

Refractive errors among students enrolled in Assiut University, Egypt

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Aim

The aim of this study was to assess the prevalence of refractive errors in students enrolled in the first year in Assiut University, Assiut, Egypt.

Patients and methods

A total of 3442 students attending the pre-enrollment fitness clinic in Assiut University Hospital for 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 3442 students were enrolled in this study; refractive error was found in 360 (10.46%) students, 193 males and 167 females. Among these 360 students, the mean uncorrected visual acuity in the right and left eye was 0.19 ± 0.18 and 0.20 ± 0.18 , respectively, whereas the best-corrected visual acuity in the right and left eye was 0.80 ± 0.26 and 0.80 ± 0.26 , respectively.

The mean spherical equivalent in the right and left eye was -2.71 ± 2.76 and -2.97 ± 2.83 , respectively.

Conclusion

Refractive error is a common cause of visual impairment among the group of adolescents admitted for university education in Upper Egypt. Myopia is particularly more prevalent than that reported in other regions of Egypt and other countries. Early detection and correction is essential to avoid ametropic amblyopia.

Keywords:

Refractive error Myopia Hypermetropia, Astigmatism, south of Egypt, Assiut

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Background

Refractive error leading to low vision is one of the most common problems of visual impairment, especially among adolescents, and frequently remains undiagnosed for long periods. The WHO's 'Vision 2020: The Right to Sight' initiative considered correction of refractive errors as one of the targets to eliminate avoidable causes of visual impairment [1].

Refractive error in Egypt is a major health problem that is linked to environmental factors such as socioeconomic level, heavy traffic, and environmental pollution [2].

In Egypt, there are few studies showing the prevalence of errors of refraction. The present study is a preliminary survey to determine the prevalence of refractive error among first-year Assiut University students. Assiut University is the largest university in Upper Egypt and accommodates students from all other governorates of Upper Egypt.

Patients and methods

This study is a cross-sectional descriptive study involving students attending the pre-enrollment medical examination clinic of Assiut University (Assiut, Egypt). The students were enrolled during the period from 1 September 2010 to 15 September 2010.

The visual acuity of the students was assessed using a Landolt broken ring 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.

For all enrolled participants, color vision was assessed using Ishihara charts and ocular alignment using cover-uncover and alternate cover tests; anterior segment slit-lamp examinations were also performed.

Autorefractometry 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 retinal disease were excluded from the study.

Amblyopia depth is classified according to the Pediatric Eye Disease Investigator Group (PEDIG) grading [3], which grades amblyopia as tight (<20/20 and better than 20/40), moderate (20/40 to 20/80), and severe amblyopia (worse than 20/80).

The collected data were analyzed using SPSS (version 11; SPSS Inc., Chicago, Illinois, USA), and the graphs were constructed using MS Excel 2007. The prevalence of refractive errors among the screened students was estimated.

Statistical significance was assessed using Student's *t*-test for quantitative data as visual acuity and refractive error and the χ^2 -test for qualitative data; differences were considered significant if *P* value less than 0.05.

Results

A total of 3442 students (2137 males and 1305 females) were enrolled in this study. Three hundred and sixty students had visual acuity less than 6/9 in either eye, 193 males and 167 females. The average age of the students was 18 ± 1.56 years.

The mean spherical equivalent in the right and left eye was -3.13 ± 2.76 and -2.97 ± 2.83 D, respectively. The magnitude of refractive error in the right and left eye was 3.43 ± 2.59 and 3.29 ± 2.45 , respectively (Table 1).

The percentage of students with spherical equivalents greater than plus or minus one diopter was found to be 9.70% for the right eye and 9.41% for the left eye. The mean uncorrected visual acuity (in decimal notation) in the right and left eye was 0.19 ± 0.18 and 0.20 ± 0.18 , respectively, whereas the best-corrected visual acuity (in decimal notation) in the right and left eye was 0.80 ± 0.26 and 0.80 ± 0.26 , respectively.

The distribution of refractive error in this study followed a normal distribution pattern with a skew toward myopia (Figs. 1–3).

The prevalence of severe amblyopia was found in 4.86% of eyes and moderate amblyopia in 11.11% of eyes (Table 2 and Fig. 4).

Compound myopic astigmatism was the most prevalent refractive error (71.39%), followed by simple myopia (6.81%), whereas simple hyperopic astigmatism was the least common (0.42%) (Tables 3 and 4).

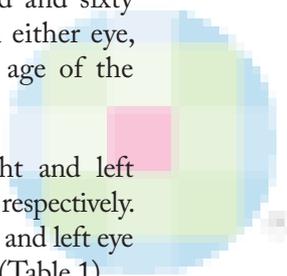
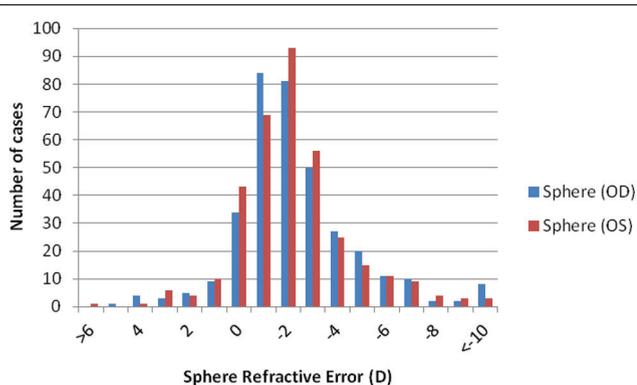


Table 1 Statistics of visual acuity (uncorrected and corrected) and refractive errors in the students enrolled in this study

	UCVA (OD)	BCVA (OD)	Sphere (OD)	Cylinder (OD)	SE (OD)	Magnitude of refractive error (OD)	UCVA (OS)	BCVA (OS)	Sphere (OS)	Cylinder (OS)	SE (OS)	Magnitude of refractive error (OS)
Mean \pm SD	0.19 ± 0.18	0.80 ± 0.26	-2.71 ± 2.76	-0.85 ± 1.23	-3.13 ± 2.94	3.43 ± 2.59	0.20 ± 0.18	0.80 ± 0.26	-2.54 ± 2.59	-0.91 ± 1.88	-2.97 ± 2.83	3.29 ± 2.45
Range	0.00–1.00	0.00–1.00	-16.50 to +5.00	-7.75 to +3.00	-17.50 to +5.00	0.00–17.50	0.02–1.00	0.00–1.00	-17.75 to +7.00	-25.00 to +10.25	-18.38 to +8.00	0.00–18.38

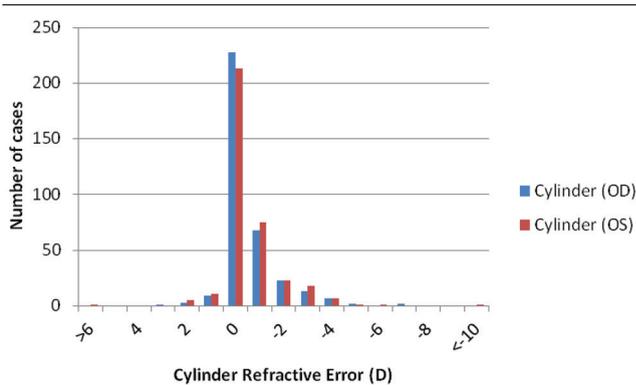
BCVA, best-corrected visual acuity; UCVA, uncorrected visual acuity.

Figure 1



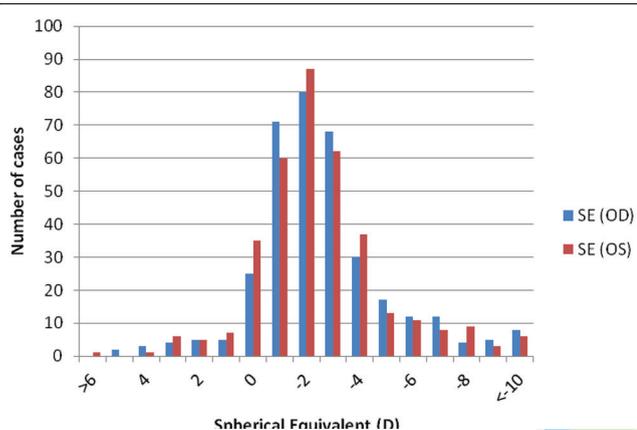
Sphere refractive error.

Figure 2



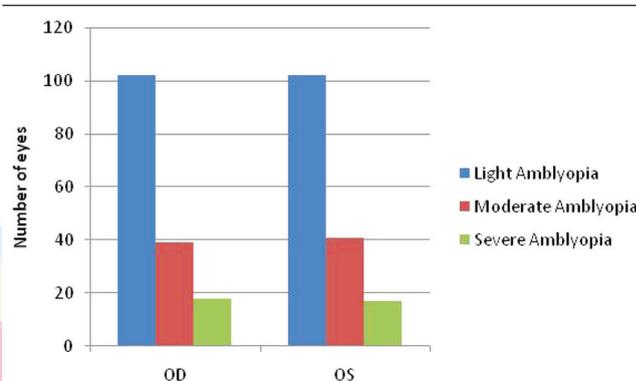
Cylinder refractive error with prescription in negative cylinder notation.

Figure 3



Spherical equivalent of refractive error (D).

Figure 4



Amblyopia severity.

Table 2 Severity of amblyopia

	N (%)		
	Number of right eyes	Number of left eyes	Number in both eyes
Light amblyopia	102 (28.33)	102 (28.33)	204 (28.33)
Moderate amblyopia	39 (10.83)	41 (11.39)	80 (11.11)
Severe amblyopia	18 (5.0)	17 (4.72)	35 (4.86)

Table 3 Types of refractive error

Types of refractive error	N (%)		
	OD	OS	Both eyes
Myopia	67 (18.61)	54 (15.00)	121 (16.81)
Hyperopia	5 (1.39)	2 (0.56)	7 (0.97)
Simple myopic astigmatism	4 (1.11)	4 (1.11)	8 (1.11)
Simple hyperopic astigmatism	1 (0.28)	2 (0.56)	3 (0.42)
Compound myopic astigmatism	257 (71.39)	257 (71.39)	514 (71.39)
Compound hyperopic astigmatism	15 (4.17)	18 (5.00)	33 (4.58)
Mixed astigmatism	11 (3.06)	19 (5.28)	30 (4.17)
No refractive error	0 (0.00)	4 (1.11)	4 (0.56)
Total	360 (100)	360 (100)	720 (100)

It is obvious from the results that most of the refractive errors (indicated by the spherical equivalent) fall in the -2 range.

High myopia (defined as refractive error equal to or higher than -5 D) was found to be relatively high, with a percentage of 4.72% (right eye) and 3.61% (left eye) (Table 5).

Discussion

Comparison of the prevalence of refractive errors with other different studies is difficult because of the variable definition and cut-off values for refractive errors and the variable age range of participants enrolled in each study. However, the prevalence of refractive errors in this study was found to be 9.41–9.70%. El-Bayoumy *et al.* [4] carried out a wide-range study in urban areas of Cairo, which indicated a prevalence of refractive errors of 22.1% and myopia of 12.3%. These ratios are higher than those found in this study and this can be attributed to the difference in the target

Table 4 Types of astigmatism

Types of astigmatism	N (%)		
	OD	OS	Both eyes
Against the rule astigmatism	145 (40.28)	163 (45.28)	308 (42.78)
With the rule astigmatism	98 (27.22)	88 (24.44)	186 (25.83)
Oblique astigmatism	45 (12.50)	49 (13.61)	94 (13.06)
No astigmatism (myopia, hyperopia, or no refractive error)	72.00 (20.00)	60 (16.67)	132 (18.33)
Total	360 (100)	360 (100)	720 (100)

Table 5 Frequency distribution of refractive error expressed in spherical equivalent in the range of high myopia

Spherical equivalent (D)	N (%)		
	Number of right eyes	Number of left eyes	Both eyes
-5	17 (4.72)	13 (3.61)	30 (4.17)
-6	12 (3.33)	11 (3.06)	23 (3.19)
-7	12 (3.33)	8 (2.22)	20 (2.78)
-8	4 (1.11)	9 (2.50)	13 (1.81)
-9	5 (1.39)	3 (0.83)	8 (1.11)
-10	3 (0.83)	3 (0.83)	6 (0.83)
-11	0 (0.00)	2 (0.56)	2 (0.28)
-12	2 (0.56)	0 (0.00)	2 (0.28)
Less than -13	3 (0.83)	1 (0.28)	4 (0.56)

population age and population density, which is an urban population in the El-Bayoumy *et al.*'s [4] study, compared with the more prevalent rural setting of our study population.

In an older study, myopia was not responsible for even a single case of blindness in rural areas, although it was third in order of magnitude as a cause of blindness in urban areas. Probably, infection and its resulting corneal opacities made it difficult to detect the presence of myopia or there was a lower prevalence of myopia at that time [5].

Several studies have shown the association of female sex with a higher incidence of refractive errors [4,6–10]. In this study, the number of males with refractive errors was higher than the number of females with refractive errors: 193 (53.61%) males and 167 (46.39%) females; this is because there were more male students (62.09%) than female students (37.91%). However, the prevalence of refractive errors was higher among female students (12.7%) than among male students (9%).

This study is in agreement with Dr. Gawdat's results on the relative prevalence of compound myopic astigmatism, followed by simple myopia being the most common type of refractive error. However, the prevalence of high myopia in this study was found to be lower (4.17%) than that in Gawdat's study (7.40%);

no explanation could be found for this difference and further investigation may be required [11].

The prevalence of moderate refractive amblyopia (11.11%) and severe refractive amblyopia (4.86%) is higher than that in other geographic areas either in south of Egypt or worldwide because of the absence of early diagnosis and management [6,12–14].

Establishment of a school screening program for early detection and spectacle correction of refractive error is recommended to reduce the incidence of amblyopia. Although many studies [6,12] have reported higher myopia rates in larger cities, probably because of better socioeconomic factors, the prevalence of high myopia in upper Egypt was found to be particularly high and further studies may be required to define the possible etiological factors.

Conclusion

Refractive error is a common cause of visual impairment among adolescents in Upper Egypt. High myopia is particularly more prevalent than that reported in other regions of Egypt and other countries. Early detection and correction is essential to avoid ametropic amblyopia.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

References

- Resnikoff S, Pararajasegaram R. Blindness prevention programmes: past, present, and future. *Bull World Health Organ* 2001; **79**:222–226.
- Saad A, El-Bayoumy BM. Environmental risk factors for refractive error among Egyptian school children. *East Mediterr Health J* 2007; **13**:819–828.
- Kowal L. PEDIG study on amblyopia; vision therapy by atropine penalization versus occlusion. *Binocul Vis Strabismus Q* 2002; **17**:275.
- El-Bayoumy BM, Saad A, Choudhury AH. Prevalence of refractive error and low vision among schoolchildren in Cairo. *East Mediterr Health J* 2007; **13**:575–579.
- Said ME, Goldstein H, Korra A, El-Kashlan K. Prevalence and causes of blindness in urban and rural areas of Egypt. *Public Health Rep* 1970; **85**:587–599.
- Gao Z, Meng N, Muecke J, Chan WO, Piseth H, Kong A, *et al.* Refractive error in school children in an urban and rural setting in Cambodia. *Ophthalmic Epidemiol* 2012; **19**:16–22.
- Alam H, Siddiqui MI, Jafri SI, Khan AS, Ahmed SI, Jafar M. Prevalence of refractive error in school children of Karachi. *J Pak Med Assoc* 2008; **58**:322–325.
- Congdon N, Wang Y, Song Y, Choi K, Zhang M, Zhou Z, *et al.* Visual disability, visual function, and myopia among rural Chinese secondary school children: the Xichang Pediatric Refractive Error Study (X-PRES) — report 1. *Invest Ophthalmol Vis Sci* 2008; **49**:2888–2894.
- Khandekar RB, Abdu-Helmi S. Magnitude and determinants of refractive error in Omani school children. *Saudi Med J* 2004; **25**:1388–1393.

- 10 He M, Huang W, Zheng Y, Huang L, Ellwein LB. Refractive error and visual impairment in school children in rural southern China. *Ophthalmology* 2007; **114**:374–382.
- 11 Gawdat I. Studies on the incidence of refractive errors in Egypt. *Bull Ophthalmol Soc Egypt* 1976; **69**:513–520.
- 12 Hashim SE, Tan HK, Wan-Hazabbah WH, Ibrahim M. Prevalence of refractive error in malay primary school children in suburban area of Kota Bharu, Kelantan, Malaysia. *Ann Acad Med Singapore* 2008; **37**:940–946.
- 13 Hassanien RH, Abdalla AE. Prevalence and causes of visual acuity in school children in Al-Minya area. *Bull Ophthalmol Soc Egypt* 2001; **94**:929–932.
- 14 Padhye AS, Khandekar R, Dharmadhikari S, Dole K, Gogate P, Deshpande M. Prevalence of uncorrected refractive error and other eye problems among urban and rural school children. *Middle East Afr J Ophthalmol* 2009; **16**:69–74.

