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ORIGINAL

Use of technological tools and visual problems in medical students at a university in Cajamarca

Uso de herramientas tecnológicas y problemas visuales en estudiantes de medicina de una universidad de Cajamarca

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ABSTRACT

Objective: determine the relationship between the use of technological tools and visual problems in medical students at a university in Cajamarca in 2024.
Method: basic type study with a quantitative approach, non-experimental, cross-sectional and correlational design. Two questionnaires were applied to a sample of 165 MH students, the first on the use of HT, prepared by Quinto M. in 2018, consists of 6 questions, with a Cronbach's Alpha of 0,88 and the second, "Questionnaire of Visual Disorders (Symptoms of the user of data display screens)", prepared by Flores and Cárdenas in 2019, which has 14 items and a Cronbach Alpha of 0,734.
Results: significance was identified between the use of HT and visual problems (p = 0,0156). Likewise, cell phone use was significant in relation to burning or itchy eyes (p = 0,0003), and the use of laptop computers with the same symptom (p = 0,003).
Conclusion: the factors associated with PV addressed aspects such as age, sex, year of studies, socioeconomic level, but were not significant. However, significance was observed in the use of HT and PV in MH students (p = 0,0156). Thus, excessive use of HT predisposes us to developing PV, so these findings help us reflect and take measures to prevent the development of PV.

Keywords: Technological Tools; Visual Problems; Medical Students; Burning or Itchy Eyes.

RESUMEN

Objetivo: determinar la relación entre el uso de herramientas tecnológicas y los problemas visuales en estudiantes de medicina de una universidad de Cajamarca en 2024
Método: estudio de tipo básico con un enfoque cuantitativo, diseño no experimental, de tipo transversal y correlacional. Se aplicó dos cuestionarios, en una muestra de 165 estudiantes de MH, el primero sobre uso de HT, elaborado por Quinto M. en 2018, consta de 6 preguntas, con un Alfa de Cronbach de 0,88 y el segundo, "Cuestionario de Trastornos Visuales (Síntomas del usuario de Pantallas de visualización de datos)", elaborado por Flores y Cárdenas en 2019, el cual cuenta con 14 ítems y un Alfa Cronbach de 0,734.
Resultados: se identificó significancia entre el uso de HT y los problemas visuales (p = 0,0156). Asimismo, resultó significante la utilización de celular en relación al ardor o picor de ojos (p = 0,0003), y el uso de computadoras portátiles con el mismo síntoma (p = 0,003).
Conclusión: los factores asociados a los PV, abordaron aspectos como edad, sexo, año de estudios, nivel socioeconómico, pero no tuvieron significancia. Sin embargo, se observó significancia ante el uso de las HT y

los PV en estudiantes de MH (p = 0,0156). Es así que el uso excesivo de HT predispone a desarrollar PV, por lo que estos hallazgos nos ayudan a reflexionar y tomar medidas para prevenir el desarrollo de PV.

Palabras clave: Herramientas Tecnológicas; Problemas Visuales; Estudiantes de Medicina; Ardor o Picor de Ojos.

INTRODUCTION

Technological tools are electronic devices that have completely changed communication and access to new knowledge. These include smartphones, tablets, computers, among others. With regard to health, they have contributed to telemedicine and diagnosis. On the other hand, in the field of education, they have had a dramatic influence not only within the classroom but also beyond it with the emergence of online learning platforms and resources that have allowed students and professionals to access a wide variety of content.[1] Similarly, technological development has enabled evolution in all professional fields, with education being the area where teachers have introduced technological tools into their learning sessions as an aid in the transmission of knowledge.[2]

However, technological tools do not only bring benefits. According to various specialist journals, their excessive and improper use can cause numerous visual problems.[3] Among the most common is asthenopia, whose symptoms include eye pain, itching, burning, tearing, irritation, and redness, among others.[4] Similarly, dry eye can occur, which is the poor distribution and increased evaporation of tears on the surface of the eye due to prolonged use of computers.[5] This is a high risk for medical students due to the increasing use of HT, which is more relevant in the development of EOS than the tortuosity of the Meibomian glands.[6] Likewise, these visual difficulties are mainly accompanied by psychosocial and musculoskeletal disorders, such as painful postures due to remaining in the same position for a prolonged period of time.[4]

Internationally, in Ethiopia in 2020, visual acuity was assessed in medical students, finding that about 13 % had visual problems.[7] Then, in Iraq and Jordan in 2022, a study was conducted on the influence of virtual platforms on dry eye syndrome, observing that 29 % of medical students had this condition.[8] Similarly, a year later, a study was conducted in six medical schools in Jordan, where it was determined that symptomatic EOS developed more frequently in students in their first years of medical school, who had more than six hours of daily exposure to electronic device screens, and who were female.[9] Furthermore, in 2023, a university in Spain assessed that computer vision syndrome (CVS) was caused by frequent use and high exposure to technological screens.[10] However, in Indonesia in the same year, at a medical school, 84 % of students who used technological devices for four or more hours a day did not find a significant relationship with the onset of any visual problems.[11]

In Latin America, at a university in Ecuador, a study was conducted in 2019 on the health impact of using electronic devices, observing that of the total number of university students evaluated, 7 % presented eye strain, as well as an increase in muscle problems in 47 %.[12] Similarly, three years later in the same country, a study was conducted on electronic computers as a predisposing factor for the development of asthenopia in university medical students, concluding that more than 50 % of students who spent more than 3 hours in front of computers developed asthenopia.[13] On the other hand, at a university in Colombia in 2023, it was observed that nearly 50 % of students blink less frequently than normal due to the use of smart devices, triggering eye disorders such as burning, itching, and pain, among others.[14] Similarly, in the same year, research was conducted at a university in Argentina, determining that excessive use of digital screens caused visual fatigue in medical school students.[15]

In Peru, in 2021, a study was conducted at a university in Lima on the influence of SVI on the health of medical students, who presented visual symptoms such as watery eyes and itching.[16] At the same time, a university in Cajamarca sought to determine the characteristics of the same syndrome, finding that due to study activities, there is greater use of devices such as cell phones and laptops, with a more frequent usage time of 4 to 6 hours. It was determined that of the total number of medical students, around 66 % have SVI, with a higher prevalence in women (70 %) and in the older classes.[17]

The lack of information about visual problems caused by the misuse of technological tools creates a gap in knowledge about the national situation and that of Cajamarca, which raises the following question: how is the use of technological tools related to visual problems in medical students at a university in Cajamarca in 2024? This study is important so that, with the proper use of technological tools, which are extremely useful in the development of the career, the development of visual problems can be reduced and/or prevented. Therefore, the proposed research hypothesis is: there is a relationship between the use of technological tools and visual problems in medical students at a university in Cajamarca in 2024. To this end, the main objective is to determine the relationship between the use of technological tools and visual problems in medical students at

a university in Cajamarca in 2024. as well as other objectives such as finding the most commonly used types of tools, the most frequent types of visual problems, and determining the average time spent using technological tools and the s used in academic activities by human medicine students at a university in Cajamarca in 2024.

METHOD

The study was basic in nature with a quantitative approach, non-experimental design, cross-sectional and correlational in nature, involving university students belonging to the human medicine faculty of a university in Cajamarca. It was quantitative, as there was no interference in the process and thus no effect on the results; non-experimental, because at no point during the research was the independent variable manipulated to influence the result; cross-sectional, because the information was collected between April and May 2024; and correlational, because it sought to find the relationship between the use of technological tools and visual problems.[18]

The survey technique was applied, and the instruments used were two questionnaires derived from two theses, which related the use of technological tools and visual problems in medical students. The questionnaire on the use of technological tools was developed by Quinto M. in 2018. It consisted of six questions and sought to find out about age, academic degree, use of electronic devices, time, type of device, gender, use of glasses, family history of glasses use, and asthenopic symptoms. The Cronbach's alpha obtained was 0,88 (good). To detect visual problems, the questionnaire developed by Flores and Cárdenas in 2019 was used, which had a total of 14 items divided into three sections: ocular symptoms, visual alterations, and asthenopic disorders. The Estaninos scale was used for this purpose, with terms such as "Never," "Occasionally," "Often," and "Always and constantly." The Cronbach's alpha is 0,734, therefore, we determined that the instrument used was acceptable, reliable, and validated by experts for our research. It was validated in Lima, Peru, at the National University of Callao.

The population on which our research focused consisted of 287 MH students, excluding boarding school and first-year students. To find the sample, the finite population formula was used, finding a necessary sample of 165 MH students, with a confidence level of 95 %, a margin of error of 5 %, and a proportion of 0,50.

Descriptive statistics were applied for data analysis because they allowed the characteristics of the study group to be evaluated using frequency tables. Inferential statistics were also used, employing the chi-square test with a significance value of "p" < 0,05.

Within the parameters of ethics, the voluntary participation of the participants was taken into consideration, and the content of the questionnaire was explained to them in detail. The privacy of their personal information and the answers they provided was guaranteed. The research carried out at was for academic and research purposes. In addition, the rights of the author of the questionnaire used were respected.

Table 1. Distribution of factors associated with visual problems in human medicine students at a university in Cajamarca

Factors	F	%
Demographic and cultural factors		
Age		
18 to 20	51	31
21 to 23	81	49
24 and above	33	20
Gender		
Men	78	47
Women	87	53
Year of study		
Second	46	28
Third	54	33
Fourth	21	13
Fifth	31	19
Sixth	13	8
Socioeconomic status		
Upper class or wealthy	1	1
Lower class	25	15
Middle class	120	73
Upper middle class	11	7
Poor or extremely poor class	8	5
Race		
African descent	3	2

Asian	2	1
Creole	8	5
Mestizo	139	84
Quechua	4	2
Other	9	5
Marital status		
Married	3	2
Cohabiting	2	1
Single	159	96
Widowed	1	1
Total	165	100

In table 1, the most prominent age group is 21 to 23 years old, with 49 %, while the most common marital status is "single" with 96 %. Likewise, the majority of students are women, with 53 %. The population is generally middle class, representing 73 %. In terms of race, the largest group is mestizo, with 84 %.

Table 2. Use of technological tools among human medicine students at a university in Cajamarca in 2024

Technological tools	N	%
Cell phone	10	6
Tablet	2	1
Desktop computer	1	1
Cell phone, Tablet	3	2
Cell phone, Laptop	41	25
Cell phone, Desktop computer	3	2
Tablet, Desktop computer	1	1
Cell phone, Tablet, Laptop	47	28
Cell phone, tablet, desktop computer	3	2
Mobile phone, Desktop computer, Laptop computer	18	11
Mobile phone, Tablet, Desktop computer, Laptop computer	36	22
Total	165	100

Table 2 highlights the use of cell phones, tablets, and laptops as a whole, representing 28 %. In addition, 25 % only use cell phones and laptops.

Table 3. Eye symptoms related to digital screens in medical students at a university in Cajamarca in 2024

		Responses	
		N	%
Eye symptoms when using digital screens	Headache	106	64,24
	Watery eyes	116	70,30
	Burning or itching eyes	141	85,45
	Blurred vision	97	58,78
	Eye pain	123	74,54
	Dry eye sensation	94	56,96
	Double vision	58	35,15

Table 3 shows that the most prevalent symptom is burning or itching eyes in 85,45 % of the sample. In addition, the second most frequent symptom is eye pain at 74,54 %. In contrast, double vision is the least prevalent symptom in MH students at 35,15 %.

Table 4 shows that there is a significant correlation between the use of technological tools and visual problems with a p = 0,0156, confirming that the majority of students who use cell phones experience itchy or burning eyes in 85,44 % of cases with a p of 0,0003, which is very significant for the study. In addition, there is also significance between the use of laptops for 4-6 hours and the same symptom in 46,66 %, with a p = 0,003. Likewise, a study was conducted with the other eye symptoms and no significance was found.

Table 4. Use of technological tools and visual problems in medical students at a university in Cajamarca in 2024

	Visual Problems		Burning or itching eyes			Double vision		
			Yes	No	Yes%	Yes	No	Yes%
Use of technological tools	Pearson's chi-square = 5,9104 p = 0,0156							
Hours of use of technological tools	Hours using laptop	1-3 hrs	46	1	27,87 %	20	46	12,12 %
		4-6 hrs	77	0	46,66 %	18	33	10,9 %
		7-10 hrs	14	0	8,48 %	6	14	3,63 %
		More than 10 hrs	4	0	2,42 %	4	1	2,42 %
			p = 0,003			p = 0,1694 T=29,07 %		
	Hours using cell phone	1-3 hours	48	4	29,09 %	17	36	10,3 %
		4-6 hrs	60	10	36,36 %	22	47	13,3 %
		7-10 hrs	28	6	16,96 %	11	23	6,6 %
		More than 10 hrs	5	0	3,03 %	4	1	2,42 %
			p = 0,0003			p = 0,084 T=32.62%		

DISCUSSION

Visual problems have become more prevalent in recent years due to the prolonged use of technological tools by MH students, as evidenced by various studies conducted over time. The average rate at which these problems occur is greater than 75 % in the different studies found. The present study highlights the significant relationship between the use of HT and PV, as well as the use of laptops and cell phones, which are related to burning or itchy eyes in MH students.

The relationship between HT and PV was significant in this research, as in the study conducted by Almudhaiyan[19], who added that the significance increases as the distance between the eyes and the technological device decreases. Similarly, Bhatnagar[20] supported that there is a significant relationship between HT and PV, adding that this will intensify with longer periods of HT use. In addition, Altalhi[21] also found this significance and added that it will increase among students who wear glasses in relation to the use of digital screens.

With regard to technological tools, this study reveals a higher frequency of joint use of cell phones, tablets, and laptops among MH students, as in the study by Zarban[22] in Saudi Arabia, where mobile devices were the most widely used electronic devices. In contrast, studies conducted by Bhatnagar[20], Jakhar[23], and Benden[24] in India and the US, respectively, found that most MH students use only cell phones.

Among the visual problems, we found that the most common were burning or itching and eye pain. Similarly, in the research conducted by AlQarni[25], Athali[21], and Jakhar[23], these symptoms were among the most common when using HT, which supports our results. Likewise, the prevalence was similar to other studies conducted on university students in Thailand[26] and Mozambique.[27] One of the causes is computer use, which leads to changes in the tear film and the entire eye area.[28] In contrast, Alamri[29] found visual fatigue to be the most common eye problem due to the amount of time spent studying with HT. Other studies do not relate visual symptoms but rather musculoskeletal discomfort, such as those conducted by Gadain[30], Pattath[31], and Malińska[32], where the most consistent manifestations were neck-shoulder, back, and spine pain, respectively.

In the present study, it was found that the most common range of HT use in the academic activities of MH students was 4 to 6 hours per day. This is similar to the study conducted by Benden[24], where the average time of use was 4,4 hours. However, other studies showed greater HT use, such as those conducted by Almudhaiyan[19] and Gadain[30], where university students used electronic devices for five or more hours a day. An even more serious situation was found in the studies by Sengo[27] and Uwimana[33], where students used electronic devices for 6 and 9 hours, respectively. This is a trigger for the development of asthenopia and EOS, as mentioned above.[33]

Finally, no significant relationship was found between sociodemographic factors and visual problems, but a relationship was found between HT use, specifically cell phone and laptop use, and the appearance of symptoms such as burning or itchy eyes. Therefore, this research complements studies already conducted by the scientific community and contributes to knowledge on the subject, which has not been widely studied in our region.

CONCLUSION

It was determined that there is a relationship between the use of technological tools and visual problems in medical students at a university in Cajamarca in 2024. It was also found that the most commonly used devices were cell phones, laptops, and tablets. Among the types of visual problems, the most frequent and statistically significant was burning or itchy eyes. It was also found that the average time spent using the most frequent and

significant technological devices was 4-6 hours while carrying out academic activities.

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