

VISION SCREENING AMONG CHILDREN IN PRIMARY SCHOOLS IN A DISTRICT OF WESTERN TURKEY: AN EPIDEMIOLOGICAL STUDY

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ABSTRACT

Objectives: To determine the prevalence of visual impairments among children in primary schools.

Methodology: This cross-sectional study was conducted between from November 1st to December 31st 2006. Visual acuity was determined with the Snellen's E chart. Visual impairment was defined as visual acuity of d"20/40 in the better eye, as amblyopia if the difference in visual acuity between both eyes was 0.2d" dioptre, and as strabismus if the cover test was positive.

Results: Of the study group (n=1606), 53.7% (n=864) were boys and 46.3% (n=742) girls. The mean age of the participants was 10.52±2.28 (range 6-17), The girls had a higher frequency of a presenting visual impairment than boys (2.4% vs. 1.0%), (p<0.05). Twenty seven (1.7%) children presented with vision of d"20/40 in the better eye. The prevalence of presenting visual acuity for d"20/40 was significantly higher in children with glasses compared to the group of children without glasses (p<0.05). The prevalence of amblyopia was 5.0%, whereas that of strabismus was 1.7%.

Conclusions: The number of students with visual impairments was high, and many students were unaware of visual impairments and their risk factors.

KEY WORDS: Visual impairment, Amblyopia, Strabismus, Primary school students.

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INTRODUCTION

Visual impairment is the consequence of a functional loss of vision, rather than an eye disorder itself, which is defined as vision of 20/40 or worse in the better eye with corrective lenses¹.

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The main purpose of screening and surveillance for visual defects throughout childhood is the early detection and treatment of relevant ophthalmic disorders, such as visual acuity, amblyopia, strabismus, and refractive errors to minimize their impact on a developing child.² As up to 6% of preschool children will have an ocular or vision defect requiring treatment or follow up.³ Early detection of a vision problem can have educational and behavioral benefits, and certainly has quality of life benefits.⁴

The American Academy of Ophthalmology, and the American Association of Pediatric Ophthalmology and Strabismus has recommended that children be examined for eye problems in

four stages: in the newborn nursery, at age 6 months, age 3 years, and 5 years and older. Amblyopia is defined as a reduction in best-corrected visual acuity that is not directly attributable to any structural abnormality of the eye or visual pathway. It is the most common cause of vision loss in children and is found in as many as 5 to 7 percent of school-age children.^{4,5} Strabismus is a deviation of the eyes. The term is used to describe eyes that are not straight or properly aligned. It consists of any deviation of binocular alignment and is present in 2-4% of the world's child population.⁶

The objective of this study was to determine the prevalence of visual impairments, and its relationship with socio-demographic characteristics among a group of primary school students.

METHODOLOGY

Subjects: Four schools situated in the district, the Sivrihisar town, western Turkey, each having approximately equal populations of children, were determined as the target population. During the screening period, the total number of children attending school was 1689, of which 1606 (95.1%) were examined. However, 4.9% children (83 persons) did not participate due to their absence from school during the study period.

Procedures: During a 1-2 day period in each school, firstly, the first part of the questionnaire was filled in by the researchers in a face-to-face interview with children. The second part of the questionnaire regarding mothers/fathers' socioeconomic and eye health were given to the children to be filled in by the children's mothers or fathers at home, and they were requested to bring it back. The second step of the study, which involved the eye examination, included the following: the values of the students' visual acuities for eyes according to the Snellen E Chart; the presence of strabismus for both eyes, and the presence of amblyopia. Visual acuity testing was conducted using the Snellen E chart for all of the children at six meters in adequate daylight, outdoors.⁷ The doubtful visual impairment cases was determined as a visual acuity of <20/40 in the better eye.⁷ A

definition of better eye was applied when one eye achieved a better score than the other in the visual acuity examination with the Snellen E charts. During the visual acuity examination, firstly the right eye was tested and then the left eye, with glasses (presenting visual acuity).^{8,9}

Amblyopia or lazy eye, a developmental disorder that degrades spatial vision and stereopsis, is almost always associated with strabismus, anisometropia, or form deprivation early in life was diagnosed if the dioptric difference in visual acuity between both eyes in the absence of an organic eye disease was ≥ 0.2 . Doubtful strabismus cases (exotropia or esotropia) was determined as positive if it was present in at least one eye in a cover-uncover test.¹⁰ The doubtful cases of all the visual impairments were referred to secondary health care in order to make certain of diagnosis and to receive treatment.

Statistical Analysis: Obtained data was evaluated through frequency and percentages ratios, Chi-square (χ^2) and Student's t tests. The measure for statistical significance was established a priori as $p < 0.05$.

Legal Ethical Consent: Ethical permission for the study was obtained prior to collecting data, by contacting and receiving approval from the appropriate management authority, the health directorships of the province and district involved.

RESULTS

During the period of study in the town of Sivrihisar, 1606 students completed the screening. Of the study group, 53.7% ($n=864$) were boys and 46.3% ($n=742$) girls. The mean age of the participants was 10.52 ± 2.28 , with a range of 6 to 17 years, with no mean age difference between boys and girls (10.48 ± 2.33 , 10.56 ± 2.22 , respectively) ($p > 0.05$). The difference between the children's age groups, <10 and >10 years old by their gender was not significant ($\chi^2 = 0.423$; $df=1$, $p=0.516$).

The proportion of children whose mothers had been educated to primary school level and below was 71.3%, with a figure of 41.2% for the same level in children's fathers. The majority

Table-I: Sociodemographic characteristics of children by status of visual acuity in the better eyes

Sociodemographics	Visual Acuity						Statistical analyses	
	<20/40		>20/40		Total		χ^2	P value
	N	%	n	%	N	%		
Sex							4.627	0.031
Boy	9	1.0	855	99.0	864	53.8		
Girl	18	2.4	724	97.6	742	46.2		
Age group								
<10 years	9	1.6	552	98.4	561	34.9	0.031	0.861
>10 years	18	1.7	1027	98.3	1045	65.1		
School type								
The Hasan Karacalar	11	2.3	461	97.7	472	29.4	1.846	0.605
The Ataturk	3	1.1	258	98.9	261	16.3		
The Cumhuriyet	6	1.5	400	98.5	406	25.3		
The Mehmet Kaplan	7	1.5	460	98.5	467	29.1		
Mother's educational level								
Primary school or below	18	1.6	1128	98.4	1146	71.4	4.172	0.525
Secondary school or over	9	2.0	451	98.0	460	28.6		
Father's educational level								
Primary school or below	11	1.7	651	98.3	662	41.2	2.413	0.790
Secondary school or over	16	1.7	928	98.3	944	58.8		
Mother's job								
Employed in any job	5	4.3	111	95.7	116	7.2	5.229	0.022
Housewife	22	1.5	1468	98.5	1490	92.8		
Father's job								
Blue collar	9	2.1	429	97.9	438	27.3	2.638	0.756
Farmer	7	2.0	339	98.0	346	21.5		
White collar	3	0.8	368	99.2	371	23.1		
Tradesman	6	1.9	314	98.1	320	19.9		
Retired	1	2.3	43	97.7	44	2.7		
Unemployed	1	1.1	86	98.9	87	5.4		
Number of siblings								
No, 1 or 2	12	1.3	891	98.7	903	56.2	1.549	0.213
3 or over	15	2.1	688	97.9	703	43.8		
Birth order in family								
First or second	18	1.5	1178	98.5	1196	74.5	0.880	0.348
Third and over	9	2.2	401	97.8	410	25.5		
Total	27	1.7	1579	98.3	1606	100.0		

of the mothers 92.8% were housewives. In terms of father's occupation, most were blue collar (27.3%), followed by farmer (21.5%). The lowest common job status seen was unemployed (5.4%). Ninety eight point four percent of our study children were born at full term.

Table-I shows the socio-demographic characteristics of children by presentation of visual acuity in the better eyes. The frequency of

presenting visual impairment for <20/40 was 1.7% in the better eyes. Nearly all the children (98.3%) had good visual acuity (>20/40). The girls had a higher frequency of a presenting visual impairment than boys (2.4% vs. 1.0%), ($p<0.05$).

The working women's children had a higher frequency of a presenting visual impairment than the others (4.3% vs 1.5%), ($p<0.05$). In

Table-II: The distribution of presenting visual impairment by children with/without glasses in the better eye

Glasses	Visual Acuity				Total	
	<20/40		>20/40		n	%
	n	%	n	%		
Children with glasses (corrected)	7	5.1	131	94.9	138	8.6
Children without glasses	20	1.4	1448	98.6	1468	91.4
Total	27	1.7	1579	98.3	1606	100.0

$\chi^2=10.504$; $p=0.001$

contrast, children aged >10 had a higher frequency of a presenting visual impairment than children aged <10 (1.7% versus 1.6%, respectively), however no statistical significance was found between the two age groups ($p>0.05$). The total monthly income of the boys' families was higher than the girls' (16.0% vs. 10.5%, respectively) ($\chi^2=10.464$; $DF=2$; $p=0.005$).

The proportion of children with glasses was only 8.6% ($n=138$). The frequency of a presenting visual impairment was significantly higher in children with glasses (corrected) as compared to children without glasses (5.1% versus 1.4%), ($p<0.01$). Twenty children without glasses examined needed glasses, glasses of 7 children with glasses needed to be corrected, and 131 children with glasses out of 138 were wearing the best correction. The distribution of a presenting visual impairment by children with/without glasses in the better eye is shown in Table-II.

The frequency of amblyopia was 5.0% ($n=81$), and that of strabismus was 1.7% ($n=27$). Additional data are presented in Table-III & IV.

DISCUSSION

In this screening, the frequency of a presentation of visual impairment for <20/40 was 1.7% in the better eyes. In some studies from under-developed or developing countries, similar results were reported showing that the frequency was between 1.2%-2.8%.^{11,12} However, there are also many studies reporting higher rates of frequency (6.4%-22.3%).^{8,9} An explanation for these differences could be that health managers for each country have different policy implications for modifying or improving existing preschool services.

In this study, the girls had a higher frequency of a presenting visual impairment than that of boys (2.4% versus 1.0%), ($p<0.05$). One explanation for girls displaying nearly two and half times more visual impairments than boys might be that the total monthly incomes of the girls' families in our screening was lower than those of the boys. Due to a lower economic status, it could be that poor families have girls' visual examinations performed less than the others.

Table-III: The distribution of amblyopia by sex and age groups

Sex	Amblyopia				Total	
	Yes		No		n	%
	n	%	n	%		
Boy	48	5.6	816	94.4	864	53.8
Girl	33	4.4	709	95.6	742	46.2
$\chi^2=1.023$; $p=0.312$						
Age groups						
<10 years	25	4.5	536	95.5	561	34.9
>10 years	56	5.4	989	94.6	1045	65.1
$\chi^2=0.621$; $p=0.431$						
Total	81	5.0	1525	95.0	1606	100.0

Our study indicated that the working women’s children had a higher frequency of a presenting visual impairment than non-workers (4.3% versus 1.5%), ($p < 0.05$). This may show that working mothers have not enough time for their children’s visual health.

In our study, the frequency of children with glasses was 8.6% ($n = 138$). This result is consistent with some studies conducted in Turkey reporting the frequency of children with glasses to be between 7.8% and 13.6%.^{13,14} The frequency of visual impairment ($< 20/40$) in the better eye was significantly higher in children with glasses (corrected) as compared to the others (5.1% versus 1.4%) ($p < 0.001$). This result might be due to the fact that fewer periodical visual examinations were conducted for children with glasses, a disclosure in line with the study results of Yaramis and Karatas.¹³

Lower education level, unemployment, having more number of siblings may indicate lower socio-economic status (SES). In this base, we expect that families with a lower SES receive less health care and less periodical vision examinations. Similarly, many studies have reported that there were the significant relationships between the mothers’ and fathers’ educational level, fathers’ job, number of siblings and visual acuity.^{15,16} In our study, the mothers’ and fathers’ educational level, fathers’ job, number of siblings, and order of birth revealed no difference according to the frequency of a presenting visual impairment, with the exception for mother’s job ($p > 0.05$, each one), meriting further study.

In the present study, the frequency of amblyopia was found to be 5.0%. This finding is compatible with the results of many researches showing that the frequency in our country, where it was found to be 6.0%,¹⁷ and other countries is between 0.14% and 11.4%.^{9,18} Since the lower frequency of amblyopia shows that visual health is better, periodically visual acuity examinations should be given importance in order to reduce this rate.

In our screening, the frequency of strabismus was found to be 1.7% ($n = 27$). This finding is compatible with many researches showing that the frequency ranged 0.2% to 7.8%.^{10,17} However, our study finding indicates a lower set of frequency values than other studies which could be explained by the fact that nearly all the children in our study group (98.4%) were born at full term in line with the studies,^{19,20} reporting that the frequency of strabismus was higher in preterm infants.

In this study, there was no difference between boys and girls with respect to strabismus (1.7% vs. 1.6%, respectively, $p > 0.05$). Contrary to these findings, the findings of a study conducted in our country reported a higher frequency of strabismus in boys than girls.¹⁷ Due to strabismus status as an important cause of lifelong visual impairment, in particular amblyopia, further study is necessary.

We are well aware of the limitations of the present screening. Firstly, it was performed in a single district, and therefore the sample may not be representative of all Turkish students. The second limitation was that since this is a

Table-IV: The distribution of strabismus by sex and age groups

Sex	Strabismus				Total	
	Yes		No		n	%
	n	%	n	%		
Boy	15	1.7	849	98.3	864	53.8
Girl	12	1.6	730	98.4	742	46.2
x ² = 0.034; p = 0.853						
Age groups						
<10 years	10	1.8	551	98.2	561	34.9
>10 years	17	1.6	1028	98.4	1045	65.1
x ² = 0.054; p = 0.817						
Total	27	1.7	1579	98.3	1606	100.0

mass-screening study at primary health care level, refraction errors, hypermetropia, myopia, astigmatism and other causes could not be determined because of insufficient time, inadequate tools and personnel such as ophthalmologist. As such more detailed examination of visual impairments was not possible in these circumstance.

CONCLUSION

The number of the students with visual impairments was high. We also observed that many students were unaware of visual impairments and their risk factors. Health education programs need to address this lack of awareness to facilitate their prevention and control.

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