

Original Research Article

PREVENTION OF AMBLYOPIA IN STUDENTS OF MUNICIPAL PUBLIC SCHOOLS IN TERESÓPOLIS - BRAZIL

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 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 cheap 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, visual field, diagnosis

1. INTRODUCTION

Among the main ophthalmological alterations detected in preschool and school-aged children, there are some that, when undiagnosed or untreated, can lead to a 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 present 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, especially 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].

34 It is a disability that is difficult to diagnose because it presents the single symptom of decrease in vision.
35 However, as children rarely complain, it is necessary to perceive the child's difficulty in seeing properly
36 [13].

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

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

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

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

50

51

52 **2. METHODOLOGY**

53

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

56 The authorization to carry out the research was granted by the Teresópolis Board of Education, which
57 indicated the four schools to be evaluated in the present study. The only inclusion criterion was the
58 chronological age between five and nine.

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

61

62 **2.1 Evaluation tools**

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

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

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

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

71

72 **2.2 Experimental procedure**

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

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

79

80 **2.3 Statistical analysis**

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

82 The characteristics of the children who presented screening test suggestive of amblyopia were compared
 83 to those whose screening was normal. When comparing two groups, the means were compared using the
 84 unpaired Student's T test (parametric) or the Mann-Whitney (non-parametric) test. Categorical variables
 85 were compared using Fisher's exact test. The level of significance employed was 5%. Statistical analyses
 86 were performed using Epi Info version 7.2.0.1 (Centers for Disease Control and Prevention, USA), and
 87 Prism 7 for Windows version 7.01 (Graphpad Software, Inc., San Diego, California, USA).

88

89 **3. RESULTS**

90

91 **3.1 Sample characteristics**

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

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

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

98 Out of the 106 students evaluated, 36 (33.9%) presented a screening test suggestive of amblyopia
 99 (positive screening) and were referred to the specialist to confirm the diagnosis. However, only 12 of them
 100 (33.3%) subsequently attended the ophthalmologist; all 12 (100.0%) had the diagnosis confirmation of the
 101 impairment, with subsequent receipt of appropriate treatment, including free supply of glasses.

102 **Table 1** summarizes the characteristics of the 106 children studied.

103

104

105 **Table 1. Sample Characteristics (Total: 106 students)**

Variables	N (%)
	5 – 14 (13.0%)
	6 – 19 (17.9%)
Age (years)	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%)

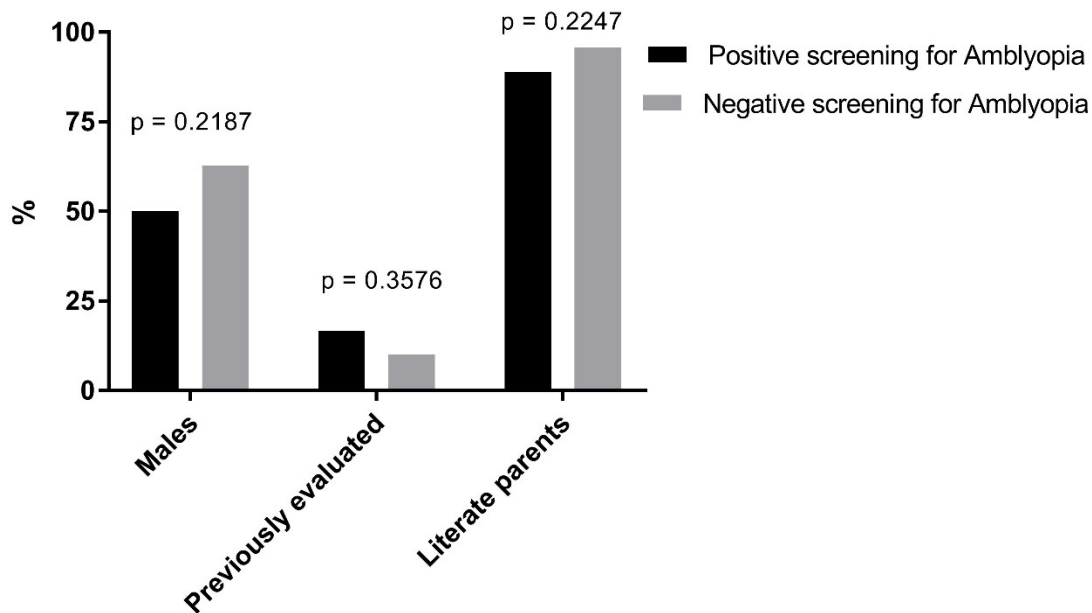
106
107

108

109 **3.2 Comparison of groups with positive and negative screening for amblyopia**

110 When comparing the children with a positive screening test with those with negative screening, we did not
 111 identify statistically significant differences regarding: age (7.1 ± 1.3 vs. 7.0 ± 1.2 years, respectively; $P =$
 112 $.48$), prevalence of males (50.00% vs. 62.86%, respectively, $P = .22$), previous ophthalmologic evaluation
 113 (16.67% vs. 10.00%, respectively; $P = .36$) or prevalence of literate parents (88.89% vs. 95.71%,
 114 respectively, $P = .23$ - **Figure 1**).

115



116

117 **Figure 1. Comparison of groups with positive and negative screening for amblyopia**

118

119

120 **4. DISCUSSION AND CONCLUSION**

121

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

125 - The low cost of the investigation using the screening test initially performed in schools and later by the
126 ophthalmologist points to a viable path in terms of financial cost for the Brazilian public health.

127 - The research results outline the need to implement campaigns to raise awareness among the
128 population in general, highlighting all those involved in the educational sector such as: school managers,
129 teachers and family, concerning the importance of early investigation of ocular dysfunctions, including
130 amblyopia, in children.

131 - As for the children referred to the specialist, that is, with positive screening for amblyopia (36), only 12
132 (33.3%) actually attended the appointment. That leads to the question on whether this percentage is
133 related to the lack of information on the importance of diagnosing ophthalmic dysfunctions of parents and
134 the person legally responsible, since it is important to remember that the schools that participated in the
135 research are public and were in the periphery of the city, fact which is directly related to financial and
136 social issues.

137 - The importance of continuing the research in the preschool and school population is also recorded here,
138 aiming not only at diagnosing amblyopia but also at making the necessary and adequate referrals for the
139 achievement of a positive result in the development of children's visual acuity.

140 - It can be inferred that, in general, due to the size and the great socioeconomic differences found
141 throughout the Brazilian territory, there is an increasing demand for the establishment of prevention
142 programs and mapping of probable causes related to the ophthalmological disorders / dysfunctions in
143 children [7].

144 - It is known that the diagnosis and treatment of amblyopia should occur as early as possible, but in many
145 cases, and whenever it is a late discovery, there is less chance that the usual treatment will be effective.

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

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

152 **CONSENT AND ETHICAL APPROVAL**

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

157

158 **REFERENCES**

159 [1] Brémond-Gignac D, Copin H, Lapillonne A, Milazzo S. European Network of Study and Research in Eye
160 Development. Visual development in infants: physiological and pathological mechanisms. *Curr Opin*
161 *Ophthalmol.* 2011;22(1):S1-S8.

162 [2] Couto Jr AS, Pinto GR, Oliveira DA, Holzmeister D, Portes ALF, Neurauter R, Portes AJF. Prevalence of
163 ametropias and ophthalmopathies in pre-school and school children in favelas of Alto da Boa Vista, Rio
164 de Janeiro, Brazil. *See Bras Oftalmol.* 2007; 66 (5): 304-8.

- 165 [3] Lopes GJA, Casella AMB, Chuí CA. Prevalence of reduced visual acuity in students of the first grade of
166 the public and private public schools of Londrina-PR, in the year 2000. *Arq Bras Oftalmol.* 2002; 65 (6):
167 659-64.
- 168 [4] Oliveira AM; Fernandes BM; Costa L; Lima A; Couto Junior AS; Portes A. Detection of amblyopia,
169 ametropias and amblyopenic factors in community assisted by Family Health Program in Rio de Janeiro,
170 Brazil. *Rev Bras Oftalmol.* 2010; 69 (2): 110-13.
- 171 [5] Taleb A, Ávila MP, Moreira H. The conditions of ocular health in Brazil. São Paulo: Brazilian Council of
172 Ophthalmology; 2009.
- 173 [6] Trigueiro SA, Lucena A, Dickson A, Tavares S, Ventura LO. Adherence to the treatment of amblyopia
174 in the Ophthalmological Reference Center of the Great Recife - Pernambuco - Brazil. *Fac Med Univ Fed*
175 *Pernamb.* 1999; 44 (2): 118-21.
- 176 [7] Albuquerque RC, Alves JGB. Prevalent eye conditions in low-income children attended at an
177 ophthalmological service in the city of Recife - PE, Brazil. *Arq Bras Oftalmol* 2003; 66 (5): 831-4.
- 178 [8] Rocha MN, Ávila MP, Isaac DL, Oliveira LL, Mendonça LS. Analysis of causes of care and prevalence of
179 ocular diseases in the emergency department. *Rev Bras Oftalmol.* 2012; 71 (6): 380-4.
- 180 [9] Rocha, MN; Avila, MP; Isaac, DL; Mendonça, LS; Nakanishi, L; Auad, LJ. Prevalence of ocular diseases
181 and causes of visual impairment in children attended at a Reference Center in Ophthalmology in mid-
182 western Brazil. *Rev Bras Oftalmol.* 2014; 73 (4): 225-9.
- 183 [10] Bechara SJ, Kara-José N. Detection and treatment of amblyopic patients in the city of São Paulo, SP
184 (Brazil). *Rev Saúde Pública.* 1987; 21 (4): 326-30.
- 185 [11] Beer SMC, Scarpi MJ, Minello AA. Ocular findings in children from zero to six years old, living in the
186 city of São Caetano do Sul, SP. *Arq Bras Oftalmol.* 2003; 66 (6): 839-45.
- 187 [12] Andrade EP, Berezovsky AS, Paula Y, Pereira J, Rocha DM, Solomon SR. Dysfunction in the fellow
188 eyes of strabismic and anisometric amblyopic children assessed by visually evoked potentials. *Arq*
189 *Bras Oftalmol.* 2016; 79 (5): 294-29.
- 190 [13] Arakaki MR, Schellini SA, Heimbeck FJ, Furuya MT, Padovani CR. Adhesion to the treatment of
191 amblyopia. *Arq Bras Oftalmol.* 2004; 67 (2): 201-5.
- 192 [14] Nogueira RDM, Ferreira BFA, Pinto HSR. Learning Objectives- Available: www.ligadeoftalmo.ufc.br.
193 Date of access: 08/20/2017.
- 194 [15] Vasconcelos GC, Costa MF. Current treatment of amblyopia: where are we? *Arq Bras Oftalmol.*
195 2013; 76 (2): V-VI.

196 [16] Oliveira CA, Hisatomi KS, Leite CP, Schellini AS, Padovani CR, Padovani CRP. Refractive errors as
197 causes of low visual impairment in children of the public school network of the Botucatu region - SP. Arq
198 Bras Oftalmol.2009; 72 (2): 194-8.

199 [17] Hospital of eyes of Sergipe. Available: www.hosergipe.com.br. Date of access: 08/20/2017.

200 [18] Mendonça RH, Ferreira EL. Visual evoked potentials (VEP) and visual acuity improvement after
201 cytidine 52-diphosphocholine (CDP-Choline) therapy in amblyopic patient. Rev Bras Oftalmol.
202 2012;71(5):328-30.

203