

Ophthalmologic screening in 510 students of public schools: development of a comprehensive social project

Triagem oftalmológica em 510 alunos de escolas públicas: desenvolvimento de um projeto social de grande abrangência

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ABSTRACT

Purpose: To evaluate the prevalence of visually impaired children at screening in three public schools in Aracaju-SE, to estimate the distribution of refractive errors and to use the data to develop a more comprehensive social project in all public schools of town. **Methods:** Cross-sectional study with visual acuity (VA) measurement at screening. Age, gender, VA, frequency of the main refractive errors, spherical equivalent and cylinder of those children with VA lower than or equal to 0.7 in any eye, difference greater than 0.2 between the eyes, signs of eye diseases or if they already wore glasses. **Results:** A total of 510 children were evaluated in 3 schools. Mean age was 9.1 ± 1.6 years. Males were 50.4%. Of the 154 children (30%) who required a more detailed examination, 97 went to the office. Of these, 51 had a prescription of glasses. Myopes accounted for 44.1% of the eyes, hypermetropia to 15.6% and astigmatism to 82.3%. Mean age of children with glasses was 9.5 ± 1.7 years. Considering that there are 15 thousand children between the 1st and 3rd years of elementary school, it can be estimated that approximately 30% will require ophthalmological consultation, corresponding to 4500 consultations (2000 to 2500 of these should need glasses). **Conclusion:** We conclude that approximately one-third of school-age children in this study had visual impairment during screening. After ophthalmological evaluation, glasses were prescribed for just over half. Astigmatism was the most prevalent refractive error in the 3 schools of the study. The data obtained were used for the planning of important social project to be developed by Sergipe's Society of Ophthalmology.

Keywords: Screening; Eye health; Visual acuity; Refraction error

RESUMO

Objetivo: Avaliar a prevalência de crianças com dificuldade visual em triagens realizadas em 3 escolas públicas de Aracaju-SE, estimar a distribuição dos erros refrativos e usar os dados para planejamento de uma ação social mais extensa em todas as escolas públicas da cidade. **Métodos:** Estudo transversal, com medida da acuidade visual (AV), na forma de triagem. Foram analisados idade, gênero, AV, frequência dos principais erros refrativos, médias de equivalente esférico e cilindro das crianças com AV pior ou igual a 0,7 em qualquer olho, diferença superior a 0,2 entre os olhos, sinais de doenças oculares ou se já fizessem uso de óculos. **Resultados:** Foram avaliadas 510 crianças nas 3 escolas. A idade média foi $9,1 \pm 1,6$ anos. Gênero masculino correspondeu a 50,4%. Das 154 crianças (30%) que necessitaram de consulta mais detalhada, 97 se dirigiram à consulta. Destas, 51 tiveram indicação de uso de óculos. Miópes corresponderam a 44,1% dos olhos, hipermetropia a 15,6% e astigmatismo a 82,3%. A idade média das crianças com indicação de uso de óculos foi $9,5 \pm 1,7$ anos. Considerando-se que há em torno de 15 mil crianças entre o 1º e o 3º anos do ensino fundamental matriculadas nas escolas públicas de Aracaju, pode-se estimar que aproximadamente 30% delas necessitarão de consulta oftalmológica, correspondendo a 4500 atendimentos (2000 a 2500 destas deverão precisar de óculos). **Conclusão:** Conclui-se que aproximadamente um terço das crianças em idade escolar neste estudo apresentou dificuldade visual durante a triagem. Após avaliação oftalmológica, foram prescritos óculos para pouco mais da metade. Astigmatismo foi o erro de refração mais prevalente. Os dados obtidos foram utilizados para o planejamento de importante ação social a ser desenvolvida pela Sociedade Sergipana de Oftalmologia.

Descritores: Triagem; Saúde ocular; Acuidade visual; Erro de refração

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The authors declare no conflict of interests.

Received for publication 05/06/2018 - Accepted for publication 30/08/2018.

INTRODUCTION

Blindness and visual impairment have a significant impact on the socioeconomic development of individuals and societies. Its consequences are a major public health problem with the greatest impact in developing countries where 80% of the world's blindness occurs.⁽¹⁾ Visual impairment may be defined as blindness (best corrected vision of 20/400 for the best-sight eye by the World Health Organization [WHO]) or as low vision (best corrected vision of 20/60 in the best-sight eye).

Overall, there are an estimated 39 million blind people, as well as 285 million people with low vision.⁽²⁾ Of these, refractive errors (lack of glasses) account for 43% of cases.

Much effort is necessary to reduce the estimated number of blind people. In response to this global need, WHO launched the Vision 2020 project in 1999: The Right to Sight, an initiative in partnership with nongovernmental organizations (NGOs).⁽³⁾ Vision 2020 aims to eliminate avoidable blindness in the world by 2020 and targets the world's leading causes of preventable visual impairment.⁽⁴⁾ Analysis of global epidemiological data on the pattern of blindness indicates that over 75% of cases are preventable. Among the leading causes of avoidable blindness are cataracts, refractive errors (myopia, hypermetropia and astigmatism), glaucoma, diabetic retinopathy, and age-related macular degeneration.

Approximately 20% of school-age children have some type of eye disorder.⁽⁵⁾ The causes of these disorders are varied, and may be linked to biological, social and environmental factors. Although there has been a huge therapeutic development in ophthalmology, preventable blindness remains common, especially among the less favored countries, which reinforces the need for population campaigns.

Uncorrected refractive errors (ametropias) are one of the main causes of visual impairment in children in Brazil.⁽⁶⁾ Early studies demonstrated that hypermetropic refractive errors (hypermetropia and hypermetropic astigmatism) in general were the most prevalent ones.⁽⁷⁾ Recently, a meta-analysis study generated an estimate that myopia will have prevalence of approximately 50% of the world population by 2050 due to changing habits such as increased near-sight activities and less time outdoors.⁽⁸⁾

Actions to prevent blindness and low vision due to refractive errors include the implementation of large-scale vision screening programs, sufficient staff to carry out quality refraction, and the provision of affordable quality eyewear.⁽⁹⁾

The objectives of the present study were to evaluate the prevalence of children with visual impairment in screening in three public schools in Aracaju-SE, estimate the distribution of refractive errors, and use data to plan a more extensive social ophthalmological action in all public schools in the city.

METHODS

The present study was approved by the Research Ethics Committee of Universidade Federal de Sergipe, and is the result of a partnership between an ophthalmological hospital with specialized ophthalmology service and a chain of optical stores in the city of Aracaju-SE. It was a social project developed with the goal of providing free glasses for the children who needed them.

After authorization obtained from the principals of 3 public schools in one of the poorest neighborhoods of the city, physicians

of the specialization course in ophthalmology carried out visual acuity screening using the following parameters:

The visual acuity test was carried out using the Snellen optotype table placed 5 meters distant in separate eyes without the use of optical correction, but with it in case the child wore glasses.

Children were selected following the criteria described below:

1. Detection of visual acuity (VA) less than or equal to 0.7 in one eye;
2. Difference greater than or equal to two lines between the two eyes;
3. Visual complaints or external signs that could indicate the presence of ocular alterations (hyperemia or ocular lesions, ocular deviation);
4. Use optical correction, so that all children wearing glasses were referred regardless of the visual acuity test.

Once selected, the children underwent a complete ophthalmological examination consisting of the visual acuity test, evaluation of extrinsic ocular motility, biomicroscopic examination, objective and subjective refractive examination under cycloplegia, and evaluation of the fundus of the eye. Examinations were carried out at a specialization service in ophthalmology in Aracaju by medical specialists.

All the children who participated in the project needed to be accompanied by their parents or legal representatives when in the ophthalmological appointment outside the school environment.

After the ophthalmological appointment, the following data was analyzed: age, gender, proportion among children with visual impairment (referred) and total screened, proportion among those examined and those who had glasses prescribed, subjective refraction, spherical equivalent, and cylindrical diopter.

For purposes of presenting data from this study, it was considered that a child had myopia when having some myopic spherical component, and also spherical equivalent less than or equal to -0.5 D; hypermetropia when having some hypermetropic spherical component and also spherical equivalent greater or equal to +1.0 D; astigmatism when having a cylindrical component less than or equal to -0.5 D.

The analysis of this data allowed to generate an estimate of the number of screened children who would require ophthalmological appointment and the amount of glasses prescribed in another social project covering all public schools in Aracaju-SE to be developed by Sociedade Sergipana de Oftalmologia (SSO).

RESULTS

Visual acuity screening was carried out in children from three public schools in Aracaju, one state and two municipal schools, in September and October 2017. In all, 510 children were evaluated, of which 117 in school 1, 148 in school 2, and 245 in school 3. The average age was 9.1 ± 1.6 years. Boys corresponded to 50.4%, and girls to 49.6%. The data is detailed in Table 1. In total, 30.2% of children evaluated presented some of the criteria leading to the indication of a complete ophthalmological examination. Only a small number had previously worn glasses (3.7% of the total examined). Even smaller numbers showed signs of strabismus at screening (1.5%).

Of the 154 children who needed a more detailed examination, 97 went to the specialized service in ophthalmology for the

Table 1
Distribution of children per school and number referred for complete examination

n(%)	School 1	School 2	School 3	Total
Total number of children screened	117 (100)	148 (100)	245 (100)	510 (100)
Referred to complete examination	25 (21.3)	47 (31.7)	82 (33.5)	154 (30.2)
Strabismus	2 (1.7)	3 (2)	3 (1.2)	8 (1.5)
Already wore glasses	3 (2.5)	10 (6.7)	6 (2.4)	19 (3.7)
Age in years (average \pm standard deviation)	9.1 \pm 1.9	9.5 \pm 1.5	8.9 \pm 1.5	9.1 \pm 1.6
Gender: male	54 (46)	75 (51)	128 (52)	257 (50.4)
female	63 (54)	73 (49)	117 (48)	253 (49.6)

appointment. This number corresponds to an absenteeism rate of 37%. Among those examined, 51 (102 eyes) had an indication to wear glasses (Table 2). According to previously defined criteria, 44.1% of eyes were myopic, 15.6% were hypermetropic, and 82.3% had some component of astigmatism (simple, composite or mixed astigmatism). The average age of children with glasses prescription was 9.5 ± 1.7 years. The spherical equivalent of myopic was -1.2 ± 0.8 D, and $+3.0 \pm 1.5$ D among hypermetropic. The cylindrical degree found in the astigmata was -1.3 ± 0.8 D.

Table 2
Refractive data of children examined in the office

Total number of eyes (n(%))	102 (100)
Myopic (n(%))	45 (44.1)
Hypermetropic (n(%))	16 (15.6)
Astigmata (n(%))	84 (82.3)
Age in years (average \pm standard deviation)	9.5 \pm 1.7
Spherical equivalent - myopia (D, average \pm standard deviation)	-1.2 ± 0.8
Spherical equivalent - hypermetropia (D, average \pm standard deviation)	$+3.0 \pm 1.5$
Astigmatism (D, average \pm standard deviation)	-1.3 ± 0.8

One of the objectives of the present study was to use the data to contribute to creating a more comprehensive social project. Considering that there are around 15 thousand children between the 1st and 3rd years of elementary school enrolled in the municipal and state public schools of Aracaju, it can be estimated that approximately 30% of them will require an ophthalmological examination, which corresponds to 4500 appointments. About 2,000 to 2,500 of them will need glasses.

DISCUSSION

The present study is the result of a partnership between a chain of optical stores and a specialized service in ophthalmology, which carried out visual acuity screening in three public schools in the city of Aracaju-SE. SSO aims to carry out an extensive and comprehensive social project with free eye care and donation of glasses to those who had prescription, a survey of these data was made in order to better define the plan of action. The

project is called Visão Sergipana. Initially, it will be limited to the metropolitan area of the capital of Sergipe. In a second phase, it is intended to extend throughout the state.

Currently, it is estimated that approximately 30% of the world population has myopia.(8) An older study estimated that approximately 20% of school-age children would have sight difficulties.(5) Our study showed that 30% of children submitted to visual acuity screening at the school had some degree of visual impairment justifying subsequent ophthalmological examination. Of those who went to the ophthalmology office, around 52% had glasses prescription. Despite absenteeism, it can be estimated that at least 15% of children of public schools in Aracaju may need glasses. Considering the total of 15 thousand children enrolled from the 1st to 3rd year of elementary education in the municipal and state schools in the city, a minimum of 2250 children needing glasses is expected. As 3.7% already wore glasses in this study, it can be inferred that 555 children of the programmed school age should already be corrected in the total to be covered by the SSO project. Still, there must be at least 1695 children who have never worn glasses and need them.

Preventing preventable visual impairment leads to substantial long-term savings in social and health spending proportional to the number of individuals who no longer need medical or social care. Refractive errors affect a large proportion of the population worldwide, regardless of age, gender, and ethnic group. They can be easily diagnosed, measured and corrected with glasses or other refractive corrections to achieve normal vision. If, however, they are not corrected or the correction is inadequate, they become an important cause of low vision and even blindness. Low visual acuity due to uncorrected refractive errors can have immediate and long-term consequences on children and adults, such as loss in education and employment opportunities, reduced economic gain for individuals, families and societies, as well as impact on quality of life. Several factors are responsible for its non-correction: lack of awareness and recognition of the problem at personal and family level, and at Community and public health level; unavailability and/or inability to pay for medical appointments; insufficient supply of corrective lenses at affordable prices.(10)

The prevalence of refractive errors varies greatly according to the way studies classify their findings. In the present study, we describe the average spherical equivalent between myopic and hypermetropic. In addition, the average cylindrical value among all those with astigmatism was less than or equal to -0.5 D. For this reason, the prevalence of astigmatism was quite high, since even those classified as myopic or hypermetropic could have astigmatism associated and belong to more than one group (myopic and astigmata simultaneously, for example). As the main objective was to characterize the existence of the refractive error and not its classification, we made a simplified data presentation.

It can be concluded that approximately one-third of school-age children in this study presented visual difficulty in the screening carried out at school. After detailed ophthalmologic evaluation, half had prescription to wear glasses. Astigmatism was the most prevalent refractive error in the 3 schools of the study. Finally, data was very relevant for the planning of the social project Visão Sergipana by Sociedade Sergipana de Oftalmologia, which may be able to identify at least 2250 children in need of glasses, of whom 1695 should never have had the opportunity to wear them. Thus, it can contribute enormously in fighting preventable blindness and blindness.

REFERENCES

1. Congdon N, O'Colmain B, Klaver CC, Klein R, Muñoz B, Friedman DS, et al.; Eye Diseases Prevalence Research Group. Causes and prevalence of visual impairment among adults in the United States. *Arch Ophthalmol*. 2004;122(4):477–85.
2. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *Br J Ophthalmol*. 2012;96(5):614–8.
3. Pararajasegaram R. VISION 2020—the right to sight: from strategies to action. *Am J Ophthalmol*. 1999;128(3):359–60.
4. Pizzarello L, Abiose A, Ffytche T, Duerksen R, Thulasiraj R, Taylor H, et al. VISION 2020: The Right to Sight: a global initiative to eliminate avoidable blindness. *Arch Ophthalmol*. 2004;122(4):615–20.
5. Alves MR, Kara-José N. Campanha “Veja bem Brasil”. Manual de orientação. São Paulo: Conselho Brasileiro de Oftalmologia; 1998.
6. Kara-José N, Alves MR. Problemas oftalmológicos mais frequentes em escolares. In: Conceição JA, coordenador. Saúde escolar: a criança, a vida, e a escola. São Paulo: Sarvier; 1994. p.195-203
7. Cordonnier M, Dramaix M. Screening for abnormal levels of hyperopia in children: a non-cycloplegic method with a hand-held refractor. *Br J Ophthalmol*. 1998;82(11):1260–4.
8. Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, Sankaridurg P, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. *Ophthalmology*. 2016;123(5):1036–42.
9. Dandona L, Dandona R. Revision of visual impairment definitions in the International Statistical Classification of Diseases. *BMC Med*. 2006;4(1):7.
10. Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. *Bull World Health Organ*. 2008;86(1):63–70.

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