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Causes of visual impairment: a retrospective study in Macedonian children

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Background: Reliable data on the prevalence and causes of visual impairment in children are necessary for developing a systematic vision screening program with valid and reliable test protocols.

Purpose: The aim of the study was to investigate the prevalence, main causes, and associated factors of visual impairment among Macedonian children aged 0–18 years.

Methods: This retrospective study analyzed the clinical record of 829 children, attending the department of ophthalmology from October 2013 to October 2018. The following variables were investigated: age, gender, and diagnosis.

Results: The prevalence of visual impairment was statistical significance higher in girls than in boys ($p < 0.05$), with a male to female ratio of 1/1.2. The most frequent diagnostics were refractive errors (42.6%), ocular inflammation (20.6%), and strabismus (9%).

Conclusion: In our country, data on the prevalence, magnitude and causes of visual impairment in children are needed for planning and evaluating preventive and curative services for children, and for planning special education and low vision services.

Key words:

visual impairment, causes,
prevalence

Introduction. Global estimates indicate that there are around 19 million visually impaired (VI) children worldwide; of these, 1.4m are blind and 17.5m have low vision. In a recent classification by the World Health Organization (WHO), the major cause of worldwide vision impairment was uncorrected refractive error, approximately 12.8 million cases (67%) [1, 2]. The prevalence of childhood VI vary between countries, ranges from 0.3 per thousand children in the developed countries to 1.5 per thousand in the developing countries [3].

In the global initiative “VISION 2020 The Right to Sight,” childhood VI and refractive error are highlighted as a priority area [4]. However, because of the requirement for additional resources and expertise, along with a general lack of authentic prevalence information, visual impairment among Macedonian children is currently not a priority in the planning of eye care services. Therefore, reliable data on the prevalence and causes of VI in children are necessary for developing a systematic vision screening program with valid and reliable test protocols. Such data will help to direct the application of available resources and efforts for early detection to people who are at risk, thereby reducing the high short- and long-term costs to the health system and society.

The **aim** of the study was to investigate the prevalence, main causes, and associated factors of visual impairment among Macedonian children aged 0–18 years.

Material and methods

This study was conducted at the Department of Ophthalmology in City General Hospital 8th September, Skopje, N. Macedonia. The clinical record of 829 children, aged 0-18 years, attending the department of ophthalmology from October 2013 to October 2018 were in-

cluded in the study. The study adhered to the Declaration of Helsinki.

Data analysis was carried out using SPSS version 20.0 for Windows. The differences in prevalence between age and sex groups were analyzed using a χ^2 test. A p value of < 0.05 was considered significant. Also, prevalence estimates of visual impairment were expressed as percentages with 95% confidence interval.

Results and discussion

The sample was divided into three groups during the analyses by combining the age range of 0-6 years for pre-school children, than 7-14 years for elementary school children and 15-18 years for high school children. According to Table 1, it is understood that the majority of the participants are from the groups of “15-18 years” and “7-14 years”. The ratio of the participants in the age group of 0-6 years are 9.0%. Results from statistical analyses showed that age was significantly associated with VI, with participants in the 0-6 age group being less likely to have VI compared to the other age groups. Also, data from other studies suggest that VI had a linear relationship with increasing age [5]. Comparing the sexes, the prevalence of VI was statistical significance higher in girls than in boys ($p < 0.05$), with a male to female ratio of 1/1.2.

In 829 participants, refractive errors were the leading cause of VI, accounting for 42.6%, followed by ocular inflammation (20.6%), and strabismus (9%) (Table 2). With regard to the causes of VI and sex, ocular inflammation was distributed evenly between female and male study participants (20.4% versus 20.9%), whereas refractive errors were found more often in girls than in boys (44.8%

Table 1. Distribution of participants by age and sex

Child characteristics	Girls n (%)	Boys n (%)	All n (%; 95% CI)*	p**
All participants	456 (55.0)	373 (45.0)	829 (100.0; 0.51-0.58)	<.05
Age in years				
0-6	40 (8.8)	35 (9.4)	75 (9.0; 0.41-0.61)	<.05
7-14	131 (28.7)	108 (29.0)	239 (28.8; 0.48-0.61)	
15-18	285 (62.5)	230 (61.6)	515 (62.2; 0.50-0.59)	

* Confidence intervals (CIs) ** P values were calculated by using χ^2 test

Table 2. Causes of visual impairment by sex

Rank	Causes	Girls n (%)	Boys n (%)	All n (%; 95% CI)*	p**
1	Refractive errors	204 (44.8)	149 (39.9)	353 (42.6; 0.57-0.42)	<.05
2	Ocular inflammation	93 (20.4)	78 (20.9)	171 (20.6; 0.54-0.45)	>.05
3	Strabismus	53 (11.6)	29 (7.8)	82 (9.9; 0.64-0.35)	>.05
4	Eye injuries	12 (2.6)	38 (10.2)	50 (6.0; 0.24-0.76)	<.05
5	Macular degeneration	22 (4.8)	22 (5.9)	44 (5.3; 0.50-0.50)	>.05
6	Retinal diseases	25 (5.5)	18 (4.8)	43 (5.2; 0.58-0.41)	>.05
7	Computer vision syndrome	22 (4.8)	12 (3.2)	34 (4.1; 0.64-0.35)	>.05
8	Other causes	7 (1.5)	11 (3.0)	18 (2.2; 0.38-0.61)	>.05
9	Amblyopia	6 (1.3)	9 (2.4)	15 (1.8; 0.40-0.60)	>.05
10	Optic nerve disorders	10 (2.3)	4 (1.1)	14 (1.7; 0.71-0.28)	>.05
11	Nystagmus	2 (0.4)	3 (0.8)	5 (0.6; 0.40-0.60)	>.05
Total		456 (55.0)	373 (45.0)	829 (100.0)	

* Confidence intervals (CIs) ** P values were calculated by using χ^2 test

versus 39.9%). We also found a difference between the sexes, with an around 76% higher prevalence of eye injuries in boys, this was statistically significant ($p < 0.05$). Clinical evidence suggests that refractive errors are common ophthalmic disorders in children. Also, refractive error was the most prevalent cause of VI in our sample, accounting for 42.6% of the total. This finding is lower to other population-based studies, which have reported rates of 53% to 95.6% for VI caused by ametropia [6, 7].

Conclusion

In our country, data on the prevalence, magnitude, and causes of visual impairment in children are needed for planning and evaluating preventive and curative services for children, and for planning special education and low vision services.

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