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COMPUTER VISUAL SYNDROME IN MEDICAL STUDENTS IN VIRTUAL EDUCATION OF A PERUVIAN UNIVERSITY DURING 2021

SÍNDROME VISUAL INFORMÁTICO EN ESTUDIANTES DE MEDICINA EN EDUCACIÓN VIRTUAL DE UNA UNIVERSIDAD PERUANA DURANTE EL 2021

Rosario Mercedes Meneses Castañeda [1], Sergio Luis Ramos Rodriguez [1], Chiara del Carmen Molfino Jaramillo [1], Ely Luisa Sánchez Miraval [1], David Francisco Stein Montoros [1], Lourdes Guissel Chávez Rodríguez [1]

ABSTRACT

Introduction: Students during virtual classes due to COVID-19 may develop computer visual syndrome (SVI) due to excessive time in front of digital screens. **Objective:** To determine the frequency of computer vision syndrome in sixth-year medical students at Ricardo Palma University during virtual education due to COVID-19 in October and November 2021. **Methods:** Cross-sectional descriptive study in 147 sixth-year medical students who received virtual education at a Peruvian university during 2021. A non-probability sampling was used for convenience and the SVI was evaluated with the SVI-Q questionnaire, in addition characteristics were evaluated. demographics, visual preventive measures and eye diseases. The results were analyzed with SPSS v.21 for Windows. The study was approved by the Ethics Committee. **Results:** Most of the students were young adults (54%) and female (60%). The frequency of computer visual syndrome was 93%, it occurred in 94% of women and 90% of men. Most of the students reported having myopia (44%) and astigmatism (22%). Regarding visual symptoms, the students mainly presented tearing (7.9%), itching (7.6%), and headache (7.6%). An association was found between SVI and the use of preventive measures for vision care. **Conclusions:** A high frequency of SVI was found in medical students who took virtual classes.

Keywords: Vision Disorders; Education, Distance; Students, Medical. (Source: MESH-NLM)

RESUMEN

Introducción: Los estudiantes durante las clases virtuales debido al COVID-19 pueden desarrollar síndrome visual informático (SVI) por el exceso de tiempo frente a pantallas digitales. **Objetivo:** Determinar la frecuencia del síndrome visual informático en estudiantes de sexto año de medicina de la Universidad Ricardo Palma durante la educación virtual por COVID-19 en octubre y noviembre de 2021. **Métodos:** Estudio descriptivo transversal en 147 estudiantes de medicina de sexto año que recibieron educación virtual en una universidad del Perú durante el 2021. Se utilizó un muestreo no probabilístico por conveniencia y el SVI se evaluó con el cuestionario SVI-Q, además se evaluaron características demográficas, medidas preventivas visuales y enfermedades oculares. Los resultados se analizaron con SPSS v.21 para Windows. El estudio fue aprobado por el Comité de Ética. **Resultados:** La mayoría de los estudiantes fueron adultos jóvenes (54%) y del sexo femenino (60%). La frecuencia de síndrome visual informático fue de 93%, se presentó en el 94% de mujeres y el 90% de hombres. La mayoría de las estudiantes refirió tener miopía (44%) y astigmatismo (22%). En lo referente a los síntomas visuales, los estudiantes presentaron principalmente lagrimeo (7,9%), picor (7,6%), dolor de cabeza (7,6%). Se encontró una asociación entre el SVI y el uso de medidas preventivas para el cuidado de la visión. **Conclusiones:** Se encontró una elevada frecuencia de SVI en estudiantes de medicina que llevaron clases virtuales.

Palabras claves: Trastornos de visión; Educación a Distancia; Estudiantes de Medicina. (Fuente: DeCS- BIREME)

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INTRODUCTION

Currently, technology is a part of our daily life and has become indispensable; Electronic devices such as cell phones, tablets, computers, and televisions have been brought into our homes with increasing frequency for recreational and/or vocational purposes. In the last century, the modern world has become addicted to the screens of such devices, thus generating a great demand for daily use; these make life easier for many people worldwide; however, their inappropriate use can cause damage to health[1]. The year 2020 brought a pandemic due to SARS-COV2, which altered the lifestyle of many people. The primary measure was confinement and social distancing, depriving physical and social interaction. On the other hand, this promoted relationships through electronic devices; thus, people relied on devices to obtain information or for entertainment[2].

The American Optometric Association (AAO) defines the term computer vision syndrome (CVS) as a group of eye and vision problems related to excessive and prolonged use of electronic equipment[1]. For example, a person who dedicates a large part of their day to being in front of a computer as an employee or student performs 12 000 to 35 000 head and eye movements daily, and their pupils react 5 000 to 17 000 times. Consequently, symptoms such as dry eye, blurred vision, eye pain, neck and shoulder pain, and headache occur [1,3].

The prevalence of people around the world suffering from CVS ranges from 64% to 90%, and approximately 60 million people have been affected. In addition, 75% of people who spend more than six hours a day in front of a computer have a higher incidence of visual problems [4].A report by the AAO indicates that each year, ten million people go to a health center for eye examinations for visual problems related to the increased use of computers[1]. University students make up one of the groups most exposed to CVS after the group of office workers. One report indicates that

approximately 81% of college students are affected by CVS; the widespread use of electronic devices for various academic activities explains this. Another study reveals that 89.9% of university students who use the computer for more than two hours a day suffer from CVS. This syndrome negatively impacts students' daily work, thus affecting productivity, efficiency, time management, general health, and well-being[4,5].

Therefore, the present investigation aims to determine the prevalence of computer vision syndrome in 6th-year medical students in a Peruvian university in the context of virtual education due to COVID-19.

METHODS

Design and study area

A cross-sectional descriptive observational study was carried out at a university in the Peruvian capital.

Population and sample

The population consisted of sixth-year medical students from the Faculty of Human Medicine of Ricardo Palma University, who received virtual education from October to November 2021. To find the sample size, the EPIDAT software was used. 4.2, considering a population size of 238, a prevalence of computer vision syndrome of 0.50, a confidence level of 95%, and an error of 5%. A total sample of 147 students was obtained, and a non-probabilistic sampling was carried out for convenience.

Variables and instruments

The dependent variable was computer vision syndrome (CVS), defined as the set of ocular, visual, and extra-ocular symptoms caused by exposure to the screen of electronic devices [1]. For its evaluation, the Computer vision Syndrome Questionnaire (CVS-Q) was used in its original Spanish version, which consists of 7 questions. The instrument was validated in Peru and applied to administrative personnel, where a Cronbach's alpha of 0.87 was found. This is considered an acceptable level[6]. Therefore, those medical students who presented a score greater than or equal to 6 in the total score were considered positive for CVS.

The independent variables sex, use of glasses, taking breaks during computer use, use of preventive visual measures, time of continuous use of cell phones per day, time of continuous use of laptop per day, and ocular disease were included. For data collection, a questionnaire was used that included sociodemographic characteristics and other factors that could influence the prevalence of CVS.

Procedure

The questionnaires and informed consent were sent virtually to the students in the 6th year of medicine through a Google Docs file for their respective completion.

Statistic analysis

Data was entered and analyzed using the statistical program SPSS v.21 for Windows. Likewise, the results were presented in single and double-entry tables in numerical and percentage form.

Ethical aspects

The Research Ethics Committee of Ricardo Palma University approved the study. Therefore, participation in the study was carried out before informed consent was accepted. Furthermore, the information used for the research purposes was stored in a coded form, avoiding any information that would allow the identification of the participants. In this sense, the physical and psychological integrity of those involved in the study was guaranteed.

RESULTS

Regarding the sociodemographic characteristics, we found that most students were young adults (54%) and females (60%). Most wore glasses (78%), both frame (75%) and contact (3%). The highest percentage of students spent more than six hours uninterrupted computer use (43%). Likewise, most spent less than two hours of uninterrupted cell phone use (27%). Regarding visual rest, most students rested at least every hour (29%), followed by rest at least every two hours (23%). Regarding the use of preventive measures, most of them did not take any preventive measure (44%), followed by those who kept their eyes closed for a while (27%), and finally, those who gazed at distant places (18%) (Table 1).

Table 1. Sociodemographic characteristics and characteristics of eye care.

Variable Grupo de edad	N (%)
19 -24 (Young adult)	79 (54%)
≥ 25 (Adult)	68 (46%)
Sex	
Female	88 (60%)
Male	59 (40%)
Use of lenses	
Yes, with a frame	110 (75%)
Yes, contact lenses	4 (3%)
I don't wear glasses	33 (22%)
Uninterrupted use of the computer	
Less than 2 hours	9 (6%)
2 - 4 hours	41 (28%)
4 - 6 hours	34 (23%)
More than 6 hours	63 (43%)

Uninterrupted cell phone use	
Less than 2 hours	40 (27%)
2 - 4 hours	48 (33%)
4 - 6 hours	31 (21%)
More than 6 hours	28 (19%)
Taking visual breaks	
Yes, at least every 20 minutes	23 (16%)
Yes, at least every hour	42 (29%)
Yes, at least every 2 hours	34 (23%)
Yes, after more than 2 hours	30 (20%)
I don't take eye breaks	17 (12%)
Use of preventive measures for vision care	
Use of artificial tears	15 (10%)
Stare at distant places	26 (18%)
Keep your eyes closed for a while	39 (27%)
I do not take ny preventive measures	64 (44%)
I rest and perform a face wash	1 (1%)
Sleep	1 (1%)
Laptop screen distance	1 (1%)
Total	147 (100%)

Regarding any diagnosed visual disease, the majority reported having myopia (44%), followed by those with astigmatism (22%) and hyperopia (4%). Likewise, 27% did not present disease (Table 2).

Table 2. Diagnosed visual disease.

Diagnosed visual disease	N	(%)
Astigmatism	32	22%
Myopia	65	44%
Farsightedness	6	4%
Cataracts	0	0%
Eye surgery	0	0%
No disease	39	27%
Eyestrain	1	1%
Pterygium	1	1%
Myopia and astigmatism	3	2%
Total	147	100%

The students mainly presented tearing (7.9%), itching (7.6%), headache (7.6%), heavy eyelids (7.2%), and blurred vision (6.7%). Regarding the frequency of tearing, the students reported that they presented this symptom occasionally (51%), often or always (24%), and finally, never (25%). Regarding itching, the majority present this symptom occasionally (61%), never (28%), and often in a lower percentage (11%). Finally, regarding the headaches, the students presented them occasionally (50%), never 828%), and to a lesser extent often or always (22%) (Table 3).

Table 3. Frequency of ocular symptoms presented by the students.

Symptoms	Total N (%)	A often Or always N (%)	Occasionally N (%)	Never N (%)
Tearing	110 (7,9%)	35 (24%)	75 (51%)	37 (25%)
Itching	106 (7,6%)	16 (11%)	90 (61%)	41 (28%)
Headache	106 (7,6%)	33 (22%)	73 (50%)	41 (28%)
Heavy eyelids	100 (7,2%)	24 (16%)	76 (52%)	47 (32%)
Blurry vision	93 (6,7%)	16 (11%)	77 (52%)	54 (37%)
Increased sensitivity	92 (6,6%)	22 (15%)	70 (48%)	55 (37%)
Excessive blinking	90 (6,5%)	20 (15%)	70 (48%)	57 (39%)
Burning	89 (6,4%)	19 (13%)	70 (48%)	58 (39%)
Foreign body sensation	87 (6,3%)	15 (10%)	72 (49%)	60 (41%)
Dryness	85 (6,1%)	25 (17%)	60 (41%)	62 (42%)
Eye redness	80 (5,8%)	17 (12%)	63 (43%)	67 (46%)
Eye pain	76 (5,5%)	13 (9%)	63 (43%)	71 (48%)
Difficulty focusing	76 (5,5%)	15 (10%)	61 (41%)	71 (48%)
Sensation of seeing worse	74 (5,3%)	9 (6%)	65 (44%)	73 (50%)
Double vision	65 (4,7%)	12 (8%)	53 (36%)	82 (56%)
Colored halos	60 (4,3%)	17 (12%)	43 (29%)	87 (59%)

En cuanto a la intensidad de los síntomas, el lagrimeo fue principalmente moderado (59%), leve (25%) y en menor proporción intenso (16%). El picor fue principalmente moderado (54%), leve (28%) y en menormente intenso (18%). El dolor de cabeza fue en su mayoría moderado (44%), leve (28%) y severo (28%). En cuanto a la frecuencia de SVI, se encontró el que 93% (136) de los estudiantes presentaron SVI. En cuanto a la relación entre el sexo del estudiante y el SVI, este síndrome fue más frecuente en mujeres, presentando SVI el 94% de las ellas y el 90% de los hombres. En la Tabla 4 se estudiaron las comorbilidades asociadas a SVI, de las cuales solo las medidas preventivas estuvieron asociadas (p=0,025).

Tabla 4. Comorbilidades asociadas al Síndrome visual informático en la población estudiada.

Comorbilidades	No SVI	SVI	Total	Valor de p
Edad	24,0 (22,0-25,0)	24,0 (23,0-26,0)	24,0 (23,0-26,0)	0,12
Sexo				0,28
Femenino	7 (8,0%)	81 (92,0%)	88 (100,0%)	
Masculino	8 (13,6%)	51 (86,4%)	59 (100,0%)	
Uso de lentes				0,57
No uso lentes	5 (15,2%)	28 (84,8%)	33 (100,0%)	
Sí, con marco	10 (9,1%)	100 (90,9%)	110 (100,0%)	
Sí, de contacto	0 (0,0%)	4 (100,0%)	4 (100,0%)	
Uso ininterrumpido del computador				0,53
Menos de 2 horas	1 (11,1%)	8 (88,9%)	9 (100,0%)	
2 - 4 horas	3 (7,3%)	38 (92,7%)	41 (100,0%)	
4 - 6 horas	2 (5,9%)	32 (94,1%)	34 (100,0%)	
Más de 6 horas	9 (14,3%)	54 (85,7%)	63 (100,0%)	

Regarding the intensity of the symptoms, tearing was mainly moderate (59%), mild (25%), and to a lesser extent, intense (16%). The itching was mainly moderate (54%), mild (28%), and less intense (18%). Headaches were mainly moderate (44%), mild (28%), and severe (28%). Regarding the frequency of CVS, it was found that 93% (136) of the students presented CVS. Regarding the relationship between the student's sex and CVS, this syndrome was more frequent in women, presenting CVS in 94% of them and 90% of men.

DISCUSSION

The present study found that the frequency of Computer Vision Syndrome was high, similar to that found in various studies in the population of medical students [7-10]. However, other studies found a mean prevalence oscillating between 50%-60%[8,11]. Likewise, at the national level, there is only one study on postgraduate students belonging to various faculties, resulting in a prevalence of 61%. The prevalence in students at the medical school level was 32.8% [12]. In national studies on employees, a high prevalence was found related to workers with digital tasks[13,14]. It should be noted that, due to the increasing use of information computer technologies (ICTs) in academic and work tasks, computer vision syndrome could be considered a public health problem, taking into account the reference of its prevalence at the national level and worldwide and still the ignorance of the approach and impact of this problem.

Likewise, it was found that women have a higher frequency of CVS than men. This coincides with studies reported on medical students, in which it was observed that females had a higher risk of developing CVS than males[7,8]. This may be due to hormonal factors, in which women may be more predisposed to developing dry eye [15], as well as other external factors. On the other hand, at the national level, no significant difference has been found in the prevalence in both sexes [12]. Therefore, more studies would be needed to determine if, in reality, there is a significant variation in the prevalence of CVS in terms of gender and perhaps also considering the type of occupation.

Among the most frequent symptoms of computer vision syndrome in the students who were part of our population, tearing was observed with the highest percentage of responses (7.9%). This is similar to the finding in the study by Ghufran et al., where excessive tearing was the predominant ocular symptom (20.6%) [7]. In the present work, tied for second place we found itchy eyes and headaches (7.6% of responses for both), the latter symptom being the most frequent in other studies such as that of Altalhi A et al.[9] and Iqbal et al.[10] (68% and 50.2% respectively), differing from our results. Itchy eyes were found to be the third most prevalent symptom (63%) in the study by Altalhi A et al. [9]; however, it is not described among the most frequent symptoms in others. In our study, heavy eyelids (7.2%) ranked third, a symptom not evidenced in previous works. However, in the study by Vikanaswari, GI & Handayani, A.[12] they mention tense or tired eyes as the most frequent (72.8%). In addition, unlike our study, other works agree that neck pain is the most characteristic symptom of computer vision syndrome [7,12]. In this sense, a degree of variability is observed in relation to the report of symptoms most representative of this syndrome in the people suffering from it.

Another finding is the higher prevalence of CVS in those medical students who use a computer/laptop for more than 6 hours compared to those with only a few hours of exposure. This coincides with other studies carried out amongst medical students in which a significant correlation is found, the longer the hours of consumption (greater than 4 to 6 hours approximately) of digital devices, the greater the risk of presenting symptoms of CVS, and the one that occurs with the most frequent is myopia [16-18]. On the other hand, two previous studies were presented, the first being carried out in Jamaica and the second in Saudi Arabia, both with a sample similar to this present work. Both did not find a significant relationship between the presence of CVS symptoms and the time the participants spent in front of the computer/laptop [4,19]. This discrepancy may be due to factors specific to the sample or the methodology. However, a significant association between exposure time and suffering from CVS symptoms is explained by the fact that the longer the time spent on a laptop screen, the frequency of blinking decreases, and the production of the tear film decreases, which leads to its vaporization and causes symptoms associated with CVS.

Regarding the use of preventive measures against CVS, at least 41% of the students did not take any preventive measures, which is reflected in the study by Mendoza et al., where 59% of the population studied did not take preventive measures during the use of electronic devices, considering it a significant risk factor for developing CVS [20]. On the other hand, within the preventive measures against CVS, the techniques most used by students were: keeping their eyes closed for a specific time and trying to fix their gaze on distant sites, with 28% and 18%, respectively. These results are consistent with various national and international studies where students opt to use these measures to help relax muscles and provide a change in eye focus, preventing eye fatigue [5,13,21]. Although, in the present study, around 10% stated the use of artificial tears as a preventive measure, studies such as the one by Wang et al. [2] consider the use of these agents as a symptomatic treatment to reduce the effects of dry eyes in CVS, but not as preventive measures per se.

Among the study's limitations is its methodology; the cross-sectional information collection does not allow for determining causal inferences. Likewise, the collection of information virtually could generate a selection bias, where only those 6th-year students with internet access were able to participate in the study. Likewise, as it is a virtual questionnaire, the resolution of possible doubts of the participant concerning the questions of the questionnaire is limited, which could generate an information bias.

CONCLUSION

In conclusion, a high frequency of CVS was found amongst 6th-year students of the Faculty of Human Medicine, which showed a higher percentage of women being affected. Therefore, it is recommended to educate medical students on the use of preventive measures to avoid CVS, such as taking breaks of approximately 5 minutes every hour and placing the computer/laptop screen at a distance between 50 and 60 cm, among others, during virtual classes.

Correspondence: *Rosario Mercedes Meneses Castañeda.*
Address: *Av. Benavides 330 Dpto 102 - Miraflores.*
Telephone number: *999369700 - 444-6077*
E-mail: *drcharimeneses@hotmail.com*

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