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ORIGINAL PAPER

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Amblyopia in Children: Analysis Among Preschool and School Children in the City of Tuzla, Bosnia and Herzegovina

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ABSTRACT

Aim: This study measured the prevalence of amblyopia in preschool and school children between 4 and 15 years of age in Tuzla, Bosnia and Herzegovina and as well and to examine its relations with anisometropia and strabismus. **Methods:** Children from eight daycare centers and twenty four elementary schools were screened for amblyopia by volunteer personnel (medical students), any child who failed to pass the screening examination, was referred to the ophthalmologist for complete examination at University Clinic Center Tuzla. The examination included VA, stereopsis, cover testing, refractive retinoscopy, and examination of the red reflex and posterior pole. **Results:** Total of 7415 children, which included 3790 males and 3625 females, in the age range of 3 to 15 years from 24 schools and 8 preschool were screened. Fifty night children (1.9%) were diagnosed with amblyopia, unilateral in 28 and bilateral in 31. **Conclusion:** Prevalence of significant refractive errors is high enough to justify a school eye screening program solely for this purpose. preschool and school screening program in children in critical period of development of amblyopia must be conducted to find out the ametropias and amblyopia in time; and treat them earlier.

Keywords: Amblyopia, visual acuity, screening program.

1. INTRODUCTION

In a preschool and school children in Bosnia and Herzegovina there is very limited information available on the prevalence of eye disorders. Screening for visual acuity in children has never been performed in our country prior to our study. Amblyopia is consider an impairment of vision arising from dysfunction of processing of

visual information caused by degradation of the retinal image during a sensitive period of visual development (1). Amblyopia is the most common cause of monocular vision loss in children with an estimated prevalence of 0,20 - 6,2%, depending on population and study (2-5). In adult population amblyopia affects approximately 3% of them (6). Detection of amblyopia as early as possible is the crucial factor for the successful treatment (7, 8). Failure to diagnose and manage amblyopia before the age of 8 years can result in life-long visual impairment (9).

There are different classifications of amblyopia. Amblyopia is usually classified by cause:

- Strabismic when it is due the presence of squint;
- Anisometropic where the refractive error is significantly greater for one eye than the other;
- Meridional where there is a significant degree of astigmatism;
- Stimulus deprivation where, for example, a cataract or ptosis obscures the visual axis;
- Ametropic where the refractive error is such that neither eye receive a good quality image;
- Amblyopia is usually unilateral, but it may be bilateral in cases of bilateral high refractive error or bilateral ocular pathology (10).

The screening program for amblyopia and refractive errors in pediatric population followed by appropriate treatment should be obligatory in Bosnia and Herzegovina. These kind of screening programs could be a way of significantly reducing the prevalence of amblyopia.

2. AIM

This study measured the prevalence of amblyopia in preschool and school children between 4

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and 15 years of age in Tuzla, Bosnia and Herzegovina and as well and to examine its relations with anisometropia and strabismus. We carried out a retrospective study. An approval from Ethics Committee Board of the institute was obtained to conduct this study in accordance with the Declaration of Helsinki.

3. PATIENTS AND METHODS

All the pre-school children from 7 daycare centers and school children from all 24 elementary schools in Tuzla were eligible for the study. Written consent from at least 1 parent plus the assent of each child were obtained prior to examination. Although the parents were offered the option of withdrawing their child from the study, no child was withdrawn. The screening in daycare centers and elementary schools was conducted by medical students. Medical students specially were trained in a one day workshop to assess children's visual acuity. They were taught how to grade the pupils' eyesight for each eye separately by whether or not the pupil could see at least three out of five optotypes of the 6/12 line of Snellen's E chart at 6 meters. Each child failing the vision screening was examined by an ophthalmologist at the University Clinic Center in Tuzla. At University Clinical Center all the children who failed exam in the school underwent detailed eye examination and history.

Ophthalmologic examination at University Clinic Center Tuzla consisted of:

- measurement of the monocular linear visual acuity;
- evaluation of ocular motility;
- slit lamp biomicroscopy;
- refraction under cycloplegia (cyclopentolate, every 5 minutes for 3 times). Retinoscopy was performed 45 minutes following the first instillation. Subjective refraction was also performed if the child collaborated;
- direct ophthalmoscopy under mydriasis, and indirect ophthalmoscopy, when necessary;
- applanation tonometry when necessary.

A cover-uncover test was then performed to confirm the diagnosis if strabismus was present. Cover tests were performed by trained orthoptist using fixation targets at both distance (6m) and near (30cm). The presence of strabismus, its characteristics (constant or intermittent), type (exotropia, esotropia, hyper/hypotropia or dissociated vertical deviation) and size (prism diopters) were also recorded. If eyes moved after removal of the cover, the child was considered to have a "phoria"; and if the degree of deviation did not change on cover and uncover, the child was considered to have a "tropia" [> 5 degree/ 10Δ diopter (D)]. The eye movements were tested in 6 cardinal directions to rule out paralytic or restrictive strabismus. Any overaction or underaction of the superior, inferior, medial, lateral, superior oblique and inferior oblique muscles was identified. Presence and absence of nystagmus (rhythmic jerky eye movements) was documented. Anterior segment was examined with slit lamp to detect cataract; congenital anomalies like anophthalmos, microphthalmos, large corneas; and evidence of previous eye surgery. The children underwent a full ocular examination, and any pathology involving the anterior and posterior ocular segments was documented. Fundus examination was performed by the ophthalmologist using indirect ophthalmoscopy. De-

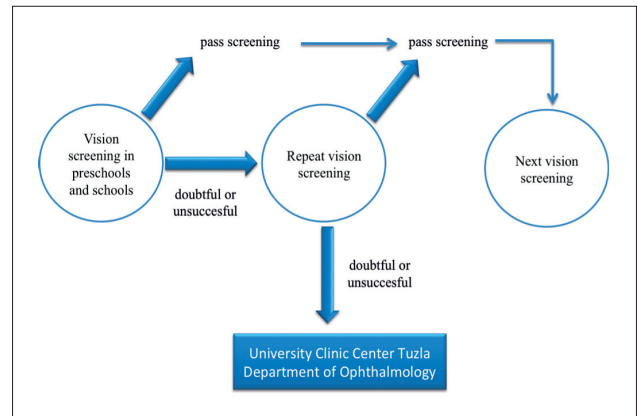


Figure 1. Screening policy at Tuzla, Bosnia and Herzegovina

tailed history about present and past ocular problems and treatment, history of any medical or surgical treatment, and family history were taken. Children with organic blindness or mental retardation were excluded.

The diagnosis of interest was amblyopia and its underlying cause - that is, strabismus, refractive errors (anisometropia, isoametropia, or astigmatism), combined mechanism (a combination of strabismus and anisometropia), or deprivation (organic eye disorder). Myopia was considered when the measured objective refraction was more than or equal to -0.75 spherical equivalent diopters in one or both eyes. Hyperopia was considered when the measured objective refraction was greater than $+2.00$ spherical equivalent diopters in one or both eyes provided no eye was myopic. Astigmatism was considered to be visually significant if ≥ 1.00 D.

All data were entered into a database (Excel; Microsoft, Redmond, WA). Relevant data were converted to a statistical analysis file (SPSS ver. 17.0 for Windows; SPSS, Chicago, IL) to enable calculation of frequencies, means, and standard deviations.

4. RESULTS

A total of 7415 children were screened from eight preschools and twenty four schools. The screening took place between November 2014 and November 2015 in Tuzla, Bosnia and Herzegovina. There were 3790 (51%) male children while 3625 (49%) were females. A total of 6896 children were examined in the elementary schools while the rest of the children were examined in day care center. The number of children

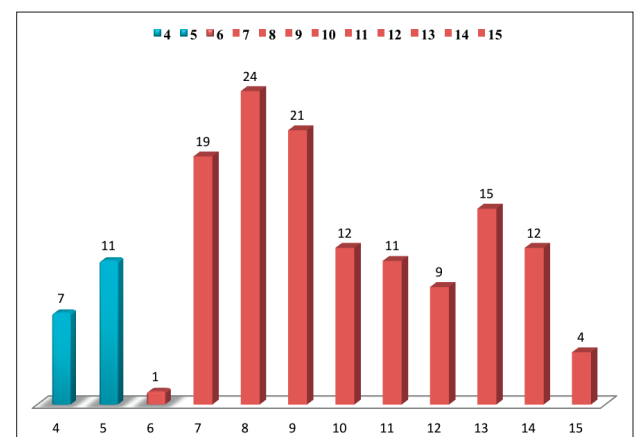


Diagram 1. Age distribution

referred to the ophthalmologists for further evaluation and management was 819. Out of this figure, 237 or 28.9% of children kept their appointment.

Out of the 237 children who visited the University Clinic Center Tuzla, 80 had no decreased visual acuity, while 157 had a decreased visual acuity. 12 children only presented first time to UCC but for the follow up examination during next twelve months they didn't show for further evaluation. Complete ophthalmological exam was performed by ophthalmologist to total 145 children, 18 of them were preschool children while 127 of them were school children. Total of 145 were prescribed glasses for the first time. The mean age of children was 9.50 ± 2.91 years, with a range of 4 to 15 years.

Of the total number of children ($n = 145$), 127 children were of school age, and 18 children were preschoolers. Bipolar chi-square test ($\chi^2 = 81.94$) was statistically significant at $p = 0.001$, so we can conclude that in this study there are children of school age compared to those of pre-school age. The subject is not uniform $\chi^2 (1, n = 145) = 81.94, p = 0.001$.

Refractive errors were found in 145 children (1,95%). There was no legally or economically blind child after refraction. Amblyopia was found in 59 children (0,79%). Out of 59 children with amblyopia, 12 of them are pre-school age, while other 47 children are school age. Unilateral form of amblyopia was found in 31 children while bilateral form of amblyopia was found in 28 children. Sex distribution of amblyopia male $n=29$ (49,1%) and female $n=30$ (50,9%) (Table 1).

Sex distribution	Number	Percentage
Male	29	49,1%
Female	30	50,9%
TOTAL	59	100%

Table 1. Sex distribution of amblyopia

Amblyopia was caused by refractive error ($n = 30$), anisometropic ($n=17$), strabismus ($n = 12$) (Table 2).

Amblyopia	Number	Percentage
Refractive errors	30	50,8%
Anisometropic	17	28,8%
Strabismus	12	20,3%
TOTAL	59	100%

Table 2. Frequency distribution of Amblyopia

Results for unilateral and bilateral amblyopia are presented in Table 3. Altogether there were 59 children with amblyopia, 31 unilateral and 28 bilateral.

Amblyopia	Number	Percentage
Unilateral	31	53%
Bilateral	28	47%
TOTAL	59	100%

Table 3. Frequency distribution of unilateral and bilateral amblyopia

5. DISCUSSION

Our screening program was the major screening program of amblyopia in Bosnia and Herzegovina after the war. Correction of refractive error alone has been shown to significantly reduce amblyopia and less frequent occlusion can be just as effective as more extensive occlusion. Ametropia and anisometropia were the most common causes of amblyopia. Refractive errors are common in Bosnian and Herzegovinian children and often remain undiagnosed. Conduction of preventive programs directed to preschool and school children requires the participation of several sectors of the community involving physicians, educators, family members and volunteer personnel (11, 12, 13).

This study highlights the importance of detecting refractive errors and amblyopia in children and correcting them in time to enhance the development of children. Children of low-income families, in which usually amblyopia go undetected for a longer period of time were equally involved in this study. One of the limitations of this study was the lower number of children that came to University Clinic Center Tuzla. This study depended on parents bringing their child for examination on a volunteer bases. The response rate was not quite good (29%), there might be differences between the non-responder and responder group. We also believe that children with amblyopia who were already, before this study under care of ophthalmologist might not have presented for the study.

6. CONCLUSION

Screening programs such this one leads to diagnosis and early treatment of uncorrected refractive errors and amblyopia in all preschool and school children. Our findings in this study may help to optimize the timing and modality of preschool and school vision screening programs. We would like to emphasize the importance of fundus reflex screening in the first months of the new born baby, followed by early detection of vision disorders in first two years, followed by visual acuity examination first with pictures and later with Landolt C. We would like to propose this kind of screening to be obligatory in whole Bosnia and Herzegovina.

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- **Transparency declarations:** Competing interest: none to declare.

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Frequency of Depression and its Correlation with Quality of Life of Patients with Oral Cavity Cancer

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July 2, 2017

Behavioral Sexual Characteristics of Female Students in Bosnia and Herzegovina

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July 2, 2017

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July 2, 2017

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