



Prevention of Amblyopia in Students of Municipal Public Schools in Teresópolis – Brazil

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Authors' contributions

This work was carried out in collaboration between all authors. Authors PHMS and ECON designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors PHMS, MACAP, GBA, GMS and HRBC managed the data collection. Author ECON performed the statistical analysis. Authors PHMS, JMF and ECON managed the analyses of the study. Authors PHMS, JMF and HRBC managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aim: To screen amblyopia in children aged five to nine attending public schools in the city of Teresópolis – Brazil.

Place and Duration of Study: Public schools in the city of Teresópolis – Brazil, from May to September 2016.

Methodology: This study consisted of a cross-sectional evaluation of 106 children (60 boys, 46 girls; age range 5-9 years), using the Snellen Chart to screen amblyopia. Those with a positive screening were referred to an ophthalmologist for diagnostic confirmation and treatment, which included the provision of free glasses.

Results: Thirty-six children (33.9%) presented positive screenings for amblyopia and were referred for an ophthalmologist. However, only 1/3 of the children with positive screening for amblyopia sought the specialist; in all the 12 cases that were checked by the ophthalmologist, the diagnosis of

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amblyopia was confirmed and corrective glasses were provided.

Conclusion: Due to the high prevalence of amblyopia found in the children studied, the authors suggest this simple and inexpensive screening test be done regularly in children and emphasize the importance of appropriate referral and treatment for those with positive screening.

Keywords: Amblyopia; anisometropia; visual acuity; Snellen Chart.

1. INTRODUCTION

Among the main ophthalmological alterations detected in preschool and school-aged children, there are some conditions that when not diagnosed and treated in a timely manner can lead to great and irreversible visual incapacity [1]. Based on this assumption, the screening and treatment of some diseases such as amblyopia, strabismus, ametropia, anisometropia, congenital cataracts, retinoblastoma, glaucoma, malformations, and others, should be prioritized by the Public Health Programs in Ophthalmology; however, that does not happen in Brazil [2,3,4].

Furthermore, it is known that both the diagnosis and the treatment of these alterations can be of fundamental importance for the improvement of the learning process and academic performance of the children, as well as for the decrease in failure and drop-out rates of elementary and preschool [3].

In spite all that, the literature reports that most children in Brazil have never been subjected to any type of ophthalmological examination. Such fact is directly or indirectly related to economic and social reasons, hindering the access to health services and specialized professionals [2,3,5,6]. Moreover, approximately 20% of school children have some sort of vision disorder [7,8,9].

Within this framework, "amblyopia" is highlighted. Amblyopia is an ophthalmic dysfunction characterized by the reduction of the visual acuity of one or both eyes, either showing no signs of anatomical abnormality, or an organic lesion disproportionate to the low visual intensity. It is a preventable cause of visual impairment if treated in a timely manner during childhood [10,11].

Amblyopia is a result of a deficiency in the development of vision during the maturation period of the central nervous system, resulting from a failure in the correlation of the image entry of both eyes caused by an incorrect visual experience in the first months or years of life [12].

It is a disability that is difficult to diagnose because it presents with the single symptom of

having reduced vision. However, as children with amblyopia rarely complain about visual disturbance, it is necessary to perceive the child's difficulty in seeing properly [13].

The diagnosis is obtained with the evaluation of visual acuity. Currently, it is also recommended that children around three years of age have a screening exam to check for the presence of refractive errors (anisometropia) or strabismus capable of causing amblyopia, since normal visual acuity is already achieved at that age [10,14].

Despite being considered one of the earliest diseases of development - its first descriptions dating to the mid-1600s - and presenting some known features, part of its pathophysiology is still considered quite enigmatic [15].

It is known that if amblyopia is not detected or if it remains untreated, the weaker eye may become severely impaired. On the other hand, early diagnosis and treatment can restore vision to the "lazy eye"; that is, the earlier the treatment, the greater the possibility of reversing the clinical picture [15,16,17].

Such data arose the interest in performing a quantitative study of amblyopia, through visual acuity examination in children attending municipal public schools located in the outskirts of Teresópolis city - Brazil, with subsequent referral for the ophthalmologist, for diagnostic confirmation and treatment.

2. METHODOLOGY

This cross-sectional descriptive study was carried out from May to September 2016, with a sample of 106 children, aged five to nine, and enrolled in four municipal public schools in Teresópolis (Brazil).

The authorization to carry out the research was granted by the Teresópolis Board of Education, which indicated the four schools to be evaluated in the present study. The only inclusion criterion was the chronological age between five and nine. The only exclusion criterion was current treatment with an Ophthalmologist. Only one

child fulfilled the exclusion criterion for the present study, for he was at that time under treatment with an ophthalmologist.

Children that presented a positive screening test for amblyopia were referred to the Ophthalmology service of Hospital São José. The authors checked the hospital's patient list database to determine the percentage of patients who sought consultation with the specialist after referral.

2.1 Evaluation Tools

Upon authorization, the students were sent, at a specific day and time, to take the test at their very school.

The tests were carried out by two medical students, properly trained to use the Snellen Chart.

After obtaining information on age, gender, school, literacy situation of the child and parents, and history of previous care by an ophthalmologist, the student was submitted to a visual acuity test in a reserved room with adequate lighting.

The exam was performed according to the protocol of the Brazilian Council of Ophthalmology (CBO - Conselho Brasileiro de Oftalmologia).

2.2 Experimental Procedure

For the exam, the optimeter was placed at approximately 13 feet from the subject's eyes, being examined one eye at a time. Then, the children who presented the results below the normal level, that is, were unable to see the letters below 1.0 m (40 in) in the Snellen Chart were referred to the Health Department for scheduling an appointment with an ophthalmologist.

Following the consultation with the specialist and the final diagnosis, the children were then referred to the appropriate treatment, including the provision of glasses.

2.3 Statistical Analysis

Data was presented in the mean \pm standard deviation format.

The characteristics of the children who presented screening test suggestive of amblyopia were compared to those whose screening was normal.

When comparing two groups, the means were compared using the unpaired Student's T test (parametric) or the Mann-Whitney (non-parametric) test. Categorical variables were compared using Fisher's exact test. The level of significance employed was 5%. Statistical analyses were performed using Epi Info version 7.2.0.1 (Centers for Disease Control and Prevention, USA), and Prism 7 for Windows version 7.01 (Graphpad Software, Inc., San Diego, California, USA).

3. RESULTS

3.1 Sample Characteristics

In relation to the age of the children, a total of 106 students, 14 (13.0%) were 5 years old, 19 (17.9%) were 6 years old, 41 (38.6%) were 7 years old, 16 were 8 years old (15.0%) and 13 (12.0%) were 9 years old. Concerning gender, 60 (56.6%) of the children were boys, whereas 46 (43.4%) were girls.

Out of the total number of children authorized by the legally responsible person, 13 (12%) had already consulted an ophthalmologist.

As for the parents' schooling, 99 (93%) of them were literate.

Out of the 106 students evaluated, 36 (33.9%) presented a screening test suggestive of amblyopia (positive screening) and were referred to the specialist to confirm the diagnosis. However, only 12 of them (33.3%) appropriately followed up with an ophthalmologist; all 12 (100.0%) had the diagnosis confirmation of the impairment, with subsequent receipt of appropriate treatment, including free supply of glasses.

Table 1 summarizes the characteristics of the 106 children studied.

3.2 Comparison of Groups with Positive and Negative Screening for Amblyopia

When comparing the children with a positive screening test with those with negative screening, we did not identify statistically significant differences regarding: age (7.1 ± 1.3 vs. 7.0 ± 1.2 years, respectively; $P = .48$), prevalence of males (50.00% vs. 62.86%, respectively, $P = .22$), previous ophthalmologic evaluation (16.67% vs. 10.00%, respectively; $P = .36$) or prevalence of literate parents (88.89% vs. 95.71%, respectively, $P = .23$).

Table 1. Sample characteristics (Total: 106 students)

Variables	N (%)
Age (years)	5 – 14 (13.0%)
	6 – 19 (17.9%)
	7 – 41 (38.6%)
	8 – 16 (15.0%)
	9 – 13 (12.0%)
Male gender	60 (56.6%)
Previous ophthalmologic evaluation	13 (12.0%)
Literate parents	99 (93.0%)
Positive screening for amblyopia	36 (33.9%)
Positive screening further attended by the specialist	12/36 (33.3%)
Diagnostic confirmed by the specialist	12/12 (100.0%)

4. DISCUSSION AND CONCLUSION

The present study confirms data found in the literature on the percentage of children with amblyopia or some other type of ocular dysfunction in this sample of children attending public education in the city of Teresópolis; therefore, some comments deserve to be emphasized:

- The low cost of the investigation using the screening test initially performed in schools and later by the ophthalmologist points to a viable path in terms of financial cost for the Brazilian public health.
- The research results outline the need to implement campaigns to raise awareness among the population in general, highlighting all those involved in the educational sector such as: school managers, teachers and family, concerning the importance of early investigation of ocular dysfunctions, including amblyopia, in children.
- As for the children referred to the specialist, that is, with positive screening for amblyopia (36), only 12 (33.3%) actually attended the appointment. That leads to the question on whether this percentage is related to the lack of information on the importance of diagnosing ophthalmic dysfunctions of parents and the person legally responsible, since it is important to remember that the schools that participated in the research are public and were in the periphery of the city, fact which is directly related to financial and social issues.
- The importance of continuing the research in the preschool and school population is

also recorded here, aiming not only at diagnosing amblyopia but also at making the necessary and adequate referrals for the achievement of a positive result in the development of children's visual acuity.

- It can be inferred that, in general, due to the size and the great socioeconomic differences found throughout the Brazilian territory, there is an increasing demand for the establishment of prevention programs and mapping of probable causes related to the ophthalmological disorders/dysfunctions in children [7].
- It is known that the diagnosis and treatment of amblyopia should occur as early as possible, but in many cases, and whenever it is a late discovery, there is less chance that the usual treatment will be effective.

In this sense, some authors outline the existence of innovative technologies used for the early detection of anisometropia, making it possible for ophthalmologists to have an early intervention, delaying or preventing the development of amblyopia [18].

Due to the high prevalence of amblyopia found in the children studied, the authors suggest this simple and inexpensive screening test be done regularly in children and emphasize the importance of appropriate referral and treatment for those with positive screening.

CONSENT AND ETHICAL APPROVAL

The present study was approved by the research and ethics committee of Serra dos Órgãos University Center (UNIFESO) and was therefore performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. Informed consent was obtained from all the children's legally responsible guardians.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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