The prevalence of amblyopia, strabismus, and ptosis in schoolchildren of Dezful

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ABSTRACT

Purpose: To determine the prevalence of amblyopia, strabismus, and ptosis among schoolchildren in Dezful in the west of Iran.

Methods: In this cross-sectional study, 1,375 schoolchildren of Dezful were selected through multistage cluster sampling. After obtaining written consents, participants had uncorrected and corrected visual acuity tests, cycloplegic refraction, and the cover test, and were examined for ptosis at the school site.

Results: Of the 1,151 study participants (83.7%), examinations were completed for 1,130 schoolchildren. Prevalence rates of amblyopia, strabismus, and ptosis were 2.7% (95% confidence interval [CI] 0.8-4.7), 1.9% (95% CI: 0.2-3.8), and 0.8%, respectively. Anisometropia was the most common cause of amblyopia; 45.2% of cases had anisometropic amblyopia. Among cases with strabismus, 63.6% were exotropic and 36.4% were esotropic.

Conclusion: The present study indicated that the prevalence of amblyopia and strabismus in Dezful schoolchildren falls in the average range. Since the Amblyopia Screening Program has been running for years, we expected lower rates compared to previous years, but this was not observed. Correcting refractive errors can significantly reduce amblyopic cases.

Keywords: Amblyopia, Cross-sectional study, Refractive errors, Strabismus

Introduction

Treatment and correction of visual problems are costly. Blindness has been reported in 40 million people worldwide (1). The leading causes of blindness are refractive errors (uncorrected myopia) and cataracts, which have been the focus of many studies since 1990 (1-4). Recent studies still stress the magnitude of the problem with these 2 visual disorders, because not only do they affect the elderly, but young adults and children are also affected (1). Studies indicate that refractive errors are common in all ages (5-8). A look at these studies shows that over 40% of children and schoolchildren in eastern Asian countries have refractive errors (9-11). Amblyopia and strabismus are other common visual problems in childhood; previous studies reported rates between 2% and 3% (12-14). Amblyopia is considered one of the most important causes of visual impairment in children and the elderly (15-17). Amblyopia and strabismus are responsible for reduced quality of life in children as well as lower academic performance compared to others (18, 19).

Refractive errors, amblyopia, and strabismus have received much attention globally over the past decade, and studies have been able to answer many questions about these problems. Iran is the second most populous country in the Middle East. Many studies have discussed these problems in Iran in the past 10 years (5, 20, 21). One of the limitations of most of these studies is that disorders were studied separately, and we cannot tell what percentage of children in a given population has visual disorders including refractive errors, amblyopia, and strabismus. In light of the importance of visual disorders in children and lack of a study concerning all disorders, we examined visual disorders comprehensively in a population of schoolchildren in Dezful.

Methods

This study was conducted cross-sectionally between November 2013 and January 2014. The target population of...
the study was schoolchildren of the city of Dezful who were selected through multistage cluster sampling. There are 271 schools with 50,177 students in Dezful. Twenty-four schools were selected as clusters in this study. In each school, using a simple random method, a number of students were selected from each class proportionate to the number of students in that school. After sample selection, the project was explained to parents to invite them to participate, and consenting invitees were enrolled in the study. A suitable space was selected on the school site one day before the study. In each school, examinations were started with first graders, and students in each class were examined in alphabetical order.

Examinations

After the interview, students were guided into the examination room to have monocyclopigic autorefraction with the Topcon RM8800 autorefractor (Tokyo, Japan) by a single skilled technician. Then students had their visual acuity tested with their own spectacles, if any, using a Snellen tumbling E chart distanced at 6.0 meters from the examinee. For these students, lensometry was done with the Topcon LM 800 lensometer, results of which were recorded along with their prescription data. In the next step, uncorrected distance visual acuity (UDVA) was tested for all participants, and auto-reading results were refined through retinoscopy (Heine Beta, Heine Optotechnik, Herrsching, Germany) and trial lenses (MSD, Rome, Italy).

Unilateral cover test (cover-uncover) was carried out twice at 6 m and 50 cm for investigating strabismus and was repeated with the subject’s best correction if UDVA was less than 20/25. A letter from the line above the visual acuity of the weaker eye was shown to the subject for fixation to control accommodation. After binocular fixation, the right eye was covered for at least 2 seconds and any compensating movement of the left eye was noted. The occluder was then removed to note refixation movements under binocular conditions. This process was repeated for the left eye. All observed types of horizontal and vertical strabismus were then recorded. Visual acuity, lensometry, objective and subjective refractions, and the cover test were all carried out by a skilled and experienced optometrist.

Definition

In line with previous studies, our definition of amblyopia was a best-corrected visual acuity of 20/30 or worse or an interocular difference of 2 or more lines of Snellen acuity in the absence of any pathology. The diagnosis of ptosis was based on measurements of the margin reflex distance 1 (MRD1), which is the distance from the upper eyelid margin to the corneal light reflex. An MRD1 <4 mm was considered ptosis. Due to lack of information regarding their history of ptosis (congenital or acquired), only the presence or absence of ptosis was recorded for each case, and the type was not specified.

Statistical analysis

All statistical analyses were performed using SPSS v 20.0 and STATA v 11. Here we present the prevalence of amblyopia, tropia, and ptosis in percentages and 95% confidence intervals (CI). The effect of cluster sampling was taken into account in calculating standard errors, and the presence of associations was examined using multiple logistic regression.

Results

In this study, 1,375 schoolchildren were selected through cluster sampling, and 1,151 (83.7%) of them participated in the study. Examinations were completed for 1,130 children whose data were used in the analyses. The mean age of the participants was 11.05 ± 2.93 years (range 6-15), and 520 (46.0%) were female.

Amblyopia was detected in 2.7% (95% CI 0.8-4.7) of the studied sample; prevalence rates were 3.3% (95% CI 0.1-6.7) in boys and 2.1% (95% CI 0.3-3.9) in girls (p = 0.516). Amblyopia prevalence significantly increased with age; rates were 1.8% in the 6- to 7-year-old age group, 2.0% in 8- to 9-year-olds, 2.5% in 10- to 11-year-olds, 2.7 in 12- to 13-year-olds, and 4.0% in 14- to 15-year-olds. Among cases of amblyopia, 45.2% were anisometropic, 29% were strabismic, 16.1% were combined strabismic-anisometropic, and 9.7% were isometropic.

The prevalence of strabismus was 1.9% (95% CI 0.2-3.8): 2.4% in boys and 1.3% in girls (p = 0.291). Among cases with strabismus, 63.6% were exotropic and 36.4% were esotropic. Overall, 61.9% (95% CI 59.0-64.7) of the studied schoolchildren had at least one visual problem or strabismus, and 0.8% (n = 9) had ptosis. A total of 55.5% (n = 5) of the ptotic schoolchildren had deprivation amblyopia.

Discussion

Visual disorders in children and schoolchildren have been discussed in several studies in Iran and the rest of the world. However, results show that further studies are needed in this area. In this study, we demonstrated the prevalence of amblyopia, strabismus, and ptosis in schoolchildren in addition to refractive errors.

In this study, the prevalence of amblyopia was relatively high. Other studies in Iran reported lower rates, and as demonstrated in Table 1, the prevalence of amblyopia in most parts of the world is lower than what we found in this study, even though a few studies have reported rates over 4%.

This finding is difficult to explain. Although we demonstrated that amblyopia prevalence increased with age, since amblyopia does not occur after 6 or 7 years of age, it would be difficult to find a pathologic reason. The only explanation for this finding could be increased screening for amblyopia in Iran and the rest of the world. Screening programs are receiving more attention in recent years, and care is taken to conduct them accurately. The age-related increase in amblyopia prevalence implies less accurate screening in older age groups, due to which, cases were not properly identified and treated.

The National Amblyopia Screening Program has been running in Iran for over 15 years. Nonetheless, the prevalence determined in this study was not very different from the prevalence of amblyopia in previous years; it is even higher than the rate previously seen in this population. This implies...
low screening accuracy, low follow-up rate, or improper treatment of identified cases. Overall, these findings illustrate that although the prevalence of amblyopia is lower compared to other studies, its decline is less than anticipated.

In agreement with other studies, anisometropia was the most common cause of amblyopia (22). However, some recent studies in Iran and other countries suggested that strabismic amblyopia was more prevalent (23). It seems that strabismic amblyopia is more common where screening is done well, because anisometropic cases are identified and treated more easily. In our study population, a large number of the students were screened when the program sensitivity was still low, and cases of anisometropia were not diagnosed and treated well.

The prevalence of strabismus in our study (1.9%) was similar to that in other studies (12, 24), and in agreement with previous results from Iran (14), exotropia was more common. Published findings from other parts of the world are inconsistent. In studies by Chew et al (25) and Graham (26), esotropia was reported to be more prevalent than exotropia, but some studies suggest that exotropia is more common (27, 28). Studies around the world indicate a higher prevalence of exotropia in Asian children compared to those in Western countries, which can be due to a higher prevalence of astigmatism and uncorrected refractive errors (24, 27, 28).

A novel aspect of the present study was evaluation of ptosis. As demonstrated, 0.8% of the schoolchildren had ptosis. Although the prevalence of this condition is not high, judgment about this issue is difficult because population-based studies are scarce. The prevalence of ptosis in this age group was not different in Tehran (29). However, in a study by Sridharan et al (30), the prevalence of ptosis was more than 10%; this could be due to the older sample population of their study.

### Conclusion

The present study indicated that the prevalence of amblyopia and strabismus in Dezful schoolchildren falls in the average range. Since the Amblyopia Screening Program has been running for years, we expected lower rates compared to previous years, but this was not observed. Correcting refractive errors can significantly reduce amblyopic cases.

### Disclosures

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