NURSING INVESTIGATING VISUAL ACUITY DEFICIT IN HIGH SCHOOL STUDENTS

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ABSTRACT

This study investigates visual acuity deficit in freshmen in the integrated high school of Ifes - Campus Alegre (ES), with the objective of identifying the visual profile of students and the need for referral to the specialized public network. This is a cross-sectional study, carried out with public school students, using the Snellen table and structured questionnaires. Most students had normal vision, 56% had never had a visual acuity test, 5.9% had reduced vision, and 4% needed adjustments in optical correction. Income was not a limiting factor for ophthalmological evaluation, with 66.21% of low-income families. It evidenced the importance of screening performed by nurses in primary care, contributing to eye health and possibly academic performance. It reinforces the need for periodic evaluations and proposes the expansion of institutional partnerships to strengthen the Health at School Program. It suggests ophthalmological evaluation in the health and education strategies of the Federal Institutes, in order to minimize learning deficits and improve the quality of life of students.

Keywords: Visual Acuity. School Health. Triage. Apprenticeship. Primary Health Care.

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INTRODUCTION

Vision is fundamental to our connection with the world, allowing for the interpretation and absorption of information, as well as defining our position in space (Mombelli et al., 2023). Being the main means of interaction between people, vision helps us understand the world and ourselves at all stages of life (Mombelli et al., 2023). Given this importance, the early identification of visual alterations is crucial to prevent future impairment of the ability to see [Brasil, 2016]. School age is a particularly opportune period to detect possible visual disturbances, which can manifest themselves through learning difficulties presented by students (Valentini et al., 2019).

The World Health Organization (WHO) estimates that approximately 1.3 billion people in the world live with some form of visual impairment (Mombelli et al., 2023). A significant portion of cases of low visual acuity are concentrated in underdeveloped countries (Mombelli et al., 2023). In Brazil, according to the census carried out by the Brazilian Institute of Geography and Statistics (IBGE), there are more than 6.5 million people with visual impairment, of which 500 thousand are blind and about 6 million have low vision (IBGE, 2022).

The early detection of visual alterations in students is of paramount importance at different stages of school life (Brasil, 2016). School age, including high school, represents a crucial period to identify and intervene in vision problems that can negatively impact students' educational and social development (Valentini, 2019, Negrine et al., 2024). In this context, the school is recognized as a strategic environment for the promotion of eye health and the performance of visual screenings (Lucena et al., 2019, Porcionato et al., 2016, Franzin; Melki, 2020, Negrine et al., 2024, Brazil, 2022).

Visual acuity screening, often performed with the Snellen table (Mombelli et al., 2023, BELGUE, TOMÉ, PONTES, 2022), is a low-cost, high-sensitivity strategy to early identify eye diseases and refractive problems that can influence academic performance (Pereira et al., 2019, Becker et al., 2019, Negrine et al., 2024, BELGUE, TOMÉ, PONTES, 2022, Brazil, 2022, Anjos et al., 2023). The identification of students with possible low visual acuity requires subsequent referral to the ophthalmologist for diagnostic confirmation and indication of correction, such as the use of glasses (Negrine et al., 2024, Becker et al., 2019, Anjos et al., 2023). In this process of promoting and preventing eye health in the school environment, the nurse plays a fundamental role in identifying failures in health maintenance, including vision problems, enabling the promotion of the student's health according to the needs encountered during the nursing consultation (Anjos et al., 2023).

The practice of nursing consultation in the school context, through interventions related to eye health, allows nurses to play their role in promoting student health (Anjos et al., 2023, Anjos et al. 2022). Studies such as the one by Martins et al. (2021), carried out with elementary and high school students, show the prevalence of low visual acuity and the importance of optical correction, reinforcing the relevance of investigations at this stage of education. When screening with the Snellen Optometric Scale, it is fixed three meters from the student, with optotypes from line 1 (20/200) to line 8 (20/20), using the illiterate "E" table for students from the 1st to the 3rd year and the alphabetical table for the 4th and 5th years, fixed at the eye level of the examinees.

The partnership between the school and the public health network, strengthened by programs such as the School Health Program (PSE), is crucial to ensure specialized care for the identified students (Regis-Aranha et al., 2020, Negrine et al., 2024, Brazil, 2022, Anjos et al., 2023). The relevance of this investigation lies in the possibility of contributing to the planning of more effective and accessible health actions for the student population of Ifes - Campus Alegre (ES) (Negrine et al., 2024, Mombelli et al., 2023), as well as providing subsidies for the institution to adopt measures to support students with visual difficulties in their learning process (Martins et al., 2021).

Therefore, the present study aims to investigate the visual acuity of students entering the first year of integrated high school at the Federal Institute of Espírito Santo, Ifes - Campus Alegre (ES), with the objective of identifying the visual profile of students and the need for referral to the specialized public network of those who present refractive problems.

METHODOLOGY

This is a cross-sectional, descriptive study, carried out with students entering the integrated technical courses of the Federal Institute of Espírito Santo (Ifes) – Campus Alegre, aged between 14 and 18 years. Data analysis was conducted using descriptive statistics.

Two instruments were used for data collection: a questionnaire and the Snellen Table (Figure 1). The questionnaire was applied at the time of care and contained sociodemographic information, such as gender, age, and place of residence, as well as aspects related to eye health, such as self-perception of vision, history of ophthalmologic examinations, previous diagnosis of visual deficit, and use of optical correction means, such as glasses or lenses.

The Snellen Table was installed in a calm and well-lit environment, positioned on a windowless wall, at a distance of five meters from the student (Figure 2). The line of

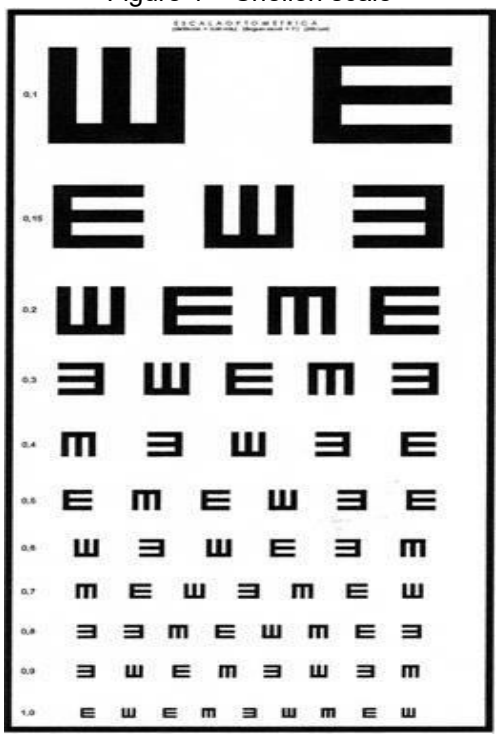
optotypes corresponding to visual acuity of 0.8 and 1.0 was placed at the level of the examinee's eyes, who remained seated during the procedure. Before the exam, the students received guidance on the correct way to identify the optotypes. The test was performed separately for each eye, with the use of an occluder, and, in cases in which the participant wore glasses, the evaluation was performed with the usual optical correction.

For the standardization of the evaluation, preserved visual acuity was considered the correct reading of two-thirds or more of the optotypes of each line of the scale. For example, in a row with six optotypes, the student should correctly interpret at least four of them.

The criteria adopted for referring students to a specialized ophthalmological consultation included visual acuity equal to or less than 0.7 in one or both eyes; difference of two or more lines between the eyes, such as right eye with an acuity of 0.8 and left eye with 1.0; clinical signs suggestive of low visual acuity and/or visible anatomical changes; and difficulties in taking the exam due to failures of understanding or collaboration on the part of the student.

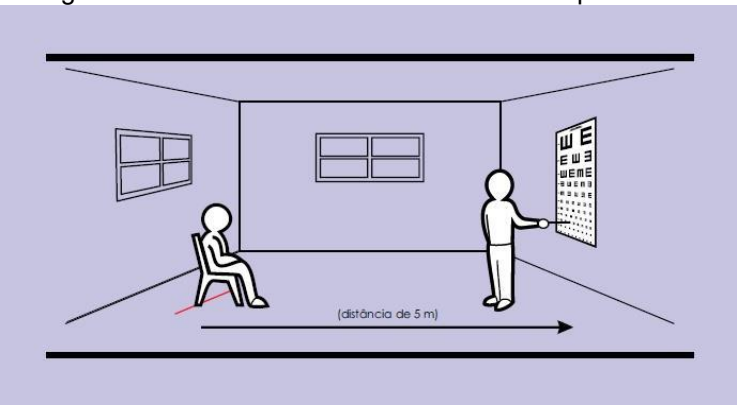
Students who were regularly enrolled as freshmen in one of the integrated technical courses offered by Ifes – Campus Alegre, aged between 14 and 17 years, and who presented the consent form signed by their guardians, along with the consent form signed by the student himself, were included in the study.

Figure 1 – Snellen scale



Source: Brazil, 2016

Figure 2 – Demonstration of how the exam is performed



Source: Brazil, 2016

The project was previously submitted to Plataforma Brasil and approved by the Research Ethics Committee (CEP), respecting the ethical precepts established by the Resolution of the National Health Council No. 466/2012, as well as the guidelines of Resolution No. 510/2016, especially Article 17. After approval, the study was presented to the teaching direction and pedagogical coordination of the institution, with an explanation of the objectives and stages foreseen for the execution of the research.

In the first week of class, the students received the Informed Consent Form (ICF) and the Informed Consent Form (TALE), which were delivered to their guardians for completion and return the following week. After the return of the terms, the team of researchers, together with the pedagogical sector, scheduled the dates and times for applying the Snellen scale and filling out the questionnaire.

At the end of the screening, the parents or guardians of the students who showed signs of reduced visual acuity were informed of the results and received a referral form for specialized care with an ophthalmologist, through the public health network.

RESULTS AND DISCUSSION

A total of 218 students entering integrated high school, in the technical courses of Agroindustry, Agriculture and Informatics, participated in the study. Of these, 38 (17.43%) were students of the Agroindustry course, 37 (16.97%) of the Computer Science course and 143 (65.60%) of the technical course in Agriculture. Table 1 shows that the age of 15 years was predominant, representing 76% of the sample of students entering high school. According to a UNICEF report (2018), the age of 15 is the requirement of Brazilian legislation for the start of high school. Late entry may occur due to delays in previous school stages or due to failure. These factors are characterized by UNICEF as loss of age-grade, which can generate a cumulative effect throughout school life.

In this sense, the applied research inferred that 25 students (11.5%) of the studied population fit this profile, with some repeating the first year of high school, while others having entered the last phase of basic education late.

Regarding gender, 107 students (49.1%) were male and 111 students (50.9%) were female. Although the school offers integrated courses, with most of the vacancies destined to the Agriculture course, the percentage of female students who seek to study at Ifes has changed over time, revealing a transition from male predominance to a greater female presence. Studies conducted by Regis-Aranha et al. (2020), Becker et al. (2019), Lucena et al. (2019), Fernandes and Franzoi (2020), Dalsoglio et al. (2024) and Becker et al. (2019) also showed a higher prevalence of this sex.

Regarding skin color, the same criteria adopted by the IBGE were used, asking students to self-declare their color or race. The majority, 122 (56%), declared themselves white, a result that contrasts with the data released by the IBGE in the 2022 census, in which the majority of the Brazilian population declared themselves brown (IBGE, 2022).

Also in Table 1, it is possible to observe that the majority of students (51.3%) reported that the family income is less than 1.5 minimum wages; 14.7% declared an income of up to 2.5 minimum wages; 8.5% up to 3.5 minimum wages; and 7.8% above 3.5 minimum wages.

Table 1. Socioeconomic characterization of the research participants at the Ifes Campus de Alegre-ES, 2024 (n=218)

Variables	**Absolute (n)**	**Relative (%)**	**Cumulative (%**
Age			
13	1	0,5	0,5
14	27	12	12,5
15	165	76	88,5
16	22	10	98,5
17	2	1	99,5
18	1	0,5	100
Sex			
Female	107	49,1	49.1
Male	111	50,9	100.0
Skin color			
White	122	56,0	56.0
Brown	76	34,8	90.8
Black	19	8,7	99.5
I prefer not to say	1	0,5	100.0
Family income (in minimum wage*)			
< 0.5	29	13,3	13.3
From 0.5 to 1	52	23,8	37.1
> 1 to 1.5	31	14,2	51.3
>1.5 to 2.5	32	14.7	66.0
> 2.5 to 3.5	18	8.3	74.3
> 3.5	17	7.8	82.1
Not declared	39	17.9	100
Optical correction			
Yes	75	34.4	34,4
No	143	65.6	100

Source: survey questionnaire.
*** Minimum wage in 2024 = R$ 1412.00 (Brazil, 2023).**

These values are in accordance with the results released by the IBGE in the 2022 census. However, there is the possibility that the numbers found in this survey do not accurately reflect the family income of high school students, since many students may not know how to accurately inform or do not have an exact notion of the values perceived by their guardians. As a consequence, it was observed that 39 students, representing 17.9%, preferred not to inform or did not know how to indicate the family income.

When asked about the use of optical correction, 75 of them (34.4%) reported using some type of correction, whether glasses or contact lenses. Given that the study was carried out with students entering high school, we can conclude that many of these students had already undergone ophthalmological evaluation during elementary school.

Table 2: Relationship between ophthalmological consultation and family income of freshmen at Ifes Campus de Alegre-ES, 2024 (n=218)

Ophthalmic examination	Household income	Frequency		
		Absolute	Relative (%)	Cumulative (%)
Yes	< half salary	18	12,2	12,2
	Half a 1	32	21,6	33,8
	> 1 to 1.5	23	15,6	49,4
	> 1.5 to 2.5	25	16,9	66,3
	> 2.5 to 3.5	13	8,9	75,2
	> 3.5	16	10,8	86,0
	Not declared	21	14,0	100,0
No	< half salary	8	14,3	14,3
	Half a 1	16	28,6	42,9
	> 1 to 1.5	7	12,5	55,4
	> 1.5 to 2.5	4	7,2	62,6
	> 2.5 to 3.5	5	8,9	71,5
	> 3.5	1	1,8	73,3
	Not declared	15	26,7	100
They don't know	< half salary	3	21,4	21,4
	Half a 1	4	28,6	50,0
	> 1 to 1.5	1	7,2	57,2
	> 1.5 to 2.5	3	21,4	78,6
	> 2.5 to 3.5	0	0	0
	> 3.5	0	0	0
	Not declared	3	21.4	100,0

Source: survey questionnaire

Table 2 shows that family income was not an impediment to ophthalmologic consultations, since 98 (66.3%) of the students who underwent this procedure belonged to families with an income of less than 2.5 minimum wages. This fact can be explained by the provision of ophthalmological services in the public health system, where care is provided based on the principle of universality of the Unified Health System - SUS.

Most of the students entering the integrated high school at Ifes - Campus Alegre (ES) belong to families with an income between half and one minimum wage (Table 2). This socioeconomic profile contrasted significantly with the findings of Tissot, Silva, and Menezes (2021), who, when investigating students after high school already at a public university, identified a predominance of students with a family income of more than five minimum wages. This difference reflects not only the impact of economic inequalities on the composition of the student body at different levels of education, but also the way in which these inequalities influence access to essential care, such as increased access to regular eye visits and early diagnosis of refractive problems. This reality reinforces the role of schools, especially in contexts of socioeconomic vulnerability, as key actors in the early identification of visual health problems, in addition to initiatives as carried out in this study, which not only assess visual acuity, but also refer those with refractive problems to the public health network, promoting equity.

Of the 148 students who reported having already had an ophthalmological consultation, 75 (50.67%) use some type of visual correction. Of these, 34 (45.33%) mentioned that, even with correction, they still face difficulties in seeing, and in 3 (4%) of these cases the visual deficit was confirmed by the Snellen scale. The results of this study are similar to those found by Tissot, Silva and Menezes (2021).

Among the students surveyed, 56 (25.69%) stated that they had never had an eye exam, while 14 (6.42%) did not remember or could not inform. The percentage of students who have never had an ophthalmological consultation is in line with the 11.4% recorded in the study by Guedes and Chaoubah (2023) in the Brazilian population. When performing the exams, it was identified that, of the 218 participants, 4 (5.9%) students had vision equal to or less than 0.7 (or 20/30 on the Snellen scale). Based on the studies by Martins et al. (2021), the identified cases need a complete ophthalmological evaluation to enable diagnosis and treatment.

Regarding the perception of eye discomfort (such as burning, itching, dry eye sensation and pain), 25 reports were recorded among students who use vision correction and 24 among those who do not use correction. The most frequent symptoms were: burning sensation in the eyes, reported by 26 students (11.9%); pruritus by 22 students (10%); eye pain by 19 students (8.7%); and dry eye sensation by 12 students (5.5%).

In a study conducted by Costa et al. (2023), the most common complaints were dry eye and headache. Fernandes and Franzoi (2020) add that headache, as a generic complaint, can often be attributed to the student's lack of interest. In this context, it is essential to offer guidance to education professionals, enabling them to identify and value

students' complaints, even if they seem simple, as they may be related to visual deficits. Table 3 presents visual acuity, individualized by each eye.

Table 3: Visual acuity of each eye in students entering high school, Ifes Campus de Alegre-ES, 2024

Eye	Frequency		
	Absolute	Relative (%)	Cumulative (%)
Left			
20/20	186	85,4	85,4
20/25	22	10,0	95,4
20/30	4	1,8	97,2
20/40	2	0,9	98,1
20/70	3	1,4	99,5
20/200	1	0,5	100,0
Right			
20/20	194	88,9	88,9
20/25	16	7,3	96,2
20/30	6	2,8	99,1
20/40	1	0,5	99,5
20/50	1	0.5	100,0

Source: Survey Questionnaire

It is perceived that most students had normal vision, identified by the Snellen scale as 20/20. 20/25 vision is also considered normal, however, for many everyday activities, specific recommendations may exist depending on individual needs. Especially if a person has symptoms such as visual discomfort or difficulty seeing at a distance, it is important to consult an ophthalmologist, thus ensuring better visual quality for daily activities.

The cutoff point indicating visual changes was equal to or greater than 20/30 (0.7) on the Snellen scale, a value also adopted by Melo, Dias Júnior and Carvalho (2018). Visual alterations were identified in 15 (6.88%) students. This study is similar to the one carried out by Regis-Aranha et al. (2020), in the Lower Amazon region, and also to the international studies by Darge et al. (2017), which found a prevalence of 5.8% in Ethiopia, and Qian et al. (2017) in China. On the other hand, it differs from the studies by Pereira et al. (2019), Vieira et al. (2018) and Becker et al. (2019), in which the prevalences found were 10.07%, 14.5% and 17.4%, respectively. The possible explanation for the divergence of the results may be related to the number of people examined, which was much higher in the studies cited, in addition to the difference in the age group of the participants, which was lower than in the present study, and also the adoption of different cutoff points for the definition of low visual acuity.

Regarding the cutoff point, in the studies by Fernandes and Franzoi (2020), normal vision was considered 20/20, and any other measure was classified as low vision, which explains the high prevalence of 67.87%. Therefore, in the previously conducted studies, the participants, because they were younger, might not have yet undergone ophthalmological

evaluation. In the studies by Vieira et al. (2018), 28 (6.48%) of those investigated belonged to the age group of 13 to 17 years, compatible with the current study, in which the age of the students ranged between 14 and 18 years. This reinforces the importance of performing visual acuity exams in this age group.

When checking each eye separately, we found low acuity in right vision in 15% of study participants and in 11% in left, which differs from the recent study conducted by Guimarães et al. (2023), in which a prevalence of 37% was found in one or both eyes. Regarding gender, 7 (46.7%) of the cases of low vision were female and 8 (53.3%) were male, results similar to those found by Guimarães et al. (2023), but divergent from those of Lucena et al. (2019), where it prevailed among female students.

The students identified with low vision were referred to the public health network for ophthalmological consultation. The parents of these students were contacted by the school's health service, received the results of the exams and a referral form. Of the 15 referred, 6 (40%) confirmed that they took their children to the specialized consultation. One of them had a result of 20/200, whose screening supported the ophthalmological diagnosis of keratoconus in the initial phase. In the report on eye health in Brazil, the result 20/200 is classified as low vision (Umbelino et al., 2023). The lack of awareness among the population, as pointed out by Vieira et al. (2018), about the importance of prevention through early ophthalmological evaluation, even before the child enters school, is a worrying factor due to the impacts that low vision can cause on learning.

When questioning students about the influence of their vision on learning or school performance, 50 (22.9%) reported that vision interferes little, and of these, 6 (2.75%) had altered visual acuity; 14 students stated that vision interferes moderately, and of these, 2 (0.9%) had altered visual acuity; 6 students reported that vision interferes completely, and of these, only 1 (0.45%) had altered visual acuity. The remaining 150 students indicated that vision does not interfere with their learning, however, 5 (2.30%) had an altered exam. It is observed, from the students' perception, that vision is a crucial factor for learning, as it connects the student to the world and to the contents presented by the teachers. Therefore, it is essential that education professionals are aware of the factors that can affect learning, with special attention to the signs and symptoms related to low vision.

CONCLUSION

It was observed that most students have normal vision. It was also noted that 56% of the students investigated had never taken the visual acuity test before entering high school; Of these, 5.9% had reduced visual acuity. Among the students who were already using

optical correction, 4% had to return to the ophthalmologist to adjust the correction. The information obtained confirms the hypothesis that many high school freshmen had already undergone a visual acuity assessment previously. In addition, we can infer that, after the diagnosis and the use of corrections, it is essential to reinforce the need for periodic evaluations, avoiding the worsening of the condition and ensuring that the learning process is not compromised by low visual acuity.

The results obtained allow us to affirm that income was not an impediment to the ophthalmological evaluation, since 66.21% of those who underwent the examination had an income of less than 2.5 minimum wages. It can be concluded that the screening of visual acuity performed by nurses, using the Snellen scale, is of great relevance, both in direct health care and in the educational sphere, as it contributes to the learning process. Thus, it is expected that partnerships between the Ministries of Health and Education, through the Health at School Program, will be strengthened and expanded, with the objective of identifying and correcting deficits in visual acuity early.

The study suggests the improvement of knowledge for the scientific community, as it reinforces the idea that visual screening performed by nurses in public health is an important tool for early diagnosis. In addition, the study brings to light hitherto unknown data on the school health of students at the Federal Institute, justifying the need to include ophthalmological evaluation in health and education strategies at the Federal Institutes of Education.

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