Prevalence of refractive error and low vision among schoolchildren in Cairo

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معدَّل انتشار العيوب الانكسارية وضَعْف الرؤية بين تلاميذ المدارس في القاهرة

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الخلاصة: أُجري مسح أوَّلي للوقوف على معدَّل انتشار العيوب الانكسارية وضَعْف الرؤية، لدى 5839 من تلاميذ المدارس في الفئة العمرية 7 – 14 عاماً، في العاصمة المصرية، القاهرة. واستخدمت في التحرِّي لوحة لاندولت لاختبار حدة الإبصار، واختبار الثقب. وتبيَّن من الدراسة أن معدل انتشار العيوب الانكسارية (حدة الإبصار ≥ 12/6) بين تلاميذ المدارس يبلغ 22.1%، وأن معدل انتشار ضعف الرؤية (حدة الإبصار ≥ 18/6) يبلغ 12.5%. وكان معدل انتشار ضَعْف الرؤية أعلى ما يكون بين تلاميذ المدارس الإعدادية الذين يزيد عمرهم على 12 عاماً. وكانت العيوب الانكسارية أعلى بين الإناث (21.4 للإناث، مقابل 13.6% للذكور). ويوصي الباحثون بإجراء مسح وطني لتحرِّي مشكلات الإبصار لدى الأطفال في سن المدرسة وما قبل سن المدرسة.

ABSTRACT A preliminary survey was conducted to detect the prevalence of refractive error (RE) and low vision among 5839 schoolchildren aged 7–14 years in Cairo, Egypt. Screening was done using Landolt broken ring chart and pinhole test. The prevalence of RE (visual acuity ≤ 6/12) among the schoolchildren was 22.1% and low vision (visual acuity ≤ 6/18) was 12.5%. The prevalence of low vision was greatest among the preparatory schoolchildren aged 12+ years. RE was higher among the female students than males (21.4% and 13.6% respectively). Development of a national survey for detection of visual problems for both preschool and school-aged children is recommended.

Prévalence des troubles de la réfraction oculaire et de la déficience visuelle chez les écoliers du Caire

RÉSUMÉ Une enquête préliminaire a été menée au Caire (Égypte) afin de déterminer la prévalence des troubles de la réfraction oculaire et de la déficience visuelle chez 5839 enfants scolarisés âgés de 7 à 14 ans. Le dépistage a reposé sur le test optométrique de Landolt, dit test de vision de loin (anneau brisé), et le test de la lampe à fente (ou sténopé, dit également *pinhole*). La prévalence des troubles de la réfraction oculaire (acuité visuelle ≤ 6/12) chez les écoliers était de 22,1 % et celle de la déficience visuelle (acuité visuelle ≤ 6/18) de 12,5 %. La prévalence de la déficience visuelle était la plus élevée parmi les écoliers de 12 ans et plus. Les troubles de la réfraction oculaire étaient plus fréquents chez les filles que chez les garçons (21,4 % contre 13,6 %). Il est recommandé de mettre en place une enquête nationale de dépistage des problèmes visuels chez les enfants d'âge préscolaire et scolaire.

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Introduction

Refractive error (RE) leading to low vision is one of the most common problems of visual impairment, especially among schoolchildren, and frequently remains undiagnosed for long periods. The World Health Organization (WHO) has grouped uncorrected RE with cataract, glaucoma, trachoma and macular degeneration, infectious disease, and vitamin A deficiency among the leading causes of blindness and vision impairment in the world [*1*]. In Egypt, a preliminary national survey done in the Helwan area of Cairo reported that 34% of the recorded disabilities were visual disability [*2*].

Correction of RE and low vision are one of the priorities of global initiatives for Vision 2020 [*3*]. 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 RE and low vision among schoolchildren in Cairo, which is the capital of Egypt, with the highest population density in the country. It is the first study on a large sample (6000 students) in 4 educational sectors of different socioeconomic level. Studies have been done in different governorates with smaller populations and in smaller samples (not more that 1000–1500) students [*4–8*]. This is also the first study to train school doctors and school nurses (as all the schools are covered by the Medical Insurance Organization, the governmental organization that funds the medical services of all school-age children in primary, preparatory and secondary schools).

Methods

Selection of the target population

This was a cross-sectional descriptive study of a cluster random sample of 12 government schools. The schools were chosen using a multistage random sampling technique. The schools of Cairo governorate were divided into clusters based on Ministry of Education geographic divisions. Four educational geographic divisions were chosen randomly (El-Waiely, Mataria, Heliopolis and Nozha).

The schools of each of the selected educational geographic divisions were stratified into primary schools, preparatory schools for males and preparatory schools for females. Subsets of school clusters were randomly selected from the 3 school strata of the chosen educational areas, i.e. 1 primary school, 1 male preparatory school and 1 female preparatory school independent of their numbers. All the students of the selected schools were included in the screening (age range 7–15 years). Private schools were excluded from the study as their health systems are different from that of the government schools and there is a private school doctor for each school.

Information on parents' education, occupation and employment status was also obtained from the parents of each child by questionnaire, to estimate the socioeconomic status according to Park and Park [*9*].

Ophthalmic examination

The health insurance school health physician and the school nurse of each school included in the study were trained by the authors how to measure the visual acuity (VA) of the students. Assessment of VA of all the students was done with a Landolt broken ring chart at 6 metres in a well-illuminated room. VA was measured with and without glasses. Children with VA 6/12 or less with or without correction were examined by pinhole test to evaluate the improvement of VA. The school doctors were also trained to evaluate ocular balance, strabismus by cov-

ered and uncovered test, and ocular motility in the 6 cardinal positions.

The children with VA ≤ 6/18 in both eyes with best correction were categorized as low vision. Children with uncorrected VA were referred to the medical insurance clinics. The type of RE was obtained from the ophthalmic prescription.

Statistical analysis

The collected data were analysed using *SPSS*, version 7.5. The prevalence of RE among the screened students was estimated. Pearson chi-squared test was applied and differences were considered significant at $P < 0.05$.

Results

From the school records, 6000 students aged from 7 to 15 years were selected to be included in the study; 161 students (2.7%) refused to participate. The remaining 5839 students (3113 females and 2726 males) were screened.

The screening revealed that 1292 of the 5839 students (22.1%) had RE (VA ≤ 6/12), and 728 (12.5%) had low vision (VA ≤ 6/18) (Table 1). Strabismus was found in only 42 students (0.7%). Of the children with RE, 55.7% were myopic, 27.3% hypermetropic and 17.0% astigmatic.

Table 1 **Visual acuity of the 5839 children screened in Cairo governorate**

Visual acuity	No.	%
6/6	2840	48.6
6/9	1707	29.2
6/12	564	9.7
6/18	336	5.8
6/24	201	3.4
6/36	125	2.1
6/60	66	1.1
Total	5839	100.0

Table 2 shows the age distribution of the children with RE: 85.4% were aged 12+ years. Figure 1 shows that the prevalence of RE and low vision were significantly higher among female students compared with males ($P < 0.05$).

Among the students with RE, 42.3% wore glasses and 57.7% had no glasses. The proportion of students with RE and without glasses was slightly higher among families of low socioeconomic status (55.0%), than among families of middle socioeconomic status (52.7%), but this was not significantly different ($P > 0.05$).

Discussion

A preliminary national survey of disabilities in Egypt in Helwan, Cairo, reported that 34% of the recorded disabilities were visual disability [*2*].

The present study was a preliminary screening to determine the prevalence of refractive error (RE) among schoolchildren from 4 different randomly selected educational geographic divisions. We found the prevalence of RE (VA ≤ 6/12) was high—22.1% of school students aged 7–14 years—and 12.5% of them had low vision (VA ≤ 6/18). The frequency of students with low vision was mostly among the preparatory-school students.

A previous study of primary-school children in one area of Cairo (Shubra) diagnosed RE in 21.8% of all examined children [*5*], whereas another study detected a higher prevalence of RE (36.8%) among primary-school children in Giza governorate [*6*]. In Menofiya governorate it was reported that 17.5% of primary-school children had RE [*4*]. In Tanta governorate, RE was found in about 39% of 511 primary-school students,

Table 2 **Distribution of visual acuity by age for children with refractive errors**

Age (years)	No. screened	Visual acuity 6/18		6/24		6/36		6/60		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
7–	359	10	2.8	3	0.8	0	0	0	0	13	3.6
8–	395	10	2.5	2	0.5	1	0.3	1	0.3	14	3.5
9–	294	5	1.7	5	1.7	6	2.0	0	0	16	5.4
10–	428	10	2.3	8	1.9	3	0.7	1	0.2	22	5.1
11–	401	23	5.7	8	2.0	8	2.0	2	0.5	41	10.2
12–	1570	111	7.1	70	4.5	40	2.5	17	1.1	238	15.2
13–	1086	65	6.0	53	4.9	26	2.4	20	1.8	164	15.1
14–15	1303	102	7.8	52	4.0	41	3.1	25	1.9	220	16.9
Total	5836	336	5.8	201	3.4	125	2.1	66	1.1	728	12.5

amblyopia in 0.8% and strabismus in 0.6% [*7*]. In Al-Minya governorate a study on a random sample of 1588 schoolchildren aged 7–15 years found RE in 11.9%, amblyopia in 3.6% and strabismus in 1.6% [*8*].

RE may be viewed as resulting from a combination of genetic and environmental factors [*10*]. Myopia has reached epidemic proportions in many countries such as Japan, Hong Kong, Taiwan and Singapore [*11*]. The present study found that myopia was the most prevalent type of RE among the screened schoolchildren (55.7%), followed by hypermetropia (27.3%), and astigmatism (17.0%); strabismus was found in only 0.7%.

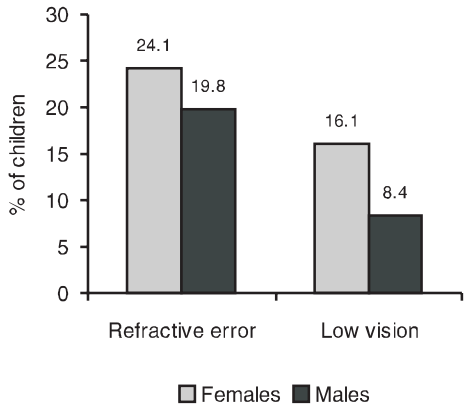

Figure 1 **Prevalence of refractive error and low vision by sex**

In a previous study, only 9.2% of the children with RE wore glasses [*7*]. But the present screening revealed that 42.3% had glasses, although family income had no significant effect. Not wearing glasses may lead to a greater deterioration in VA of the affected children. Thus, awareness about the importance of visual correction may play a significant role in proper management of RE cases. Further study about the public awareness of early detection of RE and proper management is suggested.

Recommendations

The main recommendations from this study are:

- Development of national programme for early detection of visual impairment,

involving both preschoolers and schoolchildren.

- Establishment of a school screening programme and follow-up for RE and low vision involving both preschoolers and schoolchildren.
- Governmental support for providing low-cost spectacles and school support to encourage children to wear their glasses.

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