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ORIGINAL

Factors associated with Computer Vision Syndrome in students and teachers of a private university in Peru during the SARS-CoV-2 pandemic

Factores asociados al síndrome visual informático en estudiantes y profesores de una universidad privada de Perú durante la pandemia de SARS-CoV-2

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ABSTRACT

Introduction: computer Vision Syndrome is also considered the ocular epidemic of the 21st century. It is essential to determine the number of individuals suffering from CVS and the associated factors.
Objective: to identify the factors associated with Computer Vision Syndrome in medical students and faculty at Peruvian Private University during the SARS-CoV-2 pandemic in 2021.
Methods: this was an observational, cross-sectional, retrospective, and analytical study. The participants included students and faculty members from the School of Human Medicine. The Computer Vision Syndrome Questionnaire (CVS-Q) from Google Forms was used. For bivariate analysis, the chi-squared test was used with a 95 % confidence level. Frequency and proportion calculations were used for qualitative variables, and measures of central tendency and dispersion were calculated for quantitative variables.
Results: 56,0 % of faculty and students suffered from computer vision syndrome (CVS). In the bivariate analysis, it was found that the use of eyeglasses ($p < 0,004$), a computer/cell phone screen distance of <45cm ($p < 0,031$), and a family history of visual diseases ($p < 0,010$) were associated with CVS.
Conclusions: There is a high prevalence of computer vision syndrome, with faculty members being the most affected. Factors associated with CVS were the use of eyeglasses, a computer/cell phone screen distance of <45cm, and a family history of visual diseases.

Keywords: Asthenopia; Medical Students; Educational Personnel, Education, Distance; Ocular Health.

RESUMEN

Introducción: el síndrome visual informático también se considera la epidemia ocular del siglo XXI. Es esencial determinar el número de individuos que padecen este síndrome y los factores asociados. **Objetivo**: identificar los factores asociados al Síndrome Visual Informático en estudiantes y docentes de medicina de la Universidad Privada del Perú durante la pandemia de SARS-CoV-2 en 2021.
Métodos: este fue un estudio observacional, transversal, retrospectivo y analítico. Participaron estudiantes y docentes de la Facultad de Medicina Humana. Se utilizó el Cuestionario de Síndrome Visual Informático (CVS-Q) de Google Forms. Para el análisis bivariado, se utilizó la prueba de chi-cuadrado con un nivel de confianza del 95 %. Para las variables cualitativas se utilizaron cálculos de frecuencia y proporción, y para las variables cuantitativas se calcularon medidas de tendencia central y dispersión.

Resultados: el 56,0 % de los profesores y estudiantes padecían el síndrome visual informático (SVI). En el análisis bivariante, se observó que el uso de gafas (p < 0,004), una distancia de la pantalla del ordenador/teléfono móvil < 45 cm (p < 0,031) y antecedentes familiares de enfermedades visuales (p < 0,010) se asociaban con el CVS.
Conclusiones: existe una alta prevalencia del síndrome visual informático, siendo el profesorado el más afectado. Los factores asociados al CVS fueron el uso de gafas, una distancia de la pantalla del ordenador/teléfono móvil < 45 cm y antecedentes familiares de enfermedades visuales.

Palabras clave: Astenopía; Estudiantes De Medicina; Personal De Educación, Educación A Distancia; Salud Ocular.

INTRODUCTION

Computer Vision Syndrome (CVS), caused by prolonged computer use, is also considered the ocular epidemic of the 21st century. Its clinical presentation includes symptoms such as ocular dryness, asthenopia, and blurry vision.[1] It can also manifest with neck pain, back pain, and headaches.[2] Following the COVID-19 pandemic, virtual medical education became more prominent, offering advantages such as flexibility in terms of time, space, opportunities, and resources from an individualized approach.[3] Teachers also attempted to adapt to this methodology with the goal of continuing to educate healthcare professionals who can provide quality care to the population.[4]

In Peru, there was an increase in household access to information and telecommunications technologies (ICT) during the second quarter of 2020. For every 100 households, 99 had at least one ICT device.[5] A study conducted among undergraduate students revealed that 80,6 % suffered from CVS, with male students, those between the ages of 16 and 23, and those exposed to the computer for more than 6 hours a day being the most prevalent characteristics (6). Additionally, a study among postgraduate students showed that 62,3 % had CVS, with individuals over 40 years of age and those using mobile phones for 7 to 10 hours a day having the highest prevalence.[7] Visual discomforts such as burning, itching, dry eye sensation, and eye fatigue were the most commonly reported symptoms by students.[8]

The COVID-19 pandemic was declared a global health emergency.[9] Despite strict containment measures, including quarantine, testing, and social distancing, the incidence of this disease continues to rise.[10] COVID-19 has had a significant impact on medical education, revealing weaknesses in virtual teaching, including technical issues, problems with confidentiality, reduced student participation, and the loss of exams. It was also found that students' mental well-being was affected during the pandemic,[7] with the presence of stress, frustration, and university dropout,[11] adding to these negative effects the impact of CVS.

The medical student's training includes hospital rotations that refine their skills and put their theoretical knowledge into practice, allowing them to interact with patients. Due to the current situation, the challenge of distance education was assumed, with teachers helping students stay updated on the latest developments while trying to make up for lost time due to the suspension of university classes and clinical experiences.[7] Currently, there is limited information regarding CVS in students and faculty in the School of Human Medicine. Therefore, it is essential to determine the number of individuals suffering from CVS and the associated factors to take relevant measures for visual health.

Hence, the objective of this research was to identify factors associated with Computer Vision Syndrome in medical students and faculty at Peruvian Private University during the SARS-CoV-2 pandemic in Ica-2021.

METHODS

Study Design

This study was conducted as an observational, cross-sectional, and analytical study among students and faculty members of the School of Human Medicine at Peruvian Private University, during the SARS-CoV-2 pandemic.

Population and Sample

The study population consisted of 1 390 students and 130 faculty members from the School of Human Medicine at Peruvian Private University, who participated in remote education during the SARS-CoV-2 pandemic (from 2021 to 2022). For the selection of the sample, an expected frequency of 5 % was considered using the sample size formula for the frequency in a known population, resulting in a sample of 69 students and 47 teachers. The sample selection was carried out through probabilistic sampling: Simple Random Sampling. Students who were not enrolled or did not provide informed consent, as well as faculty members who were not teaching in the School of Human Medicine or did not have active contracts, were excluded.

Evaluated Variables

The variables assessed in this research include computer vision syndrome and associated factors. These factors are categorized into sociodemographic factors (age, gender, marital status, socioeconomic status, and residence location), clinical factors (use of eyeglasses, continuous hours of computer usage, continuous hours of cell phone usage, lighting conditions, distance from the computer/cell phone, and breaks and blinking frequency during computer/cell phone usage), and epidemiological factors (personal history of visual diseases and family history of visual problems).

Procedures

The study obtained the number of students and faculty members enrolled in the School of Human Medicine in 2020 from the coordination of the School of Human Medicine at Peruvian Private University. Those who met the inclusion criteria were selected, and data were collected using an electronic questionnaire via Google Forms for Computer Vision Syndrome (CVS-Q), which had been validated and adapted for Peru by the Occupational Medicine and Environmental Health Unit at Cayetano Heredia Peruvian University. Subsequently, a database was created, and data cleaning was carried out.

Statistical Analysis

For qualitative variables such as gender, marital status, socioeconomic status, residence location, use of eyeglasses, continuous hours of computer usage, continuous hours of cell phone usage, lighting conditions, distance from the computer/cell phone, breaks and blinking frequency, personal history of visual diseases, family history of visual problems, and CVS-Q (Peruvian version), frequencies and proportions were calculated. For quantitative variables, such as age, measures of central tendency (mean and median) and measures of dispersion (standard deviation and range) were calculated. Hypothesis testing for factors associated with Computer Vision Syndrome involved linear regression and chi-square analysis, with a confidence level of 95 %.

Ethical Considerations

The study was approved by the Institutional Research Ethics Committee (CIEI) of Peruvian Private University under number 443-2022-CIEI-UPSJB on April 4, 2022. The study was also registered in the PRISA platform with registration EI00000002591.

RESULTS

A total of 116 study subjects, including both faculty members and students, were included in the analysis. Sociodemographic factors were evaluated, with a median age of 24,5 years, ranging from 17 to 58. Of the total, 55,2 % were female, 69,8 % were single, and 30,2 % were married. Regarding socioeconomic status, 93,1 % fell into the middle to high category, and 69,8 % resided in urban areas, while 12,9 % lived in residential zones (table 1).

Table 1. Sociodemographic, clinical and epidemiological factors in students and teachers of the of Universidad Privada San Juan Bautista. Ica, Peru. (n=116).

	N (%)
Age	
Mean (± SD)	31,9(±12)
Median (Range)	24,5(17-58)
Sex	
Female	64(55,2 %)
Male	52(44,8 %)
Marital Status	
Single	81(69,8 %)
Married	35(30,2 %)
Socioeconomic Level	
Medium - High	108(93,1 %)
Low	8(6,9 %)
Housing location	
Residential	15(12,9 %)
Urbanization	81(69,8 %)
Rural	20(17,2 %)
Use of eyeglasses	
Yes	65(56,0 %)

No	51(44,0 %)
Hours of uninterrupted computer use	
Less than 4 hours	31(26,7 %)
Between 4 - 6 hours	39(33,6 %)
More than 6 hours	46(39,7 %)
Hours of uninterrupted cell phone use	
Less than 4 hours	61(52,6 %)
Between 4 - 6 hours	30(25,9 %)
More than 6 hours	25(21,6 %)
Lighting	
Natural light (Day)	63(54,3 %)
Artificial light (spotlight)	53(45,7 %)
Distance from computer/cell phone	
<45 cm	33(28,4 %)
≥ 45 cm	83(71,6 %)
Breaks and flickering after computer/cell phone use	
< 30 seconds	47(40,5 %)
30-50 seconds	48(41,4 %)
>50 seconds	21(18,1 %)
History of visual disease	
None	55(47,4 %)
Myopia	27(23,3 %)
Astigmatism	22(19,0 %)
Other	12(10,3 %)
Family history of visual disease	
Yes	72(62,1 %)
No	44(37,9 %)

In terms of clinical factors, it was found that 56,0 % of the study subjects used eyeglasses, with 53 % using framed eyeglasses and 3 % using contact lenses. Among them, 39,7 % used the computer for more than 6 hours continuously, while 33,6 % used it for 4 to 6 hours. On the other hand, 52,6 % used their cell phones for less than 4 hours continuously, with 28,2 % using them for less than two hours and 24,4 % for 2 to 4 hours. Approximately 54,3 % used natural light, and 71,6 % positioned their computer/cell phone at a distance of ≥45cm. Concerning breaks and blinking frequency after computer/cell phone use, 41,4 % took breaks for 30-50 seconds. About 47,4 % reported no personal history of visual diseases, 23,3 % reported having myopia, and 19,0 % reported having astigmatism. On the other hand, 62,1 % mentioned having a family history of visual diseases (table 1).

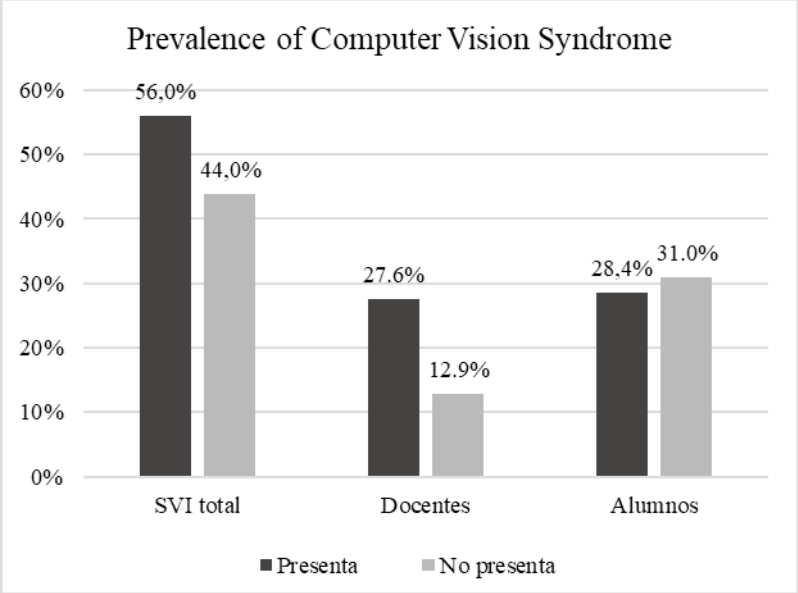

Figure 1. Prevalence of Computer Vision Syndrome (CVS) in students and faculty

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Table 2. Bivariate analysis between demographic and epidemiological characteristics with the presence of Computer Vision Syndrome in students and faculty.

Variable	Visual Computer Syndrome		p-value
	Yes	No	
Age			
17-29 years old	32(49,2 %)	33(64,7 %)	0,096
30-58 years old	33(50,8 %)	18(35,3 %)	
Sex			
Female	40(61,5 %)	24(47,1 %)	0,120
Male	25(38,5,6 %)	27(52,9 %)	
Marital Status			
Single	40(61,5 %)	41(80,4 %)	0,028
Married	25(38,5 %)	10(19,6 %)	
Socioeconomic Level			
Medium- High	62(95,4 %)	46(90,2 %)	2,274
Low	3(4,6 %)	5(9,8 %)	
Housing location			
Residential	7(10,8 %)	8(15,7 %)	0,158
Urbanization	50(76,9 %)	31(60,8 %)	
Rural	7(12,3 %)	12(23,5 %)	
Use of eyeglasses			
Yes	44(67,7 %)	21(41,2 %)	0,004
No	21(32,3 %)	30(58,8 %)	
Hours of uninterrupted computer use			
Less than 4 hours	17(26,1 %)	14(27,5 %)	0,666
Between 4 - 6 hours	20(30,8 %)	19(37,3 %)	
More than 6 hours	28(43,1 %)	18(35,3 %)	
Hours of uninterrupted cell phone use			
Less than 4 hours	31(47,7 %)	30(58,8 %)	0,359
Between 4 - 6 hours	20(30,8 %)	10(19,6 %)	
More than 6 hours	14(21,5 %)	11(21,6 %)	
Lighting			
Natural light (Day)	38(58,5 %)	25(49,0 %)	0,311
Artificial light (spotlight)	27(41,5 %)	26(51,0 %)	
Distance from computer/cell phone			
<45 cm	21(32,3 %)	12(23,5 %)	0,298
≥ 45 cm	44(67,7 %)	32(76,5 %)	
< 30 seconds	27(41,5 %)	20(39,2 %)	0,689
30-50 sec.	28(43,1 %)	20(39,2 %)	
>50 sec.	10(15,4 %)	11(21,6 %)	
History of visual disease			
None	26(40,0 %)	29(56,9 %)	0,253
Myopia	19(29,2 %)	8(15,7 %)	
Astigmatism	13(20,0 %)	9(17,6 %)	
Other	7(10,8 %)	5(9,8 %)	
Family history of visual disease			
Yes	47(72,3 %)	25(49,0 %)	0,010
No	18(27,7 %)	26(51,0 %)	

The prevalence of Computer Vision Syndrome (CVS) in students and faculty was 56,0 %, with 27,6 % of faculty

members presenting with CVS while 31 % of students did not (figure 1).

In the bivariate analysis, it was found that being single (p < 0,028), using eyeglasses (p = 0,004), and having a family history of visual diseases (p = 0,010) were significantly associated with Computer Vision Syndrome (table 2).

DISCUSSION

This study aimed to determine the factors associated with Computer Vision Syndrome (CVS) in medical students and faculty members at Peruvian Private University during the SARS-CoV-2 pandemic in Ica-2021. CVS encompasses a set of signs and symptoms that manifest during long-term work on digital devices,[12] and prolonged use for extended hours can lead to severe vision problems.[13] It is noted that students are often unaware of and lack control over the hours they spend on electronic devices for study and research.[14]

The main findings of this study include evidence of a high prevalence of CVS, with 56,0 % among both faculty and university students. This figure aligns with international studies reporting that 51,5 % of administrative staff,[15] 77,7 % of hospital workers,[16] and 76,7 % of young university students in Spain[17] also experienced CVS. National studies showed similar percentages of 62,3 % and 80,6 % in undergraduate and postgraduate students, respectively.[6,7]

In this study, it was observed that subjects who used the computer for more than 6 hours continuously (43,1 %) and cell phones for less than 4 hours (47,7 %) had a higher prevalence of CVS. It has been reported that the more hours a student spends in front of a computer,[18,19] books, and cell phones, the more likely they are to experience visual fatigue.[20]

In the bivariate analysis, it was found that females had a higher incidence of CVS (61,5 %). Similar reports from China suggest that female university students tend to experience visual discomfort, such as asthenopia (53,5 %), which is a symptom of CVS.[21] This finding is in line with studies and systematic reviews.[22,23] In contrast, Quispe et al. and Sultán et al. describe in their studies that males have a higher association with CVS.[6,13]

The use of computers not only affects the visual health of students and university faculty, but it has been demonstrated that among school students, 40 % spend 3 to 6 hours on them, leading to visual acuity problems.[24] In this study, age did not show a significant difference, indicating that both young and adult individuals have an equal predisposition to experience CVS.

It was determined that individuals who used the computer/cell phone at a distance of 45-55 cm were at greater risk of CVS. Other studies show that students engaged in prolonged academic activities are at risk of CVS, especially if they lack proper ergonomics, such as appropriate lighting and a short distance from the screen.[14] Another associated factor is having a family history of visual diseases (72,3 %). On the contrary, the study by Moreno et al. demonstrated that having astigmatism and emmetropia, as personal history factors, were associated with CVS.[20] It was also found that students and faculty who used eyeglasses were associated with CVS; a national study demonstrated a significant association between eyeglass use and the number of hours spent on the computer (p < 0,05),[23] as did Freyle et al., but with the use of contact lenses.[22]

It is crucial to consider scientific evidence for the prevention and reduction of Computer Vision Syndrome symptoms, such as frequent blinking, taking breaks from the screen, configuring devices in night mode, and enlarging the screen size for easier reading.[25,26]

CONCLUSION

This study revealed a notable prevalence of Computer Vision Syndrome (CVS) among both medical students and faculty members, with a higher incidence observed among the latter group. Through our analysis, several associations emerged between CVS and various factors. Specifically, sociodemographic factors, such as marital status, demonstrated a significant correlation with CVS occurrence, alongside clinical factors, including the use of eyeglasses among both students and faculty. These findings underscore the multifaceted nature of CVS and emphasize the importance of considering diverse factors in understanding and addressing its prevalence and impact within medical education settings.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

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