	
Electronic device	.013, .408	.046**, .002	.084**,.000	.064**,.000	.084** ,.000	1
Total	4322					

Hypermetropia and age ,address, average of success, wearing glass and residence: extremely significant association, but this association is not linear. The using of electronic device had no significant correlation

Table (6): Distributions of Astigmatism according to suspected determinants:

Determinants	Astigmatism			X^2, P value
	Absent	**Present**	**Total**	
Date of birth				
1990-	814, 93.3%	58, 6.7%	872	0.107
1995-	2092, 93.0%	157, 7.0%	2249	
1998-	1118, 93.1%	83, 6.9%	1201	

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Sex				
Female	1875, 92.4%	155, 7.6%	2030	3.270
Male	2149, 93.8%	143, 6.2%	2292	
Residence				
Urban	357, 99.4%	2, 0.6%	359	24.498, 0.000
Rural	3667, 92.5%	296, 7.5%	3963	
Wear glass				
No	3761, 96.7%	129, 3.3%	3900	776.446, 0.0001
Yes	263, 60.9%	169, 39.1%	432	
Hours of using electronic device				
0	1400, 94.2%	86, 5.8%	1486	22.281, 0.000, 12.852, 0.006
1	1193, 94.7%	67, 5.3%	1260	
2	923, 90.7%	95, 9.3%	1018	
3	426, 91.6%	39, 8.4%	465	
4 and more	82, 88.2%	11, 11.8%	93	
Average of success				
Failed	291, 94.8%	16, 5.2%	307	3.22 0.781
Acceptable	478, 92.1%	41, 7.9%	519	
Intermediate	1464, 93.0%	110,7%	1574	
Good	957, 93.4%	68, 6.6%	1025	
Very good	431, 93.3%	31, 6.7%	462	

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Excellent	402, 92.6%	32, 7.4%	434	
Total	4024,93.3%	298,69%	4322	

Most of patients with astigmatism were of date of birth 1995 and above, equal sex destitution, rural residence, wear glass, using of 2 hour electronic devices and intermediate average of success**.**

Table(7):Correlation of Astigmatism and its determinants

CC,Sig.	Astigmatism	Age	Residence	Average	Wear glass	Electronic device	BMI
Astigmatism	1						
Age	.003	1					
	.840						
Residence	.075**	.061**	1				
	.000	.000					
Average	.005	.297**	.016	1			
	.752	.000	.296				
Wear glass	.424**	.064**	.072**	.079**	1		
	.000	.000	.000	.000			
Electronic device	.054**	.046**	.064**	.084**	.084**	1	
	.000	.002	.000	.000	.000		
BMI	-.013-	-.014-	.000	.000	-.016-	-.018-	1
	.377	.352	.997	.986	.279	.226	
Total	4322						

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Astigmatism and address, wearing glass: extremely significant association, but this association is not linear. The age, average of success had no significant correlation

Discussion

Visual impairment from uncorrected refractive errors can have immediate and long-term consequences in children and adults, such as lost educational and employment opportunities, lost economic gain for individuals, families and societies, and impaired quality of life [12]. Various factors are responsible for refractive errors remaining uncorrected: lack of awareness and recognition of the problem at personal and family level, as well as at community and public health level; non-availability of and/or inability to afford refractive services for testing; insufficient provision of affordable corrective lenses; and cultural disincentives to compliance (8).

The estimate of visual impairment caused by uncorrected refractive errors is of public health concern [13,14].

Despite that refractive errors could be easily diagnosed and that spectacle correction is among the most cost-effective interventions in eye care. According[15] , screening of 5–15 years old yields the most health effects and more absolute terms, both screening of 10–15 years and 5–15 years old are very cost-effective strategies. Therefore screening of the school children is an important measure to know the magnitude of refractive error and their correction at the appropriate time.

In this study 21.8% of the screened secondary schooling graduate students were positive for uncorrected refractive errors. The prevalence of refractive errors among our sample of students was higher than that reported form similar study conducted in Saudi Arabia [16] of 9.8% among intermediate school students, Qatar of 19.7% [17], Malaysia, 7.7% [18], Nepal 8.6% [19], , Iran 3.5% [20],, Uganda 11.6% [21],and Bangkok 12.7% [22], and lower than those reported from India [23] of 25.1%.

This variation may be related to the type of sampling method used, size of population screened and the variation of geographical location in these

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studies. Like other studies where higher prevalence of refractive error has been documented in urban population [24]

Our study has found higher prevalence of refractive among urban population. However Ahuama and Atowa (1987) in their population based study in Uganda had found a higher prevalence of refractive error in rural area than urban (29.0% compared to 21.6% among urban students) [21].

Higher prevalence of refractive errors in urban may be attributed to the advanced socio-economic transition rapid urbanization in our country with greater access to and abundance of computers and electronic gadgets which have motivated peoples to remain indoors and involved in activities which cause more eye strain.

We have found a higher prevalence of refractive error among females (27.6%) than males (16.7%). This is consistent with similar studies carried out in Riyadh, Saudi Arabia among intermediate school students where it was reported a prevalence of 11.7% among females compared to 8.3% among males [25], similar findings were reported form Qatar [17] with 23.7% prevalence of refractive errors among females compared to 15.5% among males, India [26] with 17.2% vs. 13.4% among males, Ghana [27] and Germany [28].

Of the encountered refractive errors in this study, myopia was the leading type found representing 63.03% which is consistent with other studies done in various parts of the world. The research conducted in Malaysia [18], Nepal [19], India [23], Jordan [29] and Qatar [17] have found that myopia represented 77.5%, 59.8%, 20.65%, 31.05%, 63.5% and 25.54% of screened errors respectively.

In our study the rate of myopia was significantly higher in urban. This is similar to other studies where the prevalence of myopia has been found to be higher in urban area than rural [17,18.23]. This may be due to a high incidence of myopia in these populations: it is suggested that there may be a direct cause–effect relation between increased access to education and myopia, of those myopic students only 49.6% wearing spectacle correction.

In the current study we have found a high prevalence of astigmatism (31.5%) from total refractive errors, similar results have been reported form Qatar (70%) [17], Ghana (49.3%) [30], Pakistan (35.5%) [31] and Jordan (20.4%) [29] and contrary to those found in Nepal (9.2%)[19] and China (8.3%) [32], of those students with astigmatism only 56.7% wearing spectacle correction.

The prevalence of hyperopia differs depending on the criteria used. In our study, hyperopia in one or both eyes was found in 1.2% of the studied population, which is lower than the 7.7% in New Delhi[33], 3.5% in China[32], and 1.4% in Nepal[19], but higher than the 0.8% reported in rural India[23]. This difference is due to the inclusion of preschool children in some of the above studies and a non-uniform definition of hyperopia, of those hypermetropic students only 45.1% wearing spectacle correction.

These findings warrant the urgent implementation of fundamental policies including screening of children for refractive errors that should be conducted at community level and integrated into school health programs, accompanied by education and awareness campaigns to ensure that the corrections are used and cultural barriers to compliance are addressed and removed. Corrections must be accessible and affordable for people of all age especially those at school age. Training and information program should also be tailored for teachers and school health-care workers.

An important result of this study for using of electronic devices that most students with refractive errors either not using electronic devices or used only for short time (1-2) hours, this may be attributed to eye strain which occur during prolonged visual concentration for persons with refractive errors.

A significant finding is that many students with all three types of refractive errors having intermediate average of success caused by moderate academic performance due to eye strain during reading.

There is a need to conduct this type of study in different parts of Iraq to know national magnitude of the refractive error which will help the health authority to formulate appropriate strategy for effective screening program throughout the country.

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أخطاء الانكسار لدى طلبة الدراسه الثانويه في ذي قار: مدى الانتشار والمحددات لعام 2016

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الخلفية للدراسه: يعتبر خطأ الانكسار واحدا من المشاكل الصحية الرئيسية المثيرة للقلق، والذي يحمل عبئا حقيقيا على مؤسسات المجتمع والأفراد

الهدف: هدفت هذه الدراسة إلى تقييم انتشار أنواع الانكسار ونوعها الفرعي لدى الطلاب الراغبين في الالتحاق بالجامعات والمؤسسات بعد إكمال التخرج الثانوي،

المنهجية: دراسة مقطعية تحليلية شملت 4322 طالبا حضرو لفحص اللياقة البدنية في مديرية صحة العامه قبل التسجيل في الكليات، وتمتد على مدى الأشهر الثلاثة الاخيره من عام 2016؛ حيث اجري فحص طبي روتيني قبل الالتحاق بالجامعة خضع للفحص البصري بما في ذلك حدة البصر غير المصححة، رؤية اللون، بالإضافة إلى فحص مصباح الشق. الطلاب الذين يعانون من حدة البصر من 9/6 أو أقل في أي من العينين يخضع للانكسار الموضوعي والتحقق الذاتي لتحديد أفضل حدة البصر يمكن تصحيحها.

النتائج: تم تسجيل مجموعه 4322 طالبا في هذه الدراسة، و 2030 ذكور و 2292 إناث. تم العثور على خطأ الانكسار في. (35.8٪) من الطلاب، كان قصر النظر النوع الرئيسي من خطأ الانكسار والاستجماتيزم ثم هايبرميتروبيا (24.2٪، 11.5٪، 1.1٪) على التوالي. وكان العمر والجنس والعنوان ومعدل النجاح وعدد ساعات استخدام الأجهزة الإلكترونية المتغيرات المستقلة الرئيسية الهامة لخطأ حدوث الانكسار.

الاستنتاجات: خطأ الانكسار هو واحد من الأسباب الشائعة للإعاقة البصرية بين مجموعة المراهقين الذين يريدون الالتحاق بالتعليم الجامعي في الجامعات المختلفة. وقد مكنت الدراسة من فهم اتجاهات الخطأ الانكساري لدى طلبة الذكريين، وأظهرت أهمية فحص الرؤية في توفير العناية بالعين في الوقت المناسب وتحديد طلاب المدارس

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الثانوية المعاقين بصريا. قصر النظر هو أكثر انتشارا بشكل خاص من تلك التي ذكرت في مناطق أخرى حتى الكشف المبكر والتصحيح أمر ضروري لتجنب الحول الاملیکروبات.

الكلمات الرئيسية المفتاحيه: أخطاء الانكسار ,قصر النظر ,بعد النظر، الاستجماتيزم، ذي قار.

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