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Digital Visual Syndrome in Patients Under 35 Years of Age

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Abstract: Introduction: Digital visual syndrome or digital visual fatigue is a disease caused by the ocular fatigue provoked by spending much time in front of a screen. Objective: To diagnose the digital visual syndrome in patients under 35 years assisted in the refraction service. Methods: A prospective descriptive and cross-sectional study of patients assisted in the refraction service of the Specialties Polyclinic in Saturnino Lora Teaching Clinical Surgical Provincial Hospital, was carried out from April to June, 2022. Results: There was a prevalence of patients aged 26 and 35 and female sex; the most frequent symptoms were visual fatigue, ocular burning, dry eye sensation, closely blurred vision, red eye and headache after visual effort. The most used digital devices were the cellphone and the computer with a time of use from one to three hours, with emphasis in the last one with more than 4 hours. The refractive defects constituted the main cause of visual limitations. The patients with digital visual syndrome and some type of ametropia without correction were those with more symptoms, followed by the patients inadequately corrected. Conclusions: This syndrome affects the youngest population to a great extent. The appropriate interrogation and the incorporation of correct procedures in the daily optometric study allowed the diagnosis of such a syndrome in the assisted patients and the pertinent optic correction.

Key words: syndrome; computers; cell phone; vision disorders; asthenopia; ergonomics

1. Introduction

The incorporation of technology in our lives, be it computers, cell phones or tablets, has been very useful for the scientific-technical development of mankind. Access to the Internet is a fairly common phenomenon in today's society, a practice that also generates the excessive use of digital devices. [1]

Computer vision syndrome (CVS), also called digital eyestrain, is a condition caused by eyestrain resulting from spending too much time in front of a screen. [1-3] This term was coined by the American Optometric Association (AOA) to refer to a group of eye problems related to prolonged use of computers and other computer devices. [4]

CVS is a group of eye disorders that result from prolonged computer use. Working on these devices forces the eyes to constantly work in near vision, which activates the vergence and accommodative system to focus and fuse images, different from reading and writing on paper, where the image is static, well defined and has a background that gives good contrast. [5-8]

When looking at the cell phone or working with a computer, the vision is focused on a fixed, extremely close point. This generates a greater visual effort and a level of ocular discomfort that will be in correspondence with the time in front of the screen. [9, 10]

Ocular and visual symptoms, also referred to as asthenopia, include visual fatigue, eye redness and dryness, eye irritation, eye pain, difficulty or slowness in focusing, tearing, hypersensitivity to light, blurred vision and double vision. Non-ocular symptoms include neck, back and shoulder pain. [11, 12] All of these do not occur with the same frequency. Visual fatigue or eyestrain, eye burning, tearing, headache and blurred vision are the most common among patients with this syndrome. [10, 11]

It is estimated that, worldwide, approximately 60 million people suffer from CVS, so it has a prevalence range of 64-90% among computer users. [13, 14]

Often, during the questioning of the patient in optometry consultations, it is forgotten to ask whether the patient uses a computer or any other digital device, the time of use, whether or not the symptoms appear after exposure to the computer and also about the postures acquired when using them, since in many cases the asthenopia referred by the patient is associated with refractive defects or insufficiencies of accommodation and convergence. [15]

In optometry consultations, in most cases, the patient's refractive defect is corrected and asthenopia is associated with these refractive defects, overlooking CVS as one of the main causes of visual symptoms in patients who maintain a prolonged and excessive use of computers or any digital device, such as cell phones. This results in many optical corrections that are difficult for the patient to tolerate or even, even with their optical correction, they refer the same symptoms.

The aforementioned aspects and the concern about the number of individuals who come for consultation with intolerance to optical corrections, some with symptoms despite corrections (mainly small astigmatism and myopia), motivated this study, in which the poor diagnosis of computer vision syndrome, which affects the quality of visual function of patients, was proposed as a problem. Therefore, it was proposed as an objective to diagnose the CVS in patients under 35 years old, attended in refraction consultation of the Specialties Polyclinic of the Saturnino Lora Clinical-Surgical Teaching Provincial Hospital of Santiago de Cuba.

2. Methods

A descriptive, prospective and cross-sectional study was carried out with the patients who attended the refraction consultation, belonging to the Specialties Polyclinic of the Saturnino Lora Clinico-Surgical Teaching Provincial Hospital of Santiago de Cuba, in the period from April to June 2022. The sample consisted of 40 patients who met the inclusion criteria: under 35 years of age, of both sexes, blurred near vision and presence of asthenopia. Those with motor or functional alterations or manifest diseases were excluded, as well as those who, for any reason, did not cooperate with the test and could falsify the results.

A complete optometric study was performed to diagnose refractive defects, the study of binocular vision and ophthalmologic examination, in which ocular parallelism was explored by the occlusion test method, eye movements through the study of the diagnostic position of the gaze and proximal point of convergence to determine the patient's ability to converge while maintaining fusion.

The statistical program SPSS/PC, version 20.0, was used to perform the pertinent calculations, such as percentage and absolute frequency. The results were presented in simple tables and contingency tables. Prior to this study, authorization was requested from the Scientific Activities Board, the Research Ethics Committee and the management of the hospital in order to comply with the established formalities.

3. Results

The casuistry was dominated by patients aged between 26 and 35 years (62.5%) and female (65%) (Table 1).

Table 1. Patients diagnosed with visual computer syndrome

Age groups (years)	Sex					
	Female		Male		Total	
	No.	%	No.	%	No.	%
Under 15 years old	3	7.5	1	2.5	4	10
16-25	7	17.5	4	10	11	27.5
26-35	16	40	9	22.5	25	62.5
Total	26	65	14	35	40	100

The most frequent symptoms found in patients with CVS were visual fatigue (77.5%), followed by ocular burning (72.5%), dry eye sensation (55%), blurred near vision (37.5%), red eye (32.5%) and headache after near visual effort (27.5%) (Table 2).

Table 2. Patients studied according to symptoms

Syndrome	Total	
	No.	%
Visual fatigue	31	77.5
Eye burning	29	72.5
Dry eye sensation	22	55
Blurred near vision	15	37.5
Red or irritated eye	13	32.5
Headache	11	27.5
Tearing eyes	10	25
Eye pain	9	22.5
Neck pain	6	15
Double vision	5	12.5
Back pain	3	7.5
Total	154	385.0

Most of the patients (47.5%) used computing devices from one to three hours, with the computer standing out with a time of more than 4 hours (42.5%), it was the most used (42.5%) preceded only by the cell phone (52.5%) (Table 3).

Table 3. Patients studied according to the type of electronic device and time of use

Time of use (hours)	Device type						Total	
	Cell phone		Computer		Tablets		No.	%
	No.	%	No.	%	No.	%		
1-3	17	42.5	2	5	0	0	19	47.5
4-6	4	10	11	27.5	2	5	17	42.5
7-9	0	0	3	7.5	0	0	3	7.5
More than 9	0	0	1	2.5	0	0	1	2.5
Total	21	52.5	17	42.5	2	5	40	100

It was detected that 42.5% of the patients presented CVS, although refractive defects constitute the main cause of visual limitations represented by 57.5% of the studied sample (Table 4).

Table 4. Patients studied according to visual dysfunctions and diagnosis of computer visual syndrome

Visual dysfunction	Diagnosis of computer vision syndrome (CVS)							
	Pure visual dysfunction		More visual dysfunction		Pure CVS		Total	
	No.	%	No.	%	No.	%	No.	%
Emmetropia	-				2	5	2	5
Hyperopia	5	12.5	1	2.5	-	-	6	15
Myopia	8	20	9	22.5	-	-	17	42.5
Astigmatism	9	22.5	3	7.5		-	12	30
Convergence insufficiency	1	2.5	2	5			3	7.5
Total	23	57.5	15	37.5	2	5	40	100

Patients with CVS and some uncorrected ametropia had the highest number of symptoms (45%), followed by inadequately corrected patients (27.5%) (Table 5).

Table 5. Patients diagnosed with CVS according to optical correction and number of symptoms

Optical correction	Number of symptoms						Total	
	1-3		4-5		More than 5			
	No.	%	No.	%	No.	%	No.	%
Corrected	6	15	3	7.5			9	22.5
Inadequately corrected	2	5	4	10	5	12.5	11	27.5
Not corrected	1	2.5	8	20	9	22	18	45
No correction required	2	5					2	5
Total	11	27.5	15	37.5	14	35	40	100

4. Discussion

Access to technology in the home is almost universal, as demonstrated by the study conducted by the National Institute of Statistics and Informatics of Peru, in its report on Information and Communication Technologies in the Home. [14]

The AOA notes that the first cause of visual problems referred by patients in optometric consultation is related to CVS, which in recent years has become a major public health problem. [4]

The predominance of the female sex in all categories of the variable age may be in correspondence with the tendency of females to go to the doctor more quickly than males in search of relief from their visual discomfort and because of the time they devote to study. These results coincide with the research of Quispe Torres, Diego L, [13] where it was found that the female sex had a prevalence of 53.4%. In another study by Abudawood et al. [16], it was observed that females had a higher risk of developing CVS than males.

On the other hand, the age of the patients corresponds to people who maintain a very active working life, where the demand for the use of computers is very frequent and the progressive decrease in accommodation appears around 31 years of age and, therefore, the need for correction of small refractive defects. [17]

The results of this study coincide with an investigation carried out in Peru by Fernández, [18] in which a higher prevalence of CVS was observed in participants from 40 years of age onwards, followed by the 21-29 years age group.

Regarding the prevalence of eyestrain found in the present study, it may be caused by the accommodative effort that the eyes must make to focus at a very close distance. The sensation of dry eyes is associated with a reduction in tear production and tear breakup times, since there is a reduction in the frequency of blinking, thus exposing the ocular surface. [19]

Gerena and collaborators [12] refer to different factors that may contribute to the appearance of visual symptoms after prolonged computer use. These include extrinsic eye factors such as increased exposure of the ocular surface, the use of contact lenses or medication, local or systemic diseases, as well as extrinsic environmental factors such as workplace lighting (which can be natural or artificial), the ergonomic conditions of the work activity that is related to an adequate desk height for good observation of the computer, or the presence of air conditioning; all of which help to prevent symptoms, not only visual ones but also extraocular ones.

They also point out intrinsic factors, such as alterations in the accommodative mechanism of the eye, including uncorrected refractive errors, inadequate correction or the existence of ocular dysfunctions. [12]

Near blurred vision, according to Seguí Crespo M et al, [6] may be caused by convergence insufficiencies, accommodative fatigue due to effort or, in some cases, a decrease in the amplitude of accommodation. Although on a smaller scale, patients also presented musculoskeletal problems such as neck or shoulder pain, possibly due to inadequate posture for computer work. [5, 11]

Similar results were found in a study by Rueda et al, [3] in which 90.91% of the workers surveyed presented one or more symptoms related to CVS, with eye fatigue and dry eye standing out in 24.24% and 18.18%, respectively. In addition, a study conducted in Jordan [20] comprising 382 university students found that 59% of participants experienced tearing, eye fatigue and headaches.

The most commonly used computing device was the cell phone with 52.5%, followed by the computer with 42.5%. These data coincide with a study carried out by Fernández, [18] where the daily use of both was represented by 44% and 46.5%, respectively. Thus, it was possible to determine that the aforementioned devices are the most frequently used.

The time that patients use computer devices is from one to three hours, except for the computer, which is used for more than 4 hours. In Ecuador, a study was conducted on the administrative staff of the Faculty of Engineering of the National University of Chimborazo, where 77.8% were in front of a computer for more than 4 hours and 22.2% from 2 to 4 hours. [11] Similarly, it is related to the findings of Fernandez, [18] who determined that people who were more than 3 hours a day exposed to screens, spending most of their time in front of the devices at night, had a potentially higher probability of developing CVS.

The prevalence of this disease is proportional to the number of hours spent in front of the computer. Thus, spending more than three hours a day in front of the computer significantly increases the prevalence of the syndrome. Other research has reported that spending more than 30 hours a week for more than 10 years in front of a computer increases somatic, depressive and obsessive symptoms. [10, 13]

Not all individuals with CVS were accompanied by any ametropy, such as hyperopia, astigmatism, or myopia. In the case of the latter, patients who usually read without mirrors have to get too close to the tablet or computer screen to get a sharp image, to achieve this in many cases adopt a forced posture. [15]

These results are similar to a survey conducted by Columbia Medical Students in 2022, which found that 65% of patients had refractive defects, with myopia being the most common (25%), followed by astigmatism (20%). [12]

In this series, most of the patients reported having seen an optometrist when they presented with symptoms; however, only a small proportion of these patients indicated that they were asked about the use of a digital device.

Regarding optical correction, it should be noted that the asthenopia found in patients with CVS is similar to that found in refractive defects, mainly small astigmatisms. This is why care should be taken with optical correction, because if these symptoms are not assessed as possible causes of discomfort due to excessive use of computers, the presence of CVS would go unnoticed and an inadequate optical correction could be performed. [19]

It was found that, although refractive defects and convergence anomalies are the main cause of visual limitations, with proper questioning and technical procedures in daily optometric practice, it is possible to detect the CVS that causes so much discomfort to the patient.

All individuals with CVS were prescribed optical correction, according to the results of refraction and multidirectional treatment, which included ocular therapy, change in habits and adjustments in the workplace.

It is concluded that CVS largely affects the younger population. Adequate questioning and the incorporation of the correct procedures in the daily optometric study allowed the diagnosis of this syndrome in the patients attended and the pertinent optical correction.

Declaration

"Síndrome visual informático en pacientes menores de 35 años" was originally published in MEDISAN. With the author's consent, the English version has been published in AMEIR.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Authors' Contribution

Dayana Bacallao Massabeaut: conceptualization, formulation of objectives, research, methodology, supervision, visualization, writing, revision and editing. Participation: 50%.

Irene Cruz Martínez: data curation, methodology, supervision, writing, revision, editing. Participation: 30%.

Alexander Torres Moreno: methodological development and design. Participation: 10%.

Yusmary Tejeda Alvarado: development and methodological design. Participation: 10%.