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## Visual acuity of elementary school children in Itumbiara, Goiás, Brazil

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### Abstract

Visual impairment during childhood can affect development, negatively impacting the learning process and leading to poor academic performance. This approved study was conducted between February and March 2024 at Municipal School Oscar Domingos da Costa in Itumbiara, Goiás, Brazil, with children aged 6-10 from the first to third grades. Ophthalmologic screenings were performed using the Snellen optometric scale by medical students under double-blind conditions. Of 135 children, 47.4% were male and 52.6% female. The majority was in the 2<sup>nd</sup> grade (60 children), aged 6-7 years, and identified as brown (46.6%). Visual acuity was preserved in most children, with 75% of those with impaired vision being female. Only 36.3% had visited ophthalmologists, and few had chronic diseases. Glasses use was reported by 20% of boys and 80% of girls. Finally, children generally showed better results with glasses (all  $p < 0.05$ ). Collaboration among guardians, pediatricians, and teachers is crucial for kids' visual health.

**Keywords:** Visual acuity, elementary school, children, Itumbiara, Goiás, Brazil

### Introduction

Visual acuity problems are characterized by the modification of visual capacity, which can result from sensory alterations triggered by blindness (absence of light or total loss of vision) or visual impairment <sup>[1]</sup>. The World Health Organization estimates that about 7.5 million school-aged children have some type of visual impairment, and of these, 25% exhibit symptoms. The other three-quarters will need specific testing to identify the problem <sup>[2]</sup>.

The occurrence of visual impairment during childhood can affect the development of motor, cognitive, and linguistic abilities, negatively impacting the learning process and leading to poor academic performance. For this reason, early diagnosis of potential visual alterations allows for measures to correct them, such as referring the child for appropriate treatment <sup>[3]</sup>.

According to the Brazilian Institute of Geography and Statistics <sup>[2]</sup>, 3.4% of the Brazilian population has some type of visual impairment, with 0.9% affecting children aged 2 to 9 years. Lemos *et al.* (2018) <sup>[5]</sup> mention that it is concerning that most school-aged children in Brazil have never undergone an eye exam. Thus, routine visual acuity exams ensure that visual health is in good condition, contributing to the reduction of school dropout or repetition rates, as well as preventing more severe ocular complications <sup>[6]</sup>.

Brazil's Unified Health System faces barriers in ophthalmologic care, such as long waiting lines and a lack of ophthalmologists in clinics. Another problem extends to private networks, as treatments, often costly, are not compatible with the financial reality of the underprivileged population <sup>[7]</sup>. Additionally, there is a lack of awareness among parents/guardians about preventive practices in early childhood <sup>[8]</sup>.

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School is an environment that demands children's attention and visual capacity for satisfactory learning. Thus, measuring visual acuity using the Snellen Chart is a straightforward way to diagnose visual alterations in the school environment, as it involves reading lines with letters or figures (depending on the literacy level), which gradually decrease in size and are located at a personalized distance and height for the person being tested <sup>[9]</sup>.

To meet the effective ocular needs of children in public schools, parental understanding of school development and symptoms of visual problems is crucial, along with the establishment of an easily accessible ophthalmologic system for consultations and treatment guidance <sup>[10]</sup>. Given what has been pointed out, this study aimed to evaluate the visual acuity of children regularly enrolled in the 1st, 2nd, and 3rd grades of elementary school in a public educational institution in the municipality of Itumbiara, Goiás, Brazil.

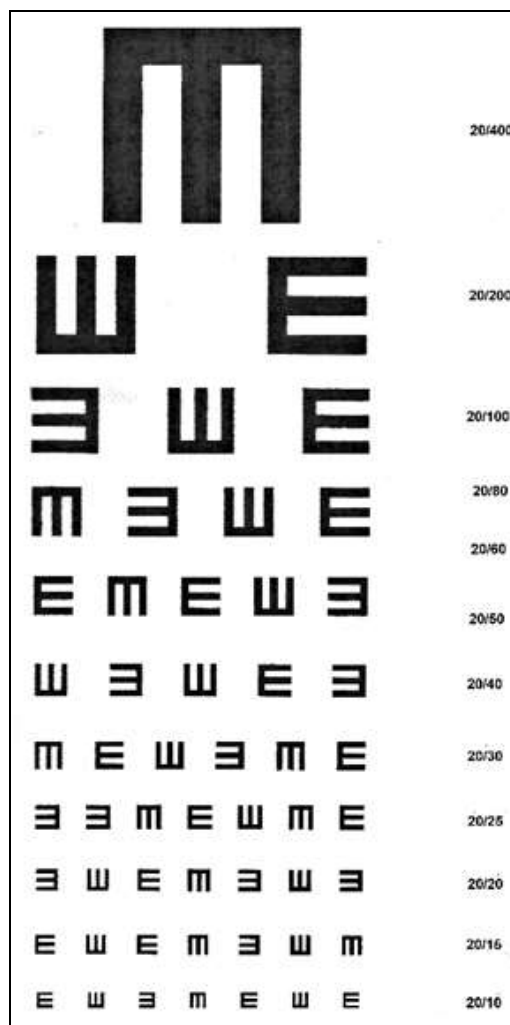
**Methodology**

This was a descriptive, cross-sectional quantitative study approved by the Ethics and Research Committee of the Instituto Master de Ensino Presidente Antônio Carlos de Araguari (IMEPAC) number CAAE: 75441223.9.0000.8041. It was conducted at the Municipal School Oscar Domingos da Costa, located in Itumbiara,

Goiás, Brazil, with children from the first to third grades (ages 6 to 10 years), who were enrolled in the first semester of 2024.

Data were collected between February and March 2024. Prior to data collection, the Free and Informed Consent Form and the Free and Informed Assent Form were sent to the legal guardians of each child. They also received a pre-test questionnaire including questions about age, birthplace, gender, and questions related to the child's ocular health. Additionally, an informational pamphlet on eye diseases was provided to guide them on seeking appropriate specialized care, regardless of the screening results. Once consent to participate was obtained, completed documents were returned to the school coordinator, ensuring the confidentiality and privacy for all participants.

The ophthalmologic screening was conducted by students from the Zarns Faculty of Medicine, who were previously instructed by an Ophthalmology Professor. The participants' names were withheld from the researchers, and their data were identified through a number previously assigned by the institution's coordinator (double-blind). The Snellen optometric scale was used (Figure 1). The test was conducted in a well-lit and quiet room, with a chair for the participant to sit in, positioned five meters away from the Snellen chart.



**Fig 1:** Snellen chart

First, each child was explained how the test would be conducted, clarifying any possible doubts. The Snellen chart

was mounted on the wall so that the 0.8 to 1.0 visual acuity line was at the child's eye level. A black pencil was used to

indicate the symbols, and an occluder card made of cardboard was used (Figure 2). Each eye was evaluated separately, and children who wore glasses were tested with and without their corrective lenses. The examiner recorded the value corresponding to the last line read without difficulty, i.e., the best visual acuity (VA) obtained for each eye. Visual acuity equal to or greater than 0.7 or 20/30 on the applied scale was considered normal.

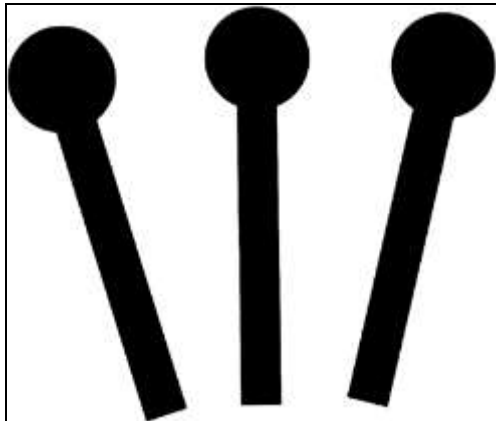


Fig 2: Ophthalmologic Occluder.

For participant's selection, inclusion criteria were children who had the Informed Consent Form signed by their guardians, as well as the pre-test form filled out by them, and were present on the day of the test application. Similarly, the exclusion criteria were children who did not have the Informed Consent Form previously signed by their guardians, who were not cooperative with the test or the anamnesis, and who were younger than 6 years or older than 10 years.

Finally, data were transmitted on to the head of the educational institution, so that the parents/guardians could access their child's performance in the test. Similarly, parents/guardians who showed low visual acuity and demonstrated interest in the test results were instructed to seek a complete ophthalmological evaluation for diagnosis and therapeutic planning.

Regarding the statistical analysis, results were presented as both absolute and relative frequencies. Statistical tests were performed using the Windows version of GraphPad Prism 5.01 software. One-way ANOVA followed by Bonferroni post-tests were employed, with  $p < 0.05$ .

## Results

In the present study, as shown in Table 1, results demonstrated that from the 385 children regularly enrolled at Municipal School Oscar Domingos da Costa, 135 met the established inclusion and exclusion criteria and were subjected to the test. Of these, 64 (47.4%) were male and 71 (52.6%) were female. The highest participation was from the 2nd grade with 60 children, followed by the 1st grade with 46 children and the 3rd grade with 29 children. Most children identified as brown (46.6%), followed by white (34.8%) and black (8.8%), and were aged between 6 and 7 years (77%).

When analyzing the level of education, it was observed that the majority of students enrolled in the 1st year were men (58.7%), while in the 2nd year the majority were women (65%). In the 3rd year, the distribution was more balanced, with 55.2% men and 44.8% women. Regarding visual

acuity, most participants, both men (47.1%) and women (52.9%), had preserved visual acuity. However, 75% of children with impaired visual acuity were female.

**Table 1.** Sociodemographic data and ocular health of volunteer children regularly enrolled at the Municipal School Oscar Domingos da Costa, located in Itumbiara, Goiás, Brazil, in the year 2024. \* $p < 0.05$  for all groups. One-way ANOVA followed by Bonferroni post-tests

Characteristics*	Volunteers = 135	
	N	%
<b>Sex</b>		
Masculine	64	47.4
Feminine	71	52.6
<b>Ethnicity</b>		
White	47	34.8
Brown	63	46.6
Black	12	8.9
Uninformed	13	9.7
<b>Age</b>		
6 years	54	40
7 years	50	37
8 years	29	21.5
Uninformed	2	1.5
<b>Enrolled in the 1st year</b>		
Masculine	27	58.7
Feminine	19	41.3
<b>Enrolled in 2nd year</b>		
Masculine	21	35
Feminine	39	65
<b>Enrolled in 3rd year</b>		
Masculine	16	55.2
Feminine	13	44.8
<b>Preserved visual acuity</b>		
Masculine	57	47.1
Feminine	64	52.9
<b>Impaired visual acuity</b>		
Masculine	2	25
Feminine	6	75
<b>Visual acuity not realized</b>		
Masculine	3	50
Feminine	3	50
<b>Consultation with an ophthalmologist</b>		
Yes	49	36.3
No	86	63.7
<b>Prevalence of chronic diseases</b>		
Asthma	7	5.2
Sensorineural hearing loss	1	0.7
Epilepsy	1	0.7
None	125	92.6
Uninformed	1	0.7
<b>Medications for continuous use</b>		
Yes	4	3
No	130	96.3
Uninformed	1	0.7
<b>Use of contact lenses</b>		
Yes	0	0
No	135	100
<b>Use of glasses</b>		
Masculine	2	20
Feminine	8	80

Additionally, only 36.3% of the volunteers had consulted an ophthalmologist. The prevalence of chronic diseases was low, with only 5.2% of participants reporting asthma and 0.7% reporting sensorineural hearing loss and epilepsy,

each. Only 3% of the volunteers were using continuous medications, and none were using contact lenses. The use of glasses was reported by 20% of men and 80% of women.

In the visual acuity test for the 7% who responded using glasses (10 children), it was observed that 80% of these children performed the test with glasses and had preserved visual acuity for both the right eye (RE) and the left eye (LE), with only three children showing different line readings between the RE and LE. Of these, two children could read up to line 10 with the right eye and line 11 with the left eye, and the other child read up to line 8 with the RE and up to line 7 with the LE.

Regarding the children who reported using glasses, when subjected to the test without them, it was observed that 40% (4 children) maintained satisfactory visual acuity, although they showed improvement in acuity when using glasses. The remaining 60% (6 children) showed a significant reduction in visual acuity, reflected by a considerable decrease in the number of lines read. From the above, 10% (1 child) demonstrated satisfactory correction, reading up to line 10 for both eyes with glasses, but without them, was able to read only the first line for both eyes.

During the visual acuity test, some students complained of burning eyes, tearing, frowning, tilting their heads, and/or squinting to try to see.

Ultimately, when asked about their interest in receiving test feedback, 126 participants expressed agreement, while 4 disagreed and 5 did not provide a response. All results  $p < 0.05$ .

## Discussion

Observing problems and conducting ocular assessments should begin in childhood, when the visual system matures up to approximately the eighth or tenth year of life, with the first five years being the most important [11]. Visual responses in infants and preschool children, born at term and with typical development, emerge in coordination with neuromotor functions. These visual responses are intertwined with sensory, behavioral, cognitive, and psycho-emotional capacities [12].

In Brazil, the first eye exam, known as the "red reflex test" should be performed in the maternity ward within the first days of life. This exam is crucial for early detection of possible vision problems, such as congenital cataracts, glaucoma, and strabismus. After this initial assessment, it is recommended to conduct exams every six months during the first two years of life and subsequently annual exams until the ages of 8-9, if no significant alterations are identified [13].

In this study, visual acuity was assessed through screening with the Snellen test and by a questionnaire completed by parents/guardians, in children from the 1st, 2nd, and 3rd grades of Elementary School, regularly enrolled and attending a public school in the municipality of Itumbiara, Goiás, Brazil. Of the 385 students, 135 met the criteria and were tested (47.4% boys and 52.6% girls). Most were in the 2nd grade (60), followed by the 1st grade (46) and the 3rd grade (29), with 46.6% identified as brown, 34.8% as white, and 8.8% as black, with ages between 6 and 8 years. In the 1st grade, boys predominated (58.7%); in the 2nd grade, girls (65%); and in the 3rd grade, the distribution was more balanced. Most had preserved visual acuity, but 75% of those with impaired visual acuity were girls. Only 36.3% had consulted an ophthalmologist, 5.2% had asthma, and

0.7% had sensorineural hearing loss and epilepsy. Only 3% used continuous medications, none used contact lenses, and 20% of the boys and 80% of the girls wore glasses. Of the 10 who reported using glasses, 80% had preserved visual acuity with glasses. Without glasses, 40% maintained satisfactory acuity and 60% showed significant reduction.

Vieira *et al.* (2018) [14] state that the loss of visual acuity leads to a decrease in quality of life due to limitations in intellectual, social, and psychological areas. In a study conducted in Itaipava - MG, authors found that 61.9% of participants had low visual acuity. Two other similar studies, conducted by Silva *et al.* (2013) [6] and Moreira Neto *et al.* (2014) [15], in the municipalities of Curitiba - PR and Pouso Alegre - MG, respectively, found 7.03% and 11.4% of elementary school children with low visual acuity, results close to the findings of the present study, which was 7.4%. The discrepancy between the cited studies and this work may be related to the evaluated population. The three studies assessed a larger sample population than this study (respectively, 432, 201, and 242), which could generate bias in the results.

By detecting visual acuity problems in children from the 1st, 2nd, and 3rd grades of elementary school at the municipal school, the context in which the lack of guidance to consult an ophthalmologist is generated can be understood. In this study, only 36.3% of parents/guardians reported having consulted their children with an ophthalmologist, and in most cases, the recommendation came from the pediatrician. This fact reinforces the importance of this study, as detecting visual acuity problems in childhood can provide affected individuals with the adoption of preventive and/or corrective measures [16, 17].

During the screening, it was also possible to observe that about one-third of the total evaluated children, including some who already use glasses despite having preserved visual acuity, reported discomfort such as eye burning, tearing, frowning, head tilting, and squinting in an attempt to see better. In this context, the adoption of visual screening programs has shown positive results, not only in terms of cost reduction but also in the effectiveness of early identification and treatment of vision problems [14, 18].

Considering the challenges faced by the public health system in ensuring that children have access to visual acuity exams and receive specialized care if they have low visual acuity, this research plays a crucial role in the early detection of visual problems during the first years of schooling in the municipality of Itumbiara. This is essential to avoid potential negative impacts on child development, which could impair their intellectual and social skills.

## Conclusion

In the present study, visual acuity was preserved in most children, with 75% of those with impaired vision being female. Only 36.3% had seen an ophthalmologist, and few had chronic diseases. Glasses use was reported by 20% of boys and 80% of girls. In visual acuity tests, children generally showed better results with glasses. It is essential to emphasize the importance of collaboration among guardians, paediatricians, and teachers for children who show signs of visual problems. This involvement is crucial for referring them to ophthalmological consultations, where they can receive a definitive diagnosis and create a personalized treatment plan tailored to the specific needs of each child.

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**Declaration of interest statement**

Authors declare no conflict of interest.

**References**

1. Osborne D, Steele A, Evans M, Ellis H, Pancholi R, Harding T, *et al.* Children's visual acuity tests without professional supervision: A prospective repeated measures study. *Eye*. 2023;37(18):3762-3767.
2. Burton MJ, Ramke J, Marques AP, Bourne RRA, Congdon N, Jones I, *et al.* The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. *The Lancet Global Health*, 2021, 9(4).
3. Santos AMS, Tajra I, Torres MV. Avaliação da saúde ocular de crianças da educação infantil em uma creche: Tecendo laços entre educação e saúde. *Saúde em Redes*. 2022;8(1):101-115.
4. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saúde. Rio de Janeiro: IBGE; c2022.
5. Lemos ABS, Cerdeira CD, Laignier BFF, Cota LHTC, Silva MC, Barros GBS. Triagem oftalmológica e análise dos potenciais fatores de risco para a baixa acuidade visual de alunos no Ensino Fundamental I da rede pública em Alfenas/MG (Brasil). *Arquivos Catarinenses de Medicina*. 2018;47(1):106-120.
6. Silva CMF, Almeida DR, Bernardes RR, Bazzano FCO, Mesquita Filho M, Magalhães CHT, *et al.* Desempenho escolar: interferência da acuidade visual. *Revista Brasileira de Oftalmologia*. 2013;72(3):168-171.
7. Hercos BVS, Berezovsky A. Qualidade do serviço oftalmológico prestado aos pacientes ambulatoriais do Sistema Único de Saúde (SUS). *Arquivos Brasileiros de Oftalmologia*. 2006;69(2):213-219.
8. Kara-Júnior N, Dellapi Jr R, Espíndola RF de. Dificuldades de acesso ao tratamento de pacientes com indicação de cirurgia de catarata nos sistemas de saúde público e privado. *Arquivos Brasileiros de Oftalmologia*. 2011;74(5):323-325.
9. Fonsêca GS, Friestino JKO, Jost LN, Santos MVR, Mittelman TH. Pela luz dos olhos teus: avaliação de acuidade visual em escolares. *Revista de Extensão Universitária*. 2021;8(7):1-8.
10. Figueiredo MO, Paiva e Silva RB, Nobre MIR. Diagnóstico de baixa visão em crianças: sentimentos e compreensão de mães. *Arquivos Brasileiros de Oftalmologia*. 2009;72(6):766-770.
11. Anstice NS, Thompson B. The measurement of visual acuity in children: An evidence-based update. *Clinical and Experimental Optometry*. 2014;97(1):3-11.
12. Zimmermann A, Carvalho KMM, Atiê C, Zimmermann SMV, Ribeiro VLM. Visual development in children aged 0 to 6 years. *Arquivos Brasileiros de Oftalmologia*. 2019;82(3):173-175.
13. Rossetto JD, Hopker LM, Carvalho LEMR, Vadas MG, Zin AA, Mendonça TS, *et al.* Brazilian guidelines on the frequency of ophthalmic assessment and recommended examinations in healthy children younger than 5 years. *Arquivos Brasileiros de Oftalmologia*. 2021;84(6):561-568.
14. Vieira JK, Rezende GX, Anastácio LB, Freitas Filho RT, Benevides HCC, Fonseca JM, *et al.* Prevalência de baixa acuidade visual em escolares. *Revista Brasileira de Oftalmologia*. 2018;77(4):175-179.
15. Moreira Neto CA, Moreira ATR, Moreira LB. Relação entre acuidade visual e condições de trabalho escolar em crianças de um colégio do ensino fundamental público de Curitiba. *Revista Brasileira de Oftalmologia*. 2014;73(4):216-219.
16. Souza AGG, Benetti B, Ferreira CIB, Fix D, Oliveira RSC, Purim KSM. Avaliação e triagem da acuidade visual em escolares da primeira infância. *Revista Brasileira de Oftalmologia*. 2019;78(2):112-116.
17. Solebo AL, Teoh L, Rahi JS; British Childhood Visual Impairment and Blindness Study Interest Group. The role of screening and surveillance in the detection of childhood vision impairment and blindness in the UK. *Archives of Disease in Childhood*. 2022;107(9):812-817.
18. Solebo AL, Rahi J. Epidemiology, aetiology and management of visual impairment in children. *Archives of Disease in Childhood*. 2014;99(4):375-379.

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