

## Review Article

### Medical Students and Computer Vision Syndrome. A review

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#### Abstract

**Aims:** The increasing use of electronic gadgets from medical students raises awareness for related health disorders such as visual complaints. The aim of this review is to examine the association between medical students and computer vision syndrome (CVS).

**Methods:** A research of the current literature was undertaken in PubMed using the terms: “medical students AND computer vision syndrome” in order to find related published articles referred to medical students. Studies written in English language and referred only to medical students were included.

**Results:** Thirteen articles were found eligible and were included in the study. Additional sources of scientific associations were also taken into consideration. The majority of medical students suffered from visual and ocular problems. The most common symptoms were among other dryness, blurred vision including extra-ocular complaints such as headache, muscular pain and sleep disorders. The screen time varied and in some cases seemed to relate with the used device. Moreover, a considerable number of medical students had previous ocular disorders and most of them wore glasses.

**Conclusion:** The prevalence of CVS should raise awareness. Rational use of screen time and the adoption of ergonomic practices should be encouraged in order to medical students revealed from such complaints.

**KeyWords:** medical students, computer vision syndrome, visual problems

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#### Introduction

Electronic devices have a major role in our everyday lives. Undoubtedly, they have facilitated many aspects of our daily habits. Nevertheless, their extreme and careless use should raise awareness since they can potentially become harmful to our health, especially to our eyes. According to the American Optometric Association<sup>1</sup> the vision and eye-related complaints due to the extensive use of electronic gadgets such as smartphones, tables and computers describe the computer vision syndrome (CVS)<sup>1</sup>. It is well-known that medical students spend a lot of time in front of digital screens for their academic tasks. Sometimes, the increased screen time may lead to a variety of ocular complaints.

The aim of this review is to examine the current literature concerning the association between medical students and CVS.

#### Methods and Materials

An advanced literature search was conducted in PubMed, using the following term: “medical students AND computer vision syndrome”. The resulting literature was consisted of 28 articles and was carefully screened by a single investigator. Only studies written in English were included. Additional search filters such as text availability, article type and publication date, were not applied. Further references from the initial articles with useful information related to the aim of the review

were also screened. Current data from the official website of the American Optometric Association were also included. Studies referred to only medical students were included. Hence, a total of 14 references were included.

#### Results

The literature retrieved six studies which examined the association between medical students and CVS. The data are categorized in Table 1. Wang et al.<sup>2</sup> in their cross-sectional, web-based survey compared Chinese medical students who attended classroom lectures and students from a Bachelor of Medicine and Bachelor of Surgery (MBBS) who took online courses. The results revealed that the occurrence of CVS was greater among MBBS students with a male predominance. The most common symptoms in MBBS students were dryness and the sense of a foreign body, 72.97% and 62.16% respectively, whereas in Chinese students the most common feeling was heavy eyelids (53.97%). Furthermore, the majority of MBBS students spent 7 to 9 hours per day in front of a screen and the most used devices were phones and computers. On the other hand, most of the Chinese students spent only 2 to 4 hours per day using mainly their phones.

Another cross-sectional survey<sup>3</sup> from Paraguay revealed that 82.5% of the participants were suffering from CVS. 138 of them spent up to 4 hours using their notebooks and the statistical difference was significant

(p=0.049). Moreover, the results retrieved that 141 (61.8%) medical students had previous ocular disorders and most of them (59.2%) wore eye glasses. Patil et al.<sup>4</sup> in their study described a male predominance in CVS

(80.23% in males whereas 75.87% in females) even though it was not statistically significant. CVS deteriorates the sleep quality of the medical students (75.5%, p<0.001) concerning sleep duration and latency.

Table 1. Relation between medical students and CVS

Researchers	Type of study	Origin of study	No of MS	Gender of MS	Prevalence of CVS	Symptoms	Screen time	Previous visual problems/use of glasses or lenses
Wang et al. <sup>2</sup> (2021)	cross-sectional, observational, web-based survey	Indian (70.27%), Indonesian (12.16%), Sri Lankan (6.76%), Pakistan (6.76%), others (4.05%).	137/171 responders (83 Chinese students & 88 MBBS students)	females: 33.33% of Chinese & 47.30% of MBBS responders	50.79% Chinese students 74.32% MBBS students	Chinese students: heavy eyelids (53.97%), dryness (50.79%), feeling of a foreign body (46.03%), colored halos around objects (7.94%)  MBBS students: dryness (72.97%), feeling of a foreign body (62.16%), heavy eyelids (58.11%), colored halos around objects (2.70%)	Chinese students: >12h: 1.59% 10-12h: 4.76% 7-9h: 22.22% 5-6h: 20.63% 2-4h: 46.03% <2h: 4.76%  MBBS students: >12h: 5.41% 10-12h: 22.97% 7-9h: 43.24% 5-6h: 22.97% 2-4h: 5.41% <2h: 0	NA
Coronel-Ocampos et al. <sup>3</sup> (2022)	cross-sectional survey	Paraguay	228	163 (71.5%) females 65 (28.5%) males	188 (82.5%)	NA	MS with CVS notebook: ≤ 4 h 50 (75.8%) ≥ 4 h 138 (85.2%)  smartphone ≤ 4 h 21 (84.0%) ≥ 4 h 167 (82.3%)  tablet ≤ 4 h 158 (85.4%) ≥ 4 h 30 (69.8%)  PC/Laptop ≤ 4 h 154 (83.2%) ≥ 4 h 34 (79.1%)	141 (61.8%) previous ocular disease 135 (59.2%) lenses with frame 7 (3.1%) contact lenses
Patil et al. <sup>4</sup> (2019)	cross-sectional, analytical study	India	463/500 responders	177 (38.2%) males 286 (61.8%) females	359 (77.5%) boys (80.23%) girls (75.87%)	poor sleep quality 75.49%	≤ 2 h: 156 (33.69%) > 2 h: 307 (66.31%)	NA
Kharel & Khatri <sup>5</sup> (2018)	descriptive cross-sectional survey	Nepal	236/299 responders	76.2% males 23.8% females	71.6%  63.7% males 36.2% females	headache (50%) dry eyes (45%).	2-3 h/d: 37.2%	Myopia: most common refractive error (31.2%)  prevalence of orthoptic problem: 17.5%
Almoussa et al. <sup>6</sup> (2022)	observational descriptive cross-sectional study	Saudi Arabia	300	124 (41.3%) males 176 (58.7%) females	94%	musculoskeletal pain (84.3%) headache (71.1%) dry eyes (68%) burning eye sensation (66%) eye redness (50.7%) blurred vision (47%) pain in/around the eyes (45%) watery eyes (35.7%) double vision (18.3%)	total hours of studying h/d:* pre-COVID19: 5.1 ± 2.1 (1-15), 5 (4-6)  during COVID-19: 6.4 ± 2.7 (1-20), 6 (5-8)	161 (53.7%) corrective lens: • 151 (93.8%) eye glasses • 10 (6.2%) contact lens
Iqbal et al. <sup>7</sup> (2021)	cross-sectional case-control study	Egypt	733	217 (39.0%) males 340 (61.0%) females	557 (76%)	visual blur 40.9% headache (46.8%)  dry eyes, eye strain/fatigue, eye redness, double vision, refocusing difficulties, near vision difficulties, unclear objects, insomnia, depression, neck & joint pains, inability to hold objects, difficulty to write	total daily 5.3 ± 1.9 screen-time 176 (31.6%) day 381 (68.4%) night	84 (15.1%) previous DED diagnosis 332 (59.6%) refractive errors/wearing 29 (5.2%) contact lenses

\*mean ± SD [range], median (IQR)

Abbreviations: No = number; MS = medical students; CVS = computer vision syndrome; h = hour; h/d = hours per day; NA = not available; MBBS = Bachelor of Medicine and Bachelor of Surgery; DED = dry eye disease

The male predominance of CVS was also noticed in a descriptive, cross-sectional study<sup>5</sup>. Headache and dryness were noticed and myopia was the most common refractive disorder. Almousa et al.<sup>6</sup> described a 94% prevalence of CVS among the enrolled medical students. The researchers reported visual and extra-ocular disorders such as musculoskeletal pain (84.3%) and headache (71.1%) and underlined that during COVID-19 pandemic the symptoms were more frequent and severe than the pre-pandemic era. Moreover, during the pandemic the screen time was also increased.

In the cross-sectional, case control study of Iqbal et al.<sup>7</sup> CVS was reported in 76% of medical students and the most frequent complaints were blurred vision and headache. The severity of the syndrome seemed to be affected by refractive errors, increased screen time and close eye-screen distance.

## Discussion

According to American Optometric Association (AOA)<sup>1</sup> the most common symptoms of computer vision syndrome (CVS) include eyestrain, dryness, headache, blurred vision and musculoskeletal complaints such as neck and shoulder pain. Previous vision problems, poor lighting and posture, short eye to screen distance or the combination of these factors can lead to CVS. Eye examination confirms the diagnosis.

Ergonomic practices are essential in order to relieve or even prevent the symptoms of CVS. AOA<sup>1</sup> suggests the location of the computer screen to be 15 to 20 degrees below the eye level and 20 to 28 inches away from the eyes. Mowatt et al.<sup>8</sup> found that visual symptoms were less frequent when the electronic device was below the eye level. Avoidance of glare with the appropriate computer position, the use of glare screen filters and the balance of light between computer screen and the surrounding are helpful.<sup>1,9</sup> Furthermore, comfortable seating position and blinking are recommended.<sup>1</sup> Another useful practice is the 20-20-20 rule. In other words, everyone should take a 20 second break to view something that is 20 feet away every 20 minutes. Some secondary preventive measures can be artificial tears, however, ethical issues arise.<sup>9</sup>

The literature supported that CVS, also known as digital eye strain, has a high prevalence in medical students. This disorder affects other groups of students, for instance engineering students. Logaraj et al.<sup>10</sup> claimed that engineering students were at higher risk of developing CVS than medical students since they spent more hours per day in front of a screen. It should be underlined that COVID-19 pandemic played an

important role in the development of CVS. Screen time increased during the pandemic<sup>11</sup> given that in person teaching was replaced with distance learning. The extended screen time use during pandemic increased the prevalence of ocular complaints.<sup>12,13</sup> Alamri et al.<sup>14</sup> in their cross-sectional study compared the use of electronic devices before and during COVID-19 pandemic. The results revealed a significant increase in their use. Most students (49%) of their cross-sectional study used electronic devices for virtual classes and 20% of the responders had multiple symptoms of ocular complaints due to extended screen time. Moreover, Wang et al.<sup>2</sup> reached similar results. They observed that MBBS students during COVID-19 pandemic spent a lot of hours in front of screens due to the virtual classes and the incidence and severity of CVS's symptoms were more profound compared with students who took classroom lectures. These findings were confirmed by Almusa et al.<sup>6</sup> who observed that 38% of the enrolled students had more severe symptoms, and 48% experienced more frequent symptoms during the pandemic due to the extended use of digital devices. Consequently, COVID-19 pandemic led to extensive use of digital devices exacerbating symptoms of CVS or previous ocular problems.

Our study is an up-to-date review concerning the association between CVS and medical students. The limitation of this study is that we excluded studies referred to other kinds of students along with medical students, for instance "health profession students" that included medical, nursing and pharmacy students, in order to have a homogeneous sample.

## Conclusion

Take all the above into consideration, it is profound that CVS due its high prevalence is a worldwide health issue that requires awareness. Medical students should be informed about its symptoms and guided about daily measures that can be taken in order to minimize the complaints accompanying CVS. Hence, ergonomic practices are of paramount importance.

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