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Eye health and screen time: a study on children in the early stages of literacy

*Saúde ocular e tempo de tela: um estudo sobre crianças em fase inicial de alfabetização**Salud ocular y tiempo frente a las pantallas: un estudio sobre niños en las primeras etapas de la alfabetización*Julia Maito^{1,2}Gustavo Beilke^{1,3}João Matheus Pimentel dos Santos^{1,4}Daniela de Linares Garbin Higuchi^{1,5}Renata dos Santos Rabello^{1,6}Athany Gutierrez^{1,7}¹ Universidade Federal da Fronteira Sul, Curso de Graduação em Medicina. Passo Fundo-RS, Brazil.² ORCID: <https://orcid.org/0009-0002-7339-5720>³ ORCID: <https://orcid.org/0009-0009-1690-5086>⁴ ORCID: <https://orcid.org/0009-0009-7673-1508>⁵ ORCID: <https://orcid.org/0000-0002-0563-4972>⁶ ORCID: <https://orcid.org/0000-0002-8966-4326>⁷ ORCID: <https://orcid.org/0000-0003-3625-4240>

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ABSTRACT

Introduction: Prolonged screen use has been causing harm to children's health and may compromise learning during the early years of literacy, which are fundamental to success in subsequent school stages. **Objective:** To estimate the prevalence of eye symptoms and examine the relationship between eye health and screen use. **Methods:** A total of 432 children enrolled in the 1st and 2nd grades of public elementary school in a municipality in northern Rio Grande do Sul participated between October and December 2023. The children's parents completed a questionnaire containing sociodemographic, epidemiological, and behavioral information about their children. Statistical analysis of the data was performed, including a description of variable frequencies and testing the significance level ($p < 0.05$) of the independent variables in relation to the dependent variable (ocular symptoms). **Results:** 89.6% of children have access to screens, with the cell phone (63.7%) being the predominant device, followed by television (26.6%). Screen time exceeding 2 hours per day was observed in 63.7% of cases. The most reported symptoms were headache (38.7%), eye itching (27.3%), and asthenopia (22%), which were more frequent among children with screen time exceeding 2 hours per day ($p < 0.05$). Only 30 children were not exposed to screens, and among these, less than 1% presented any of the evaluated symptoms. **Conclusions:** Screen exposure was highly prevalent in the study population, with a predominance of cell phone use and exposure exceeding two hours per day. Headaches, eye itching, and asthenopia were significantly more frequent among those with longer screen time, suggesting that exposure exceeding 2 hours may negatively affect children's health.

Keywords: Ocular Health; Screen Time; Child Development.

RESUMO

Introdução: O uso prolongado de telas vem causando prejuízos à saúde infantil, podendo comprometer a aprendizagem nos anos iniciais de alfabetização, fundamentais para o sucesso nas demais etapas escolares. **Objetivo:** Estimar a prevalência de sintomas oculares e verificar a relação entre saúde ocular e uso de telas. **Métodos:** Participaram 432 crianças matriculadas nos 1º e 2º anos do Ensino Fundamental público de um município do norte do RS, entre outubro e dezembro de 2023. Os pais das crianças responderam um questionário contendo informações sociodemográficas, epidemiológicas e comportamentais dos filhos. Realizou-se análise estatística dos dados, com descrição das frequências das variáveis, e testando-se o nível de significância ($p < 0,05$) das variáveis independentes em relação à dependente (sintomas oculares). **Resultados:** 89,6% das crianças têm acesso às telas, sendo o telefone celular (63,7%) o dispositivo predominante, seguido pela televisão (26,6%). Tempo de tela superior a duas horas diárias foi observado em 63,7%. As manifestações mais relatadas foram cefaleia (38,7%), prurido ocular (27,3%) e astenopia (22%), sendo mais frequentes em crianças com tempo de tela superior a duas horas diárias ($p < 0,05$). Apenas 30 crianças não eram expostas às telas, e dentre elas menos de 1% apresentava algum dos sintomas avaliados. **Conclusões:** A exposição às telas foi altamente prevalente na população estudada, com predomínio do uso de celulares e exposição superior a duas horas diárias. Cefaleia, prurido ocular e astenopia foram significativamente mais frequentes entre aquelas com maior tempo de tela, sugerindo que exposições acima de duas horas podem ocasionar impactos negativos à saúde infantil.

Palavras-Chave: Saúde Ocular; Tempo de Tela; Desenvolvimento Infantil.

RESUMEN

Introducción: El uso prolongado de pantallas está causando daño a la salud de los niños, comprometiendo potencialmente el aprendizaje en los primeros años de alfabetización, que son fundamentales para el éxito en las etapas escolares posteriores. **Objetivo:** Estimar la prevalencia de síntomas oculares y verificar la relación entre la salud ocular y el uso de pantallas. **Métodos:** 432 niños inscritos en 1.º y 2.º año de primaria pública en un municipio del norte de Rio Grande do Sul participaron en el estudio, entre octubre y diciembre de 2023. Los padres de los niños respondieron un cuestionario que contenía información sociodemográfica, epidemiológica y conductual sobre sus hijos. Se realizó un análisis estadístico de los datos, describiendo las frecuencias de las variables y probando el nivel de significancia ($p < 0,05$) de las variables independientes en relación con la variable dependiente (síntomas oculares). **Resultados:** El 89,6 % de los niños tiene acceso a pantallas, siendo los teléfonos celulares (63,7 %) el dispositivo predominante, seguido de la televisión (26,6 %). Se observó un tiempo de pantalla superior a dos horas por día en el 63,7 %. Los síntomas más frecuentes fueron dolor de cabeza (38,7%), picazón en los ojos (27,3%) y astenopia (22%), siendo más frecuentes en niños con tiempo de pantalla superior a dos horas diarias ($p < 0,05$). Solo 30 niños no estuvieron expuestos a pantallas, y entre ellos, menos del 1% presentó alguno de los síntomas evaluados. **Conclusiones:** La exposición a pantallas fue altamente prevalente en la población estudiada, con predominio del uso de teléfonos celulares y exposición superior a dos horas diarias. El dolor de cabeza, la picazón en los ojos y la astenopia fueron significativamente más frecuentes entre aquellos con mayor tiempo de pantalla, lo que sugiere que las exposiciones superiores a dos horas pueden tener impactos negativos en la salud de los niños.

Palabras Clave: Salud Ocular; Tiempo Frente a las Pantallas; Desarrollo Infantil.

INTRODUCTION

Since the federal regulation restricting the use of portable electronic devices in Brazilian public and private schools,¹ the debate on screen use in childhood has gained even greater relevance. In addition to the proven harmful effects on the physical and cognitive health^{2,3,4} of children and adolescents, the indiscriminate use of screens has caused vision damage in these populations,^{4,5} a problem of particular concern in children in the literacy phase, as it may compromise this and other stages of their school life.

Vision plays a crucial role in physical and intellectual development during childhood. To achieve a higher-quality image, the eye adapts as needed: for distance vision, the ciliary muscles relax; for “near vision,” such as when viewing screens, the ciliary muscles contract, the zonular fibers relax, and the lens changes shape. This muscle contraction is responsible for adjusting focus.⁶

The number of times a person blinks while looking at screens (a movement essential for lubricating and maintaining good eye health) is much lower than during other daily activities because the ciliary muscles remain contracted. For this reason, excessive screen use can, in the short term, lead to symptoms such as dry eyes, redness, itching, tearing, blurred vision, double vision, and even headaches. These symptoms are part of what is known as “Computer Vision Syndrome” (CVS), which is increasingly affecting the pediatric population.^{7,8}

Prolonged use of electronic visual devices is also a risk factor for myopia, one of the most common eye conditions. In recent years, the average daily screen time for children aged 8 to 12 has increased by 49 minutes, rising from four hours and 18 minutes in 2016 to five hours and seven minutes in 2019.⁹ During the COVID-19 pandemic, the rate of myopia increased by approximately 9% among children and adolescents, highlighting the damage to eye health caused by increased exposure over a short period of time.¹⁰ Eye symptoms and signs also increase significantly in adults who use computers and other screens for more than 2 hours a day.⁸

Children under six years of age are still in the developmental stage of their visual systems and are more vulnerable to the eye damage these devices can cause.^{11,12} They are also more likely to experience difficulties learning to read and write, skills formally taught in school around ages 6 and 7.¹³ In addition to impairments in visual health and school literacy, excessive screen time can lead to cognitive problems and obesity.⁹

In 2020, the Brazilian Society of Pediatrics released an update to the Guidelines for Eye Health Care in Children,¹³ with recommendations regarding screen use due to the significant increase in screen use during the COVID-19 pandemic. Among the recommendations, the following stand out: the importance of avoiding screen exposure for children under two years of age, even passively; limiting screen time to one hour per day for children aged two to five, and two hours per day for children aged six to ten, always under supervision and with breaks between use. In addition, it is also recommended for all ages that screen use does not occur during meals and that devices be turned off at least two hours before bedtime. For adults, it is recommended to take short breaks of 5 to 10 minutes per hour, preferably by focusing on something in the distance rather than the screen.

In a context where childhood is being profoundly reshaped by the digital age, and based on the assumption that there is significant indiscriminate screen use by children of all ages, this study aims to estimate the prevalence of ocular signs and symptoms and to examine the relationship between eye health and screen use, in order to broaden our understanding of the characteristics and consequences of this relationship.

METHOD

This was a quantitative, cross-sectional, analytical study conducted between October and December 2023 in the municipality of

Soledade¹, in Rio Grande do Sul. The study population comprised all children aged six to eight years who were regularly enrolled in the first and second grades of elementary school at public schools located in the urban area of the municipality. No sample size calculation was performed, since participant selection was based on exhaustion and convenience and was non-probabilistic. Thus, all parents of children enrolled in the schools, according to the inclusion criteria (mentioned above), were considered eligible.

All 14 schools in the municipality's urban area were contacted and invited to participate in the study. School administrators were asked to assist in distributing the documents to parents: the Informed Consent Form, in duplicate, and a sociodemographic and health questionnaire regarding their children (Annex 1). After obtaining informed consent from the parents, the research team contacted the schools and scheduled visits to collect the documents. Only data from questionnaires for which parents had submitted a signed Consent Form were analyzed. Some data losses in the study are attributable to the questionnaire not being completed or to parents not returning it to the school within the designated period.

The questionnaire was organized into three sections. Section 1 contained the child's sociodemographic characteristics: race/ethnicity, age, sex, and the sociodemographic characteristics of the mother or father: race/ethnicity, age, sex, education level, occupation, and family income. Section 2 contained the child's epidemiological characteristics: use of eyeglasses, physical or intellectual disabilities, and comorbidities. Section 3 included the child's behavioral characteristics: screen time; most frequently used electronic device; daily usage time (less than or more than 2 hours); presence of ocular signs and symptoms following electronic device use; sleep quality; and self-reported school performance. All questionnaire data were converted into variables and double-entered

into the *EpiData* software (version 3, freely available).

As the outcome (dependent variable), variables related to ocular signs and symptoms (Section 3) were selected and assessed using dichotomous questions (yes/no): headache, itching, tearing, blurred vision, ocular hyperemia, asthenopia, dizziness and nausea, and difficulties with reading and writing. For each symptom/sign, a variable was created in the database, categorized as the presence/absence of ocular symptoms and/or signs. Thus, if the parent checked at least one symptom or sign, it was considered present.

As predictors (independent variables), the variables from Section 3 related to screen exposure were selected (device: tablet, cell phone, television, or computer; and daily usage time: more than 2 hours or less than 2 hours), in addition to the other variables contained in Section 1 (sociodemographic) and Section 2 (epidemiological).

The statistical analysis included the absolute and relative frequency distributions of the variables under investigation. The prevalence of the outcome (ocular symptoms and signs) was calculated in relation to screen exposure time and the independent variables. The prevalence of the outcome included, in the numerator, the number of children who presented at least one ocular symptom or sign (reported by the legal guardian), and, in the denominator, the total number of children included in the sample.

To analyze the relationship between the outcome and the independent variables, we excluded 30 children from the total sample (n=432) whose parents reported no screen use; thus, we were left with a binary dependent variable (more than 2 hours of screen use vs. less than 2 hours of screen use). The exclusion of the group of children not exposed to screens is justified given the small sample sizes across the categories of clinical manifestations, which would make it difficult to interpret the results. For the independent variables, we combined the

¹ Soledade is located in the northwestern mesoregion of Rio Grande do Sul. According to data from the last census (IBGE, 2022), the municipality has an estimated population of approximately 30,000 people, with a school

enrollment rate of 96% for children and adolescents between 6 and 14 years of age. Available at: <<https://cidades.ibge.gov.br/brasil/rs/soledade/panorama>>, accessed: 06/22/2025.

factors coded as “2” (no presence of the sign/symptom) and “3” (don’t know/not reported); thus, the independent variables also became binary (presence of signs/symptoms: yes or no/don’t know/not reported). This relationship was verified using Fisher’s exact test at a significance level of 5%. In addition, the 95% confidence interval (CI) was calculated. Descriptive statistical analyses were performed using *PSPP software* (version 3.0), and inferential statistical analyses were performed using *R software* (version 4.6.0).

This study was approved by the Research Ethics Committee (CEP) of the institution to which the study is affiliated (opinion no. 6.310.664).

RESULTS

Of the total 651 children eligible to participate in the study, 432 constituted the sample. Losses include parental non-response, incomplete responses, or absence on the day of questionnaire collection. In the sample ($n=432$), 51.9% of the children are female, 52.3% are seven years old, and 81.5% are white.

Regarding mothers’ educational attainment, 45.4% have a high school diploma, and 21.5% have a college degree. As for fathers, 37.5% have a high school diploma, and 23.8% have completed the second cycle of elementary school (final grades). As for parents’ employment, in 60.4% of families both parents work, and in 25% only one parent works. 60.4% of households have a family income of up to three minimum wages.

According to data reported by parents, 89.6% of children have access to screens. The predominant device is the cell phone (63.7%), followed by television (26.6%). Regardless of screen type, 63.7% of children are exposed to screens for more than 2 hours a day. Regarding sleep habits, 57.4% sleep more than nine hours per night, and 26.4% sleep less than nine hours per night. Nearly half of the children in the sample (45.8%) have good academic performance, and 32.4% have very good performance.

More than half of the sample (57.4% [95% CI 56.4–58.3]) reported at least one ocular

symptom or sign after screen use: headache (38.7% [95% CI 37.7–39.6]), itchy eyes (27.3%–95% CI 26.3–28.2), tearing (10.9%–95% CI 9.9–11.8), blurred vision (9.5%–95% CI 8.5–10.4), ocular hyperemia (14.2%–95% CI 13.2–15.1), asthenopia (22%–95% CI 21.1–22.9), dizziness and nausea (7.4%–95% CI 6.5–8.3), and difficulty reading and writing (13.2%–95% CI 12.2–14.1). Seven percent (7%) wear glasses or contact lenses, 4% have some disability (unspecified), and 29.6% have some comorbidity, with asthma (12.3%) (any subtype of asthma), allergies (22.4%) (the type of allergy was not specified), and obesity (1.6%) being the most prevalent. It is important to note that all health data are self-reported, and there is no information regarding the medical diagnosis of these conditions.

Table 1 presents the results of the analysis of the relationship between screen time and ocular symptoms and signs. For this analysis, we considered a sample of 402 children, excluding 30 whose parents reported no screen use. Among children not exposed to screens, fewer than 1% of parents reported headache, itching, tearing, blurred vision, ocular hyperemia, asthenopia, dizziness, nausea, and difficulty reading and writing.

Statistical tests demonstrated a significant association with headache ($p<0.01$), itching ($p=0.01$), and asthenopia ($p<0.01$). It is important to clarify that this is an analysis of associations (probabilities); it does not imply causal inference or an association between the outcome and the variables. Of the children who used screens for more than two hours a day, 51.4% reported headaches; even those who used screens for less than two hours (25.2%) reported the same symptom. The same type of effect was observed regarding asthenopia: 30.3% of those exposed to screens for more than two hours daily reported this symptom, as did those who used screens for less than two hours (13.8%).

Table 1. Relationship between screen use and ocular symptoms and signs in 1st and 2nd grade elementary school children from the public school system in Soledade, RS, Brazil, 2023 (n=402)

Screen use	No		Yes		Screen use
	n	%	n	n	
Headache					
More than 2 hours	142	35,3	133	33,1	<0,01
Less than 2 hours	97	24,1	30	7,5	
Itching					
More than 2 hours	184	45,8	91	22,6	=0,01
Less than 2 hours	101	25,1	26	6,5	
Asthenopia					
More than 2 hours	198	49,3	77	19,2	<0,01
Less than 2 hours	111	27,6	16	4,0	
Blurred vision					
More than 2 hours	243	60,4	32	8,0	0,08
Less than 2 hours	120	29,9	7	1,7	
Ocular hyperemia					
More than 2 hours	230	57,2	45	11,2	0,37
Less than 2 hours	112	27,9	15	3,7	
Tearing					
More than 2 hours	245	60,9	30	7,5	0,56
Less than 2 hours	111	27,6	16	4,0	
Dizziness and nausea					
More than 2 hours	251	62,4	24	6,0	0,21
Less than 2 hours	121	30,1	6	1,5	
Difficulties with reading and writing					
More than 2 hours	235	58,5	40	10,0	0,43
Less than 2 hours	112	27,9	15	3,7	

* Fisher's exact test.

Source: the authors

DISCUSSION

Approximately 90% of children in this study use screens, mostly via cell phones, which supports our initial hypothesis. Prolonged screen exposure is also a reality among younger children: 94.5% of a sample of 180 Brazilian children aged 24 to 42 months primarily watched television. The presence of TV is an undeniable reality in Brazilian homes and schools. It is important to note that the Guidance Manual on the Healthy Use of Screens, Technologies, and Media in Daycare Centers, Nurseries, and Schools,¹⁴ published by the Brazilian Society of Pediatrics, recommends controlled and rational use of screens in educational settings, since excessive use replaces activities necessary for development, such as playing outdoors, face-to-face interaction, physical exercise, downtime, and creative leisure. Excessive screen use, a characteristic present in this and future generations, is concerning and has distanced children from *real life*, affecting their visual health. A study conducted in Tibet¹⁰ showed that the prevalence of refractive errors in children and adolescents was lower in that region than in other regions due to the extended time children spend outdoors without using digital devices.

The cell phone was the most frequently used device in our sample, and it is also the most common among adult populations.⁸ Recent data indicate that 73% of Brazilian children receive a smartphone or tablet before age 10, which corroborates the cell phone usage observed in our study. Jonathan Haidt, author of *The Anxious Generation* (2024), suggests that smartphones should be given to children only after age 14, and that access to social media should be permitted only after age 16. The psychologist argues that this “technological epidemic” can only be resolved collectively. Even before the enactment of Law No. 15,110, dated January 13, 2025, which regulates the use of personal portable electronic devices by students in public and private elementary and secondary schools, Haidt had already advocated banning these devices in school settings.

The presence of at least one ocular symptom or sign in our sample (57.4%) is also

significant, exceeding our initial hypothesis. Although most research on SVC focuses on the adult population and age appears to be an important factor,⁸ children may also exhibit several of the same signs and symptoms as adults, as demonstrated by our study. Furthermore, certain aspects of how children use computers and other digital devices may make them more susceptible than adults to developing these problems.⁴

The hypothesis of a higher prevalence of ocular signs/symptoms in children who used screens for more than two hours was confirmed for headache, asthenopia, and pruritus ($p < 0.01$). We emphasize that even children who used devices for less than two hours reported these signs/symptoms, as reported by their parents. We reiterate that this finding reflects a probabilistic relationship (not an association or a causal inference, which would require other statistical tests). The other signs/symptoms investigated did not show a statistically significant relationship. However, it is imperative that parents remain attentive to their children’s complaints and report any signs or symptoms to an ophthalmologist, as these may lead to long-term problems. Studies have shown ocular pruritus to be a risk factor for the development of keratoconus.¹⁶

Headache (38.7%) and itching (27.3%) were the most prevalent symptoms/signs among the children studied. Headache is already cited in the literature as the main symptom associated with excessive screen time.^{17,7} The high prevalence in our sample may also be explained by the fact that headache is a more impactful symptom, drawing more attention from parents than other symptoms, such as tearing (10.9%). Since the onset of the COVID-19 pandemic, complaints of headache have been associated with excessive use of electronic devices, as other studies have also demonstrated,^{7,17} with prevalences of 51% and 80.6% in children and adolescents; of the latter, 70% experience at least one headache episode every three months,¹⁷ with excessive screen time, physical, and emotional causes serving as predictors. Asthenopia, present in 22% of our sample and whose relationship with excessive screen time was evidenced in the analysis, may,

in the medium and long term, become a limiting symptom in performing daily activities, affecting productivity, efficiency, time management, physical and mental health, and general well-being.⁸

Although not related to the development of ocular signs/symptoms, difficulty with reading and writing was reported in 13.2% of the study's total sample (including the group of children not exposed to screens). This is a relevant variable given the age group of the children participating in our study, who are in the early stages of literacy. It should be noted that this information was self-reported by parents in the questionnaire, based on their perceptions of the child's learning, and may not accurately reflect reality.

Given the small number of children who did not use screens, our study did not compare this group with the other groups (those who used screens for less than two hours a day or more than two hours a day) with respect to the signs and symptoms they presented. This limitation reflects how widespread children's access to screens is. Studies with larger sample sizes are needed to make this comparison. Other limitations of this study include reliance on self-reported data from parents and the inability to establish causality, as the analysis reveals only possible associations between screen use and the onset of ocular symptoms, other factors may be involved.

The results presented here reflect the growing trend of school-age children accessing mobile devices and the potential damage that unrestricted use can cause to eye health. Knowledge of these and other scientific findings, as well as awareness and education, are fundamental steps to ensure that children use technology in a balanced way, protecting eye health, preventing diseases, and promoting healthy and holistic development.

There is no doubt that unrestricted screen use by children can cause harm to physical and mental health, both in the short term (learning limitations) and in the long term (quality of life and social interaction). It is important to emphasize that ocular symptoms/signs serve as a warning to reassess whether visual health and screen use are being

managed appropriately¹³, as recommended by the guidelines of the Brazilian Societies of Pediatrics and Ophthalmology.

Considering the above, we consider it prudent for every institution – from the family to the school – to engage in dialogue and establish guidelines for the conscious and supervised use of electronic devices, in accordance with scientific, educational, and child health guidelines. Thus, we emphasize:

- Restrict children under two years of age from any type of screen;
- Limit children aged two to five years to one hour of daily screen time, and children aged six to ten years to two hours daily, always under supervision and with breaks between use;
- Avoid, for all ages, the use of screens during meals, restoring face-to-face family interactions and prioritizing quality time with children;
- For all ages, disconnect from screens 2 hours before bedtime.

CONCLUSION

Exposure to screens for more than 2 hours may be associated with the onset of ocular symptoms or signs in children, such as headache, asthenopia, and eye itching. Overall, the findings corroborate the literature on this topic. The high prevalence (57.4%) of at least one ocular symptom or sign among children underscores the need to alert parents and educators to monitor screen use and limit screen time to prevent ocular symptoms or signs that may lead to other complications in adulthood, as well as negative impacts on children's cognitive development and overall health.

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Authors' contributions:

dos Santos JMP: data collection and validation.

Beilke G: data collection and validation.

Maito J: statistical analysis, data collection,

investigation, writing - preparation of the original.

Rabello RS: conceptualization, resource management, project management, investigation, methodology, supervision, validation.

Gutierrez A: writing - revision and editing, supervision, validation, visualization.

Higuchi DLG: investigation, supervision, validation, visualization.

ANNEX A – DATA COLLECTION INSTRUMENT

RESEARCH PROJECT

Eye health of schoolchildren in the municipality of Soledade, Rio Grande do Sul

Research team: Professor Dr. Renata Rabello (coordinator), Professor Dr. Athany Gutierrez (collaborator), Professor Dr. Daniela de Linares Garbin Higuchi (collaborator), and medical students: Gustavo Beilke, João Matheus Pimentel dos Santos and Julia Maito.

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Guidelines for completion: This questionnaire is divided into four sections. We ask that a person responsible for the child complete SECTIONS 1, 2, 3, and 4 using legible handwriting and without making any alterations or erasures.

Number in the research: _____

Date: ____/____/2023

Visual acuity assessment: () Normal () Abnormal (DO NOT FILL IN)

SECTION 1 – SOCIODEMOGRAPHIC DATA

A – INFORMATION ON THE CHILD

a) Race/color:

1 () White 2 () Black 3 () Mixed-race 4 () Indigenous 5 () Yellow 6 () Not informed

b) Birthdate: ____/____/____

c) Age: _____ years

d) Sex:

1 () Female 2 () Male

B - INFORMATION ON PRENATAL CARE, CHILDBIRTH, AND PREGNANCY

(regarding the child being evaluated)

a) During the pregnancy, the mother received prenatal care?

1 () Yes 2 () No 3 () Don't know/don't remember

b) If so, how many prenatal visits did you have? _____ 2 () Don't know/don't remember

c) In which trimester did you begin prenatal care?

1 () 1st quarter 2 () 2nd quarter 3 () 3rd quarter 4 () Did not receive prenatal care 5 () Don't know/don't remember

d) Was the child born prematurely?

1 () Yes 2 () No

e) Did the child need to be admitted to the ICU right after birth?

1 () Yes 2 () No

f) Did any of these complications occur during pregnancy, childbirth, or postpartum?

Gestational diabetes

1 () Yes 2 () No 3 () Don't know/don't remember

Did you already have diabetes BEFORE the pregnancy?

1 () Yes 2 () No 3 () Don't know/don't remember

Gestational hypertension

1 () Yes 2 () No 3 () Don't know/don't remember

Did you already have high blood pressure BEFORE getting pregnant?

1 () Yes 2 () No 3 () Don't know/don't remember

Preeclampsia

1 () Yes 2 () No 3 () Don't know/don't remember

Eclampsia

1 () Yes 2 () No 3 () Don't know/don't remember

Urinary tract infection

1 () Yes 2 () No 3 () Don't know/don't remember

Excessive weight gain

1 () Yes 2 () No 3 () Don't know/don't remember

STIs (syphilis, chlamydia, HIV, genital warts)

1 () Yes 2 () No 3 () Don't know/don't remember

Another complication: _____

C – INFORMATION ON PARENTS/GUARDIANS

(refers to the person filling out the questionnaire)

a) Race/color:

1 () White 2 () Black 3 () Mixed-race 4 () Indigenous 5 () Yellow 6 () Not informed

b) Birthdate: ____ / ____ / ____

c) Age: ____ years

d) Sex:

1 () Female 2 () Male

e) Kinship to the child:

1 () Mother 2 () Father 3 () Grandmother/Grandfather 4 () Other

f) Father's education level:

1 () No schooling/Illiterate 2 () Elementary 1st cycle (1st-5th grade)
3 () Elementary 2nd cycle (6th-9th grade) 4 () High school (1st-3rd year)
5 () Graduation 6 () Don't know

g) Mother's education level:

1 () No schooling/Illiterate 2 () Elementary 1st cycle (1st-5th grade)

3 () Elementary 2nd cycle (6th-9th grade) 4 () High school (1st-3rd year)

5 () Graduation 6 () Don't know

h) Is the father currently working?

1 () Yes. Occupation: _____ 2 () Not working/unemployed

i) Is the mother currently working?

1 () Yes. Occupation: _____ 2 () Not working/unemployed

j) Marital status:

1 () Married 2 () Single 3 () Widow/er 4 () Divorced 5 () Common-law marriage

k) How many children do you have? _____

l) Place of residence:

1 () Urban 2 () Rural

m) Number of residents in the household: _____

n) Number of rooms in the household: _____

o) Monthly household income:

1 () Up to 3 minimum wages 2 () From 4 to 6 minimum wages

3 () From 7 to 11 minimum wages 4 () More than 11 minimum wages

p) Does the father have a vision problem (myopia, hyperopia, astigmatism)?

1 () Yes 2 () No 3 () Don't know

q) Does the mother have a vision problem (myopia, hyperopia, astigmatism)?

1 () Yes 2 () No 3 () Don't know

SECTION 2 – EPIDEMIOLOGICAL CHARACTERISTICS OF THE CHILD

a) Does your child wear glasses or contact lenses for vision correction?

1 () Yes 2 () No

b) Does your child have a disability?

1 () Yes. Which one? _____ 2 () No

c) Does your child have any of these comorbidities?

Asthma

1 () Yes 2 () No 3 () Don't know/don't remember

Cancer

1 () Yes 2 () No 3 () Don't know/don't remember

Diabetes

1 () Yes 2 () No 3 () Don't know/don't remember

Allergy

1 () Yes 2 () No 3 () Don't know/don't remember

Cardiovascular disease

1 () Yes 2 () No 3 () Don't know/don't remember

Systemic arterial hypertension

1 () Yes 2 () No 3 () Don't know/don't remember

Obesity

1 () Yes 2 () No 3 () Don't know/don't remember

Down syndrome

1 () Yes 2 () No 3 () Don't know/don't remember

Autoimmune disease (lupus, arthritis, vitiligo)

1 () Yes 2 () No 3 () Don't know/don't remember

Another disease: _____

d) Does your child take any long-term medication (every day)?

1 () Yes 2 () No 3 () Not informed

e) Does your child use any eye drops?

1 () Yes. Which one? _____ 2 () No 3 () Not informed

SECTION 3 – BEHAVIORAL CHARACTERISTICS OF THE CHILD

a) Does your child have access to a computer, mobile phones, tablets, and the like?

1 () Yes 2 () No

b) Which electronic device does your child use the most?

1 () Tablet 2 () Cell Phone 3 () Television 4 () Computer 5 () Does not use an electronic device

c) How much time does your child spend using electronic devices each day?

1 () Less than 2 hours 2 () More than 2 hours 3 () Doesn't use an electronic device

d) For how many hours are these devices used continuously?

1 () 1 hour 2 () 2 hours 3 () More than 2 hours

e) How many minutes are the breaks?

1 () No break 2 () Less than 20 minutes 3 () More than 20 minutes

f) Has your child reported any of these symptoms after using electronic devices?

Headache

1 () Yes 2 () No 3 () Don't know/don't remember

Itchy eyes

1 () Yes 2 () No 3 () Don't know/don't remember

Tearing

1 () Yes 2 () No 3 () Don't know/don't remember

Blurred vision

1 () Yes 2 () No 3 () Don't know/don't remember

Bloodshot eyes

1 () Yes 2 () No 3 () Don't know/don't remember

Fatigue after using these devices

1 () Yes 2 () No 3 () Don't know/don't remember

Dizziness and nausea

1 () Yes 2 () No 3 () Don't know/don't remember

Reading and writing difficulties

1 () Yes 2 () No 3 () Don't know/don't remember

Other symptoms: _____

g) How do you rate your child's sleep quality?

1 () Excellent 2 () Good 3 () Regular 4 () Bad 5 () Very bad

h) How many hours a day does your child normally sleep?

1 () Less than 9 hours 2 () More than 9 hours

i) How is your child doing in school?

1 () Very well 2 () Well 3 () Regular 4 () Badly 5 () Very badly

j) Overall, how would you rate your child's health?

1 () Very good 2 () Good 3 () Regular 4 () Bad 5 () Verry bad

SECTION 4 – CLINICAL CHARACTERISTICS OF THE CHILD

a) Did your child have the newborn eye screening test at birth or during their first year of life?

1 () Yes 2 () No 3 () Don't know/don't remember

b) Did your child see an ophthalmologist before the age of 5?

1 () Yes. Reason: _____ 2 () No 3 () Don't know/don't remember

c) Is there an ophthalmologist in the city?

1 () Yes 2 () No

d) Does your child have regular eye check-ups (do you take your child for a routine vision exam)?

1 () Yes 2 () No

e) If your child sees an ophthalmologist regularly, in which city does the doctor practice?

1 () Soledade 2 () Another municipality

f) How often do you take your child to see an ophthalmologist?

1 () Every 6 months 2 () Annually

3 () When there are symptoms 4 () I never took my child for consultation

g) Has your child ever reported any of these symptoms?

Headache

1 () Yes 2 () No 3 () Don't know/don't remember

Itchy eyes

1 () Yes 2 () No 3 () Don't know/don't remember

Tearing

1 () Yes 2 () No 3 () Don't know/don't remember

Blurred vision

1 () Yes 2 () No 3 () Don't know/don't remember

Bloodshot eyes

1 () Yes 2 () No 3 () Don't know/don't remember

Dizziness and nausea

1 () Yes 2 () No 3 () Don't know/don't remember

Reading and writing difficulties

1 () Yes 2 () No 3 () Don't know/don't remember

Other symptoms: _____

We appreciate your participation!