Prevalence of Computer Vision Syndrome among undergraduate medical students in Riyadh, Saudi Arabia: A multi-university cross-sectional study

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Abstract

Background: Computer Vision Syndrome (CVS) is a group of eye and vision-related symptoms resulting from prolonged and extensive use of electronic devices. Such symptoms include blurry vision, dry eyes, watery eyes, headaches, fatigue, and neck pain. This study aimed to measure the prevalence of CVS and the frequency of exercising ergonomic practices among undergraduate medical students attending several medical colleges in Riyadh, Saudi Arabia.

Methods: A cross-sectional study surveyed 1,014 undergraduate medical students from several medical colleges in Riyadh. Data collection was held for four weeks throughout July-August 2021. Data were analyzed using IBM SPSS Statistics Version 21. CVS-Q manual was implemented as the scoring system.

Results: Out of the total surveyed medical students, 85.5% reported using electronic devices for educational purposes. Neck pains (42.5%), headaches (39.4%), and eye dryness (38.6%) were the most frequent symptoms. 60.8% of students were found CVS-positive. Male students were significantly less predicted to have CVS than female students (P<0.001). Brightness levels of screens correlated substantially with the risk of CVS (P=0.035) as more students who used bright backlight were found CVS-positive compared to those who did not.

Conclusion: CVS and its associated symptoms were relatively common among medical students. Future studies are necessary to measure CVS across larger samples. Further awareness and routine ophthalmic assessments are imperative to mitigate this issue and promote ocular health.

Keywords: Computer Vision Syndrome, Medical Students, Saudi Arabia, Electronic Devices.

Introduction

In this era of advanced technology, medical students are presented with various opportunities to pursue their academic learning in more personalized and convenient manners. The use of digital devices has become an integral part of a student's learning process. Nevertheless, the continuous use of such technological gadgets for extensive durations is inevitably bound to instigate vision-related problems.

Computer Vision Syndrome (CVS), or Digital Eye Strain, is an umbrella term that refers to various ocular and non-ocular symptoms related to extensive, prolonged use of digital devices, such as smartphones, tablets, and computers. These symptoms comprise ocular manifestations like blurry vision, dry eyes, redness, itchiness, excessive tearing, and non-ocular manifestations such as headaches, neck pain, and shoulder pain. It is further explained by the American Optometric Association (AOA) as a group of vision-related symptoms that result from prolonged use of computers, tablets, or cellphones and are experienced either during periods of usage or persisting after [1].

Learning through digital and electronic devices has become standard practice for students. However, whether for educational purposes or research work, the consequences of such educational advancement have raised significant health concerns. A study at the University of Birmingham Medical School in England found that 70% of medical students use smartphones to facilitate their medical education [2]. A local study conducted at King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS) in Jeddah, Saudi Arabia, described that 97.3% of its participants had reported at least one symptom of CVS [3]. Similarly, another study in Jeddah at King Abdulaziz University concluded that 90% of its participants expressed CVS symptoms, with the most reported symptoms being excessive tearing, dryness, and itching [4].

The symptoms of CVS generally manifest with prolonged hours of use. A study conducted in Pune, India, demonstrated that 39.9% of students who presented with CVS symptoms spent an average of 6-8 hours of computer use [5]. Another study on Qassim University medical students in Saudi Arabia reported that most students with CVS complaints spent more than 8 hours on computers or some visual display monitor [6]. In consequence, the syndromic symptoms (extra-ocular symptoms) begin to manifest. A study done on Bahria University students in Karachi revealed that out of all its medical students complaining of ocular CVS symptoms, 38% experienced fatigue, and 21.8% experienced neck and shoulder pain [7].

The presence of these symptoms can disrupt daily activities if left untreated. Subsequently, preventive measures and ergonomic practices are sought after for symptom relief. A Malaysian-based study conducted across five universities demonstrated that taking breaks amidst working was the most common practice performed by students for symptom relief (68.8%), followed by looking at far-away objects and massaging eyes [8]; while in another study, the two most common practices were adjusting brightness level according to surrounding lighting and taking breaks while using devices at 82% and 66%, respectively [3].

During the Covid-19 pandemic, the imperative transition from traditional lecture halls to virtual classrooms due to mandatory e-learning to maintain public health safety has significantly affected university students' vision [9]. Consequently, this study aimed to measure the prevalence of Computer Vision Syndrome and its associated habitual risk factors among undergraduate medical students in Riyadh, Saudi Arabia, during this period, as well as the frequency of ergonomic practices exercised by the students.

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Methods

A cross-sectional study was conducted on 1,014 undergraduate medical students attending four medical colleges in Riyadh, Saudi Arabia, from July-August of 2021. Respondents included were required to be undergraduate medical students attending medical colleges in Riyadh, irrespective of gender and age. The study involved four major public medical colleges from governmental universities in Riyadh: King Saud University (KSU), King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), Imam Mohammed Ibn Saud Islamic University (IMSIU), and Princess Nourah Bint Abdulrahman University (PNU). Five academic levels are included in this study, aside from the preparatory year (as it is not a legitimate medical year as per governmental requirements). Exclusion criteria included students who do not use electronic devices for academic purposes, interns, other health sciences majors, and students outside the Riyadh region.

The data collection process was held for four weeks from July-August 2021. Respondents were asked to fill out a self-administered online questionnaire. The sampling technique was based on non-probability (convenience) random sampling, and the expected sample size was estimated to be 377 with a 95% confidence interval (CI) and a 5% margin of error.

The validated Computer Vision Syndrome Questionnaire (CVS-Q) was adapted and developed from previous literature [4, 5, 10]. It was implemented as a data collection tool divided into three sections: Section 1 comprised questions regarding demographic data, ophthalmological medical history, and whether electronic devices were used for academic purposes and/or studying. Section 2 detailed questions regarding study habits using electronic devices and behavioral practices such as time spent using such devices, lighting source, posture, and other study habits. Section 3 included the 18-item CVS-Q questionnaire, the frequency of exercising ergonomic practices to reduce symptoms, and whether the symptoms have exacerbated since the mandatory transition to virtual classrooms amid the Covid-19 pandemic.

Participation in this research was optional. All respondents consented to partake and engage.

Respondents were not required to give out names, student IDs, or other personal information. All records were kept confidential and used carefully, and respondents' data were only accessible to the researchers. Ethical approval was obtained through the ethical committee of the Institutional Review Board (IRB) of Imam University (IMSIU) Medical College.

Regarding statistical analysis, the mean and standard deviation (SD) were used to describe continuously measured variables, and the frequency and percentages were used for categorically measured variables. The chi-squared ($\chi 2$)-test of independence was used to assess the correlations between categorically measured variables, and the independent samples t-test was used to determine the statistical significance of mean differences on metric variables across the levels of categorical binary outcomes.

CVS-Q scoring manual was followed to estimate students' total CVS scale score with a cutoff value of six (6 points), which was used to classify students' final CVS risk into positive versus negative states. The Multivariate Binary Regression analysis was used to assess the statistical significance of the predictors of students' odds of having CVS. The association between students' odds of having CVS with sociodemographic and other relevant predictor variables was expressed as an Odds Ratio (OR) with an associated 95% confidence interval (CI). The alpha significance level was considered at 0.050 level. The IBM SPSS Statistics Version 21 statistical analysis software program was used to analyze the data.

Results

Sociodemographic Data

One thousand and fourteen (1014) university students attending four medical colleges in Riyadh enrolled themselves electively into the study and completed an online questionnaire. The majority of students were females (59%), whereas the remainder of the students were males (40.3%). The academic year of study was as follows: 175 (17.3%) students were in their first study year, 167 (16.5%) students in their second year, 239 (23.6%) students in their third study year, 261 (25.7%) students in their fourth year, and 172 (17%) students in their fifth year.

Asked to indicate their affiliated universities, 274 (27%) students were attending KSAU-HS, 272 (26.8%) students were attending IMSIU, 251 (24.8%) students were attending KSU, and 217 (21.4%) students were attending PNU. Out of 1,014 total students, 865 (85.3%) enrolled in the study reported using electronic devices for educational and academic purposes [Table-1].

Students' Study Habits

Regarding students who use electronic devices (n=865), their study habits were assessed. The time spent using electronic devices was measured: 22 (2.5%) students used electronic devices for less than an hour per day, 62 (7.2%) students used devices for about 1-2 hours per day, 271 (31.3%) students used electronic devices for 3-4 hours per day, and 591 (59%) students used electronic devices for more than 4 hours per day.

Table-1: Demographic and Academic Characteristics (n= 1014)

	Frequency	%
Gender		
Female	605	59.7
Male	409	40.3
Year of Study		
1st Year	175	17.3
2nd Year	167	16.5
3rd Year	239	23.6
4th Year	261	25.7
5th Year	172	17
University		
Imam Mohammad ibn Saud Islamic University	272	26.8
King Saud bin Abdulaziz University for Health Sciences	274	27
King Saud University	251	24.8
Princess Nourah bint Abdulrahman University	217	21.4
Use of Electronic Devices for Academic Purposes		
No	149	14.7
Yes	865	85.3

About taking breaks, 765 (88.4%) students reported taking short breaks from electronic devices while studying, of which the frequency was as follows: 191 (22.1%) students had breaks every 30 minutes or less, 414 (47.9%) students had breaks every 30-60 minutes, and 260 (30.1%) students had breaks every 60 minutes or more.

Asked to indicate the distance they keep their eyes away from the screens of laptops/tablets, 362 (41.8%) students keep a distance greater than a forearm length, whereas 503 (58.2%) students keep a distance less than a forearm length. Moreover, 311 (36%) students reported they keep their screen level parallel to their eye level, 522 (60.3%) students keep it below the level of their eyes, and 32 (3.7%) students keep it above the level of their eyes.

Furthermore, students were asked to indicate the brightness of their devices: 60 (6.9%) students preferred a dark screen, 289 (33.4%) students preferred a flat screen, 424 (49%) students preferred brightly lit screens, and 92 (10.6%) students preferred very bright screens. As for using anti-glare screen filters, only 225 (26%) students reported the use of anti-glare screen filters. The remaining findings are showcased in Table-2.

Frequency of CVS Manifestations

Students were asked to rate the frequency and intensity of eighteen CVS manifestations using Likert-like scales. The top nine most experienced CVS symptoms, which were reported as often/always, were as follows: Neck, shoulder, and back pains (42.5%), headaches (39.4%), eye dryness (38.6%), tearing (22%), itching (21.6%), burning (20.5%), eye redness (20.5%), feeling that sight is worsening (20.3%), and increased sensitivity to light (20.1%). Regarding symptom intensity, the top nine symptoms reported as intense were as follows: Neck, shoulder, and back pains (20.3%), headaches (18.3%), eye dryness (17.5%), eye redness (10.9%), itchiness (9.2%), increased sensitivity to light (9.1%), eye pain (8.3%), numbness of fingers (7.9%), and feeling that sight is worsening (7.7%). Table-3 summarizes the remainder of the findings.

Ergonomic Practices

Students coping methods with their experienced symptoms were assessed in Table-4. Students' mean self-rated frequency of practicing recurrent blinking and eye massaging as the ergonomic practice was measured with 2.5/5 points, suggesting that they blink and massage their eyes to relieve CVS symptoms between rarely to occasionally on average. Additionally, students were asked to rate how often they practice the 20-20-20 rule using a Likert-like scale; their collective mean rate was measured with 2.41/5 points, indicating they perform such practice rarely to occasionally on average. The students' rate of using anti-glare screens for their electronic devices was measured with 1.95/5 points, denoting students use anti-glare screens between never to rarely on average. Asked to rate how often they adjust their brightness levels to match their surrounding conditions to relieve eye strain, students' collective mean rate was measured with 2.95/5, indicating they adjust brightness levels occasionally to often on average.

CVS-Positive Bivariate Analysis

Of 865 students who used electronic devices for academic purposes, 526 (60.8%) were considered CVS-positive. [Table-5].

Students who use electronic devices were analyzed for statistically significant associations between their demographic characteristics, study habits, and performing ergonomic practices to gain insight into why they may have a higher or lower risk of CVS. The resulting findings (Table-6) showed that male students were found to be significantly less predicted to have CVS compared to female students ($P<0.001$), according to the Chi-squared test of independence. Year of study and affiliation to a particular university showed no association with risk of CVS as P-value was statistically insignificant ($P>0.05$).

Regarding study habits, students' daily use of electronic devices correlated significantly with their CVS risk. Students who use their devices for >4 hours per day were found to be substantially more predicted to have CVS compared to those who use their devices for <4 hours per day ($P<0.001$).

Moreover, students' rate of taking these breaks correlated significantly with their risk of CVS ($P=0.020$); students who take breaks every 60 minutes or more were found to be considerably more predicted to have CVS than those who take breaks less than every 60 minutes.

Additionally, bivariate results showed that students who kept a shorter distance between their eyes and their screens (less than the length of a forearm) were found to be significantly more predicted to have CVS ($P<0.001$) than those who kept a long distance (more than the length of a forearm). The students' posture while using electronic devices did not correlate significantly with their risk of having CVS ($P=0.323$). However, the level at which they stationed these screens relative to their line of sight has considerably converged on their risk of CVS; those students who stationed their screens at one aligned level with their line of sight were found to be significantly less inclined to have CVS compared to students who kept it below or above their line of sight ($P<0.001$).

The source of room illumination did not correlate with their risk of having CVS, albeit the brightness levels of their screens did indeed correlate significantly with their risk of CVS ($P=0.035$), as students who set their screen backlight as dark were found to be considerably less predicted for CVS. In contrast, students who set their screen backlight as bright were significantly more predicted to risk CVS than those who used different screen-brightness settings.

Table-2: Students' Study Habits & Electronic Device Use Conditions. (n=865)

	Frequency	%
1. Time spent studying using a laptop/tablet:		
Less than an Hour per day	22	2.5
1-2 hours per day	62	7.2
3-4 hours per day	271	31.3
> 4 hours per day	510	59
2. Taking breaks during studying using a laptop/tablet		
No	100	11.6
Yes	765	88.4
3. Frequency of taking breaks during studying using a laptop/tablet		
Every 30 minutes or less	191	22.1
Every 30-60 minutes	414	47.9
Every 60 minutes or more	260	30.1
4. Distance from laptop/tablet screen:		
Greater than a forearm length	362	41.8
Less than a forearm length	503	58.2
5. Posture during studying using a laptop/tablet:		
Sitting	351	40.6
Sitting & lying down	473	54.7
Lying	41	4.7
6. Level of the laptop/tablet screen:		
The same level of the eyes	311	36
Below the level of the eyes	522	60.3
Above the level of the eyes	32	3.7
7. Source of lighting in the room:		
From the ceiling/wall	579	66.9
In the dark	47	5.4
Natural light (windows)	143	16.5
Table lamp	96	11.1
8. Brightness of laptop/tablet screen:		
Dark	60	6.9
Dull	289	33.4
Bright	424	49
Very Bright	92	10.6
9. Use of screen filters/anti-glare screens:		
No	640	74
Yes	225	26

Table-3: Frequency and Intensity of CVS Symptoms. (n=865)

	Frequency of Symptoms			Intensity of Symptoms	
	Never (%)	Occasionally (%)	Often/Always (%)	Moderate (%)	Intense (%)
Burning	357 (41.3)	331 (38.3)	177 (20.5)	400 (46.2)	57 (6.6)
Itching	342 (39.5)	340 (39.3)	183 (21.2)	402 (46.5)	80 (9.2)
The feeling of a foreign body	440 (50.9)	303 (35)	122 (14.1)	323 (37.3)	64 (7.4)
Tearing	356 (41.2)	319 (36.9)	190 (22)	400 (46.2)	59 (6.8)
Excessive blinking	421 (48.7)	313 (36.2)	131 (15.1)	316 (36.5)	59 (6.8)
Eye redness	314 (36.3)	374 (43.2)	177 (20.5)	403 (46.6)	94 (10.9)
Eye pain	418 (48.3)	294 (34)	153 (17.7)	324 (37.5)	72 (8.3)
Heavy eyelids	567 (65.5)	196 (22.7)	102 (11.8)	212 (24.6)	31 (3.6)
Dryness	266 (30.8)	265 (30.6)	334 (38.6)	370 (42.8)	151 (17.5)
Blurred vision	444 (51.3)	257 (29.7)	164 (19)	292 (33.8)	49 (5.7)
Double vision	657 (76)	144 (16.6)	64 (7.4)	144 (16.6)	34 (3.9)
Difficulty focusing for near vision	528 (61)	213 (24.6)	124 (14.3)	251 (29)	50 (5.8)
Increased sensitivity to light	449 (51.9)	242 (28)	174 (20.1)	273 (31.6)	79 (9.1)
Colored halos around objects	590 (68.2)	173 (20)	102 (11.8)	202 (23.4)	31 (3.6)
Feeling that sight is worsening	473 (54.7)	216 (25)	176 (20.3)	283 (32.7)	67 (7.7)
Headaches	235 (27.2)	289 (33.4)	341 (39.4)	411 (47.5)	158 (18.3)
Neck, shoulder, or back pain	221 (25.5)	276 (31.9)	368 (42.5)	402 (46.5)	176 (20.3)
Numbness of hands/fingers	458 (52.9)	258 (29.8)	149 (17.2)	257 (29.7)	68 (7.9)

Table-4: Students' Ergonomic Practices (n=865)

	Frequency	Mean (SD)	Percentage
Frequent blinking & massaging of eyes		2.50	
Never	244		28.2
Rarely	214		24.7
Occasionally	248		28.7
Often/Always	60		6.9
Very Often	99		11.4
Taking short breaks every 20 minutes for 20 seconds and staring at objects that are at least 20 feet away (20-20-20 rule)		2.41	
Never	270		31.2
Rarely	225		26
Occasionally	213		24.6
Often	60		6.9
Very Often	97		11.2
Use of anti-glare screens		1.90	
Never	509		58.8
Rarely	116		13.4
Occasionally	120		13.9
Often	54		6.2
Very Often	66		7.6
Adjusting brightness level to match the surrounding lighting conditions		2.95	
Never	173		20
Rarely	144		16.6
Occasionally	226		26.1
Often	193		22.3
Very Often	129		14.9

Table-5: Prevalence of CVS among medical students (n=865)

	Frequency	%
Computer Vision Syndrome Diagnosis		
No (CVS-Q score <6 points)	339	39.2
Yes (CVS-Q score ≥6 points)	526	60.8

Table-6: Medical Students' Risk of CVS (n=865)

Table-6: Medical Students' Risk of CVS (*n*=865)	Computer Vision Syndrome		
	CVS-*Negative* (*n*=339)	CVS-*Positive* (*n*=526)	*P*-value
Sex			
Female	168 (49.6%)	377 (71.7%)	<0.001*
Male	171 (50.4%)	149 (28.3%)	
Year of Study			
1st year	58 (17.1%)	84 (16%)	0.400
2nd year	49 (14.5%)	95 (18.1%)	
3rd year	83 (24.5%)	117 (22.2%)	
4th year	99 (29.2%)	137 (26%)	
5th year	50 (14.7%)	93 (17.7%)	
University			
Imam Mohammad ibn Saud Islamic University	60 (17.7%)	100 (19%)	0.618
King Saud bin Abdulaziz University for Health Sciences	98 (28.9%)	165 (31.4%)	
King Saud University	91 (26.8%)	141 (26.8%)	
Princess Nourah bint Abdulrahman University	90 (26.5%)	120 (22.8%)	
1. Time spent using laptop/tablet (n=865)			
Less than an Hour per day	7 (2.1%)	15 (2.9%)	<0.001*
1-2 hours per day	28 (8.3%)	34 (6.5%)	
3-4 hours per day	134 (39.5%)	137 (26%)	
> 4 hours per day	170 (50.1%)	340 (64.6%)	
2. Taking breaks during studying using a laptop/tablet			
No	32 (9.4%)	68 (12.9%)	0.117
Yes	307 (90.6%)	458 (87.1%)	
3. Frequency of taking breaks during studying using a laptop/tablet			
Every 30 minutes or less	69 (20.4%)	122 (23.2%)	0.020*
Every 30-60 minutes	182 (53.7%)	232 (44.1%)	
Every 60 minutes or more	88 (26%)	172 (32.7%)	
4. Distance from laptop/tablet screen			
Greater than a forearm length	169 (49.9%)	193 (36.7%)	<0.001*
Less than a forearm length	170 (50.1%)	333 (63.3%)	
5. Posture during studying using a laptop/tablet			
Sitting	148 (43.7%)	203 (38.6%)	0.323
Sitting /Lying down	175 (51.6%)	298 (56%)	
Lying	16 (4.7%)	25 (4.8%)	
6. Level of the laptop/tablet screen			
The same level of the eyes	149 (44%)	162 (30.8%)	<0.001*
Below the level of the eyes	177 (52.2%)	345 (65.6%)	
Above the level of the eyes	13 (3.8%)	19 (3.6%)	
7. Source of lighting in the room			
From the ceiling/wall	224 (66.1%)	355 (67.5%)	
In the dark	18 (5.3%)	29 (5.5%)	0.952
Natural light (windows)	59 (17.4%)	84 (16%)	
Table lamp	38 (11.2%)	58 (11%)	

Table-6: Medical Students' Risk of CVS (n=865) (continued)

8. Brightness of laptop/tablet screen			
Dark	31 (9.1%)	29 (5.5%)	0.035*
Dull	113 (33.3%)	176 (33.5%)	
Bright	169 (49.9%)	255 (48.5%)	
Very Bright	26 (7.7%)	66 (12.5%)	
9. Use screen filters/anti-glare screens			
No	238 (70.2%)	402 (76.4%)	0.042*
Yes	101 (29.8%)	124 (23.6%)	
10. Worsening symptoms since the transition to virtual classrooms during the COVID-19 pandemic			
No	194 (57.2%)	180 (34.2%)	<0.001*
Yes	145 (42.8%)	346 (65.8%)	
Ergonomic Practices			
Frequent blinking & massaging of eyes mean (SD)	2.04 (1.14%)	2.78 (1.30%)	<0.001*
Practicing the 20-20-20 rule, mean (SD)	2.12 (1.24%)	2.60 (1.28%)	<0.001*
Using anti-glare screens, mean (SD)	1.66 (1.14%)	2.06 (1.34%)	<0.001*
Adjusting device brightness, mean (SD)	2.60 (1.36%)	3.16 (1.26%)	<0.001*

*P-value <0.05 is considered statistically significant.

Multivariate Analysis

As a further step, the multivariate logistic binary regression analysis was used to assess the combined and individual associations between students' characteristics with their odds of having CVS. The results in multivariate analysis findings, showcased in Table-7, showed that male students were significantly less predicted (0.498 times less) to have had CVS than females (P=0.002).

Students' years of study did not converge significantly on their odds of having CVS, but the different institutional backgrounds differed substantially concerning their odds of CVS. IMSIU students were found to be considerably more predicted to have CVS (2.35 times more predicted) compared to the students of PNU (P=0.006). In contrast, KSAU-HS students were significantly more predicted (2.34 times more) for CVS than PNU students (P=0.003). Still, KSU and PNU students may not necessarily differ in their odds of having CVS (P=0.571); note the bar graph in Figure-A.

Table.7: Multivariate Logistic Binary Regression Analysis of the University Students' odds of CVS. (n=865)

	Multivariate adjusted Odds Ratio	95% C.I.for OR		p-value
		Lower	Upper	
Sex of the student= Male	.498	.323	.766	.002
Year of Study	1.077	.938	1.237	.291
University=P. Nourah B Abdelrahman (reference comparison group)				.004
University=Imam Mohd Bin Saudi Islamic	2.352	1.271	4.350	.006
University= King Saud Bin Abdulaziz University	2.344	1.346	4.081	.003
University=King Saudi University	1.164	.688	1.969	.571

Dependent Variable= Having CVS? No/Yes.

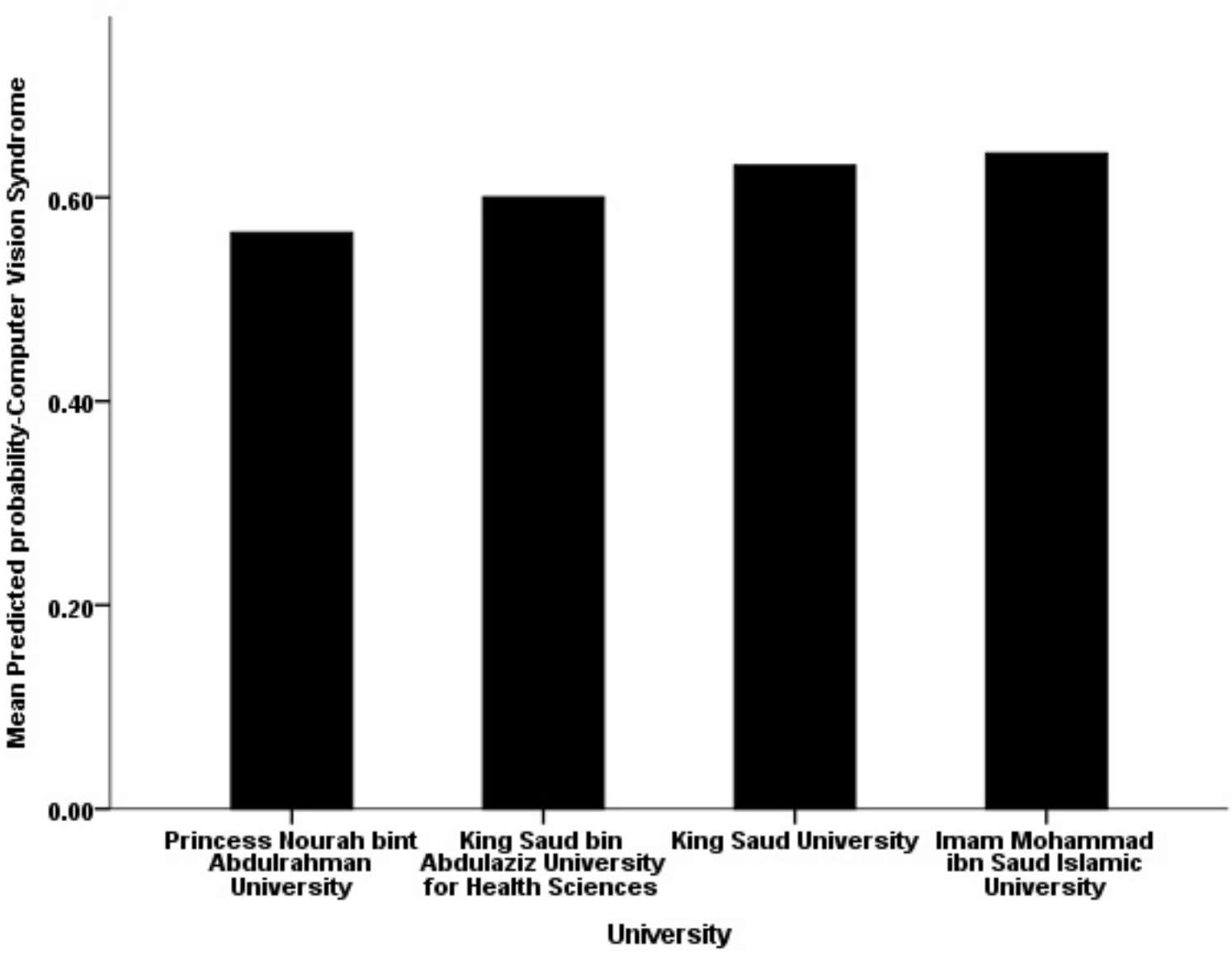

Figure-A: The difference between different university students on their probability of having computer vision syndrome

Discussion

Computer Vision Syndrome (CVS) is a frequent occupational complication reported globally [10, 11, 12]. This is evident in a study conducted by Ranasinghe et al. in which the one-year prevalence of CVS among computer office workers in Sri Lanka was 67.4% [10]. In comparison, this study comprised a smaller sample of 865 medical students, of whom 60.8% (526) were considered CVS-positive, indicating slight prevalence. This is relatively similar to a study done by Alamro et al. [14], which was localized to a single university in the Riyadh region, reporting the prevalence rate of CVS to be 69.8%. However, higher prevalence rates were reported in other medical colleges in Saudi Arabia; Abdudawood et al. [4] reported a high prevalence rate of 95%, whereas Altalhi et al. [3] reported a higher prevalence of 97.3%. Other studies in Pakistan, Malaysia, and India have also reported high prevalence rates with 67.2%, 89.9%, and 78.6%, respectively [7], [8], [15].

The most frequently reported ocular symptoms were eye dryness (38.6%). In contrast, Abdudawood et al. [4] reported that excessive tearing and eye dryness were the most common ocular symptoms observed. As for extra-ocular symptoms, neck, shoulder, and back pains (42.5%), followed by headaches (39.4%), were the most frequent among respondents. This is nearly similar to Alamro et al., where the most experienced symptom was headache [14].

This current study implemented the CVS-Q scoring system [16]. Using the CVS-Q, a severity score of six points or higher (6 ≥) indicates that the respondent suffers from CVS. The resulting findings using CVS-Q yielded that 60.8% of students were considered CVS-positive. There is a disparity of rates compared to global studies, albeit this is a region-wide study. Compared to other studies, the prevalence of CVS in a Jordanian-based sample was 94.5% [17], whereas the prevalence in a Paraguayan-based sample was 82.5% [18].

The presence of sociodemographic characteristics influencing the odds of CVS was variable. University affiliation showed no association with CVS risk. However, multivariate analysis of different university affiliations differed significantly concerning students' odds of CVS. This paradoxical finding may be about individualized behaviors and personalized environments combined with variants of institutional protocols amidst the Covid-19 pandemic.

A notable finding regarding ergonomic practices is the rate of anti-glare screen use, which was significantly greater among CVS-positive students than CVS-negative students. This could be explained by how CVS-positive students would use their devices for >4 hours per day and thus leading to more exposure time regardless of utilizing protective tools. CVS-positive students were also measured significantly more for eye massaging and frequent blinking than CVS-negative students. These findings may be explained similarly to the findings mentioned above.

Screen brightness was linked to the risk of CVS. Students with bright/very bright settings risked higher for CVS than those with dimmer settings. This is a measured association validated and corroborated in literature [19]. On the contrary, a study by Wangsan et al. reported lower brightness settings associated with CVS[20].

Conclusion

This study has revealed a slight prevalence of CVS among its participants. Therefore, future nationwide studies must assess and measure this phenomenon across a larger group to fully comprehend its magnitude and reveal its determinants. Exacerbating CVS manifestations could affect the quality of life and reduce overall productivity and performance. It is crucial to raise awareness of this overlooked condition among students and faculty to promote the healthy use of digital devices and prevent escalation to debilitating outcomes. It is also recommended to conduct ophthalmic consultations periodically.

Limitations

The study included self-reporting of symptoms by participants without clinical examination, ophthalmic testing via instruments, or physician consultations. The presence of pre-existing ocular disorders or underlying systemic disease as risk factors was not explored. One particular university is a female-exclusive college (PNU), which may skew the results concerning gender. Thus, findings cannot be inferred from the entire study population.

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Institutional Review Board Statement: The study was approved by the IMSIU Research Ethics Committee (project number 104-2020; approval date, 11 November 2020). All writing is done in accordance with the ethical principles of the Declaration of Helsinki. The survey link included a brief description of the study and a more detailed explanation on the front page. Participants were told that completion of the survey constituted consent. All participant consent and data were collected in complete confidence throughout the study.

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Conflicts of Interest

The authors declare no conflicts of interest.

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