

# Effect of Structured Teaching Guidelines on Nursing Students' Awareness regarding Computer Vision Syndrome

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## Abstract

**Background:** These days, using a computer or other visual display device is almost a need. Consequently, a great deal of people worldwide experiences a range of visual symptoms, such as dry eyes, ocular strain, ocular irritation, and ocular redness. Computer vision syndrome is the term used to describe all of these visual abnormalities. **Aim:** This study aims to evaluate the effect of structured teaching guidelines on nursing students' awareness regarding computer vision syndrome. **Design:** Quasi experimental research design was used to conduct the aim of this study. **Setting:** This study setting will be conducted in faculty of nursing, Benha University, Qalyubia governorate, Egypt. **Sample:** Convenience sample of second year students (303) from both sexes in the previously mentioned settings during the time of data collection and agree to participate in this study. **Tools:** Two tools were used; (1) Structured interview questionnaire it involved the Part one student's personal data, Part Two: This part concerned with assessment of students' knowledge regarding computer vision syndrome Part three: - Presence of symptoms after using computer (2) Likert's scale as measures of level of awareness about CVS. **Results:** Regarding awareness level about CVS, improved from  $33.26 \pm 10.31$  pre guidelines implementation to  $36.81 \pm 11.23$  post guidelines implementation. In addition, there were highly statistical differences between their mean scores pre guidelines implementation as compared to post guidelines implementation ( $p = <0.001^*$ ). **Conclusion:** After implementation of teaching guidelines has proven to be highly effective in improving students' awareness regarding CVS, which supports the research hypotheses. **Recommendations:** Developing an ergonomic training program as part of the initial training program of all computer users.

**Key words:** Structured Teaching Guidelines, Nursing Students' Awareness, Computer Vision Syndrome

## Introduction

computer vision syndrome" (CVS) refers to a collection of symptoms relating to the eyes that arise from extended use of visual display units (VDUs), including computers, tablets, smartphones, and televisions. Studies have indicated that using a VDU for at least three hours a day may raise the chance of experiencing tension headaches, low back pain, CVS, and psychosocial stress. This is anticipated to rise with extended VDU exposure, as computer users who spent more than seven hours a day reported experiencing more severe visual issues and CVS symptoms (Subri, Ali & Salleh, 2024).

More than seventy-five percent of a person's daily activities include computers. Worldwide, sixty million computer professionals experience CVS symptoms. An estimated 45 million workers stare at a computer screen for extended periods of time. In an American optometrist survey, symptoms associated with computer use were reported by 14.25% of patients who visited an optometry clinic. In order to study and conduct research, university students these days especially

those studying medicine spending more time in front of a computer screen. Numerous studies have revealed that computer users, especially medical students, have a greater prevalence of CVS. In addition to health issues, CVS lowers work quality and inefficiencies at the workplace (Alamri, et al 2022).

CVS can also be caused by reduced blinking reflex with prolonged screen looking can also result in CVS and exacerbate dry eyes. It has been established that one of the main causes of CVS symptoms is dry eyes. Additional elements that were thought to contribute to CVS included the length of time spent using the device, taking breaks, living distance from it, screen brightness, and sitting posture (Abudawood, Ashi. & Almarzouki, 2020).

Symptoms related to CVS can be classified as visual, ocular, and extraocular. Visual symptoms include blurred vision, discomfort, and diplopia. Ocular symptoms include dry eye disease, redness, eye strain and irritation. Extraocular symptoms include headache and

shoulder, neck and back pain (*Anbesu & Lema, 2023*).

There are numerous variables that affect the onset and intensity of symptoms; these factors can be classified as non-personal or personal. Personal factors include aging, poor posture, improper viewing angle, distance from device and history of eye disorders. Non-personal factors include poor contrast, limited resolution, insufficient light and room illumination (*Alamri et al, 2024*).

Management and prevention of CVS there are numerous strategies to reduce and stay away from CVS, such as: 1) The 20-20-20 Rule: every 20 minutes, stop and look at an object 20 feet away for 20 seconds. 2) Ensuring Sufficient Lighting and Glare Control: Reduce screen glare and make sure the area is well-lit. 3) Ergonomic Workspace: Ensure that the keyboard and chair are at the right heights and that the back and wrist supports are comfortable. 4) wearing certain glasses or using blue light filters on screens. 5) Practice Blinking: Blink frequently to maintain moisture in your eyes. 6). Vision Correction: require corrective lenses for refractive issues, wear the right eyewear. 7) Angle and Distance of the Screen: Screen Distance and angle: Take acceptable breaks from and angles at which you see screens. 8) regular eye exams can assist in identifying and addressing vision problems (*Sarawad, 2024*).

### Significance of the study

Computer vision syndrome is a serious public health issue as approximately 60 million individuals globally suffer from CVS, with 1 million new instances occurring each year, according to statistics. The problem of CVS is extremely high in Computer vision syndrome is a serious public health issue as approximately 60 million individuals globally suffer from CVS, with 1 million new instances occurring each year, according to statistics. The problem of CVS is extremely high in under developed nations because of the inadequate accessibility and use of equipment for personal protection, the high workload and haven't break time when using a computer (*Adane, et al., 2022*). The prevalence of CVS in Egypt was reported by *Ahmed, et al., 2019* in a study conducted among students of faculty of medicine in Cairo university, the study showed that 75% of medical student in faculty of medicine suffer from CVS, with the most experienced symptom of headache and blurred vision.

### Aim of the study

This study aims to evaluate the effect of structured teaching guidelines on nursing students' awareness regarding computer vision syndrome.

### Research Hypothesis:

H1: The nursing students' awareness score regarding computer vision syndrome could be improved after implementation of structured teaching guidelines than before.

### II. Subjects and Method

**Design:** Quasi-experimental design study was used to conduct the study.

**Settings:** This study setting was be conducted in faculty of nursing, Benha University, Qalyubia governorate, Egypt. **Sample:** Convenience sample of second year students (303) from both sexes in the previously mentioned settings during the time of data collection and agree to participate in this study. Utilizing the following formula (*Tejada and Punzalan, 2012*).

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n= sample size (100).

N= total population (132).

e= margin error (0.05).

### Tools for data collection:

**Tool I: Structured interviewing questionnaire;** It aimed to assess nursing students' knowledge regarding computer vision syndrome. This questionnaire was developed by the researcher after reviewing related literature and scientific references (*Muma, Aduda & Onyango, 2021*); (*Al Tawil, et al. 2020*); (*Pabitha, 2019*) and (*Reddy, 2013*), presented in simple Arabic structure items related to different aspects, it will consist of three parts the following three parts as the following:

**Part one:** - student's personal data: It will be concerned with student personal characteristics (age, sex, hobby, duration of computer uses per day and reason for computer use, wear glasses while using the computer, examination of the eye, presence of eye disease.

**Part Two:** This part concerned with assessment of students' knowledge regarding computer vision syndrome it consists of 2 parts as follow:

General information about CVS: it consists of 9 multiple choice questions which included definition of CVS (1question), causes (4question), risk factor (1question), signs and symptoms (3question).

A) Preventive measures of CVS: it consists of 23 multiple choice questions which included the following questions: Diagnosis of CVS (1question), treatment CVS (2question), proper position, diet and eye protection of

person (10question) and proper use of computer (10question).

**Part three:** - Presence of (headache, burning of eye, red eye, blurred vision and eye dryness) after using computer.

**Scoring system:** -

The score was distributed as one mark for each corrected answer and zero for incorrect answer. The total score will be converted into percentage as: Total knowledge score 32

- $\geq 80$  % will grade as good level of knowledge ( $> 25$  score).
- $60 < 80$  % will grade as average level of knowledge (19-25 score).
- $< 60$  % will grade as poor level of knowledge ( $< 19$  score).

**Tool II:** Likert's scale as measures of level of awareness about CVS: this part adapted from (*Muma, Aduda & Onyango, 2021*) it consists of 10 statements about the causes and possible intervention about CVS.

A scale of 1-5, expressing how well understand each statement. Where 1 = Not at all aware, 2 = A little aware, 3 = Somewhat aware, 4 = Moderately aware, 5 = Extremely aware (mark only those that apply). converted into percentage as:

- $\geq 80$  % will grade as good level of awareness.
- $60 < 80$  % will grade as average level of awareness.
- $< 60$  % will grade as poor level of awareness.

**Guidelines booklet:**

The booklet was designed by the researcher under the guidance of the supervisors after reviewing the recent literatures related to the study. It written in simple Arabic language with different illustrated colored pictures that included all theoretical content to improve learning ability of the students, increase their knowledge level concerning CVS. The booklet covered all information related to CVS It divided into two parts as follows:

**The theoretical part;** it aimed to improve patients' knowledge related to CVS (definition, signs & symptoms, causes, risk factors , diagnosing and **practical part** how to prevent and mange CVS.

**Ethical considerations:**

Approval to conduct this study will be obtained from research ethical committee in faculty of nursing, Benha university Once the researcher granted approval, the students' approval taken

after an explanation of the aim, requirement, duration and anticipated benefits of the study; they also informed that their participation is optionally, and that they have the right to withdraw at any time. The researcher assured maintaining anonymity, confidentiality of data and the information gathered used only for students benefit and for the purpose of the study.

**II. Preparatory phase:** This phase included the following; reviewing the available literature and different studies related to research problem, and theoretical knowledge of its various aspects of the study, using textbooks, evidence-based articles, internet periodicals and magazines in order to collect tools of this study.

**Content validity:**

The face and content validity were ascertained for comprehensiveness, relevance, simplicity, clarity and ambiguity through a panel of five experts from medical surgical nursing department faculty of nursing, Benha University. Also, the developed guidelines which covered all items related to computer vision syndrome awareness among nursing students based on recent current literature was revised by the same experts and all recommended modifications were done.

**Tools reliability:**

Reliability of knowledge questionnaire was determined using Cronbach's alpha coefficient which was 0.838. For the second tool awareness, reliability was 0.914. This only proves that this tool is an instrument with good reliability.

**Pilot study:**

After the tool has been designed, they were tested through a pilot study and included into result which was done before embarking on the field work to check clarity and feasibility of designed tools and to estimate the time needed to complete it items. A pilot study carried out on 10% (30 student) in second year of faculty of nursing. According to the result of the pilot study, no change was required.

**III. Field of work:**

Data collection of the study was carried out through six months, from the beginning of October, 2023 at the end of march, 2024, the official permission was obtained to collect the data from the vice dean of education and student affairs, and the director of the faculty. Students divided into 5 groups each group consist of 60 students but last group 63 student.

The researcher first explained the aim of the study to the students and reassures them that information collected will be confidentiality treated and used only for the purpose of the research. The study was conducted through four phases:

**Assessment phase (baseline data):**

The students' awareness assessment questionnaires were used to assess their awareness regarding CVS to identify students' educational needs. These tools were filled in electronic questionnaire through this link (<https://docs.google.com/forms/d/1IoR4iMkYz11GRaXZzBz3QXK66GLfBCe5oHoAaUs5y3Y/edit#responses>). It had about 20 minutes to be filled.

-Data collected three days/week.

**Planning phase:** The researcher will put plan for carrying out the study after collecting data about the study setting. The structured guidelines were developed by the researcher according to predetermined students' needs in their awareness. It was written in arabic language and it reviewed by the supervisors and the validity was done by a panel of five experts from medical surgical nursing field.

Teaching materials will be prepared e.g. discussion, lecture and various teaching media will be used such as data show, power point. Feedback and reinforcement will help in covering theoretical information.

**The implementation phase (The program intervention):** All available students during the time of data collection and agree to participate in this study will be recruited into the study. Based on initial assessment of student knowledge the researcher developed a booklet in Arabic language.

**The implementation phase included the following steps:**

The teaching sessions were classified into group. The booklet was handed out for every student and the contents of the booklet were explained over 3 sessions with 30 minutes for every session. Including periods of discussion according to the students' progress and feedback. Different teaching and learning methods used during the sessions, which included; Power point presentation, pictures, and videos were used to enhance learning of students about awareness regarding C V S.

At the beginning of the first session, students were oriented regarding the guideline's contents, its purpose and its impact. Students informed about the time of the next session at the end of the session.

Each session started by a summary about what has been discussed in the previous session and the objectives of the new session.

At the end of these session the researcher informed them they will be evaluated by the researcher after 3 months from session.

**Session one:** (introductory session) orientation and explanation of reasons, importance of educational guidelines and general knowledge regarding CVS including; definition, causes, risk factor, signs and symptoms, how computer effect on eye.

**Session Two:** An explanation of the general knowledge about CVS including; diagnosis, treatments, complications.

**Session Three:** An explanation about the preventive measures, which followed to prevent CVS. Including; ways of protection of eye, dietary guidelines, good food practices.

**Evaluation phase:** Evaluation of the effect of structured teaching guidelines on student awareness was done by comparing the results pre and post (after 3 months) the implementation of the guidelines by using same data collection tool through electronic questionnaire through this link ([https://docs.google.com/forms/d/1GUaCpaH4ExhvJBqldY9qJ\\_ddoDko6uzpTc2n2g5oNtl/edit](https://docs.google.com/forms/d/1GUaCpaH4ExhvJBqldY9qJ_ddoDko6uzpTc2n2g5oNtl/edit)).

**Results**

**Table (1):** Illustrates personal data of the studied students, this table show that more than two third of them (71.6%) their age between 19-20 years, with mean  $19.89 \pm 0.89$  Years. Less than three quarters (70.3%) of studied students were females and majority of them (98.7%) were using computer and (73.9 %) of them were used computer for education. Regarding to period of using computer daily, it was observed that half of them (53.5%) were using it from 3 to 6 hours/ day. Moreover, more than three quarters of them (78.5%) not wearing glasses while using the computer. In relation to eye examination less than three quarters of studied student were not perform any eye examinations and the majority of them (83.3%) not Suffered from any eye disease.

**Table (2):** This table shows that difference between the studied nursing students' total knowledge about CVS pre and post teaching guidelines. It reveals that no one of students (0.0%) had good knowledge about computer specific preventive measures pre-teaching guidelines. While it improved as less than two thirds of students (64.0%) had good knowledge post-teaching guidelines. There were highly statistically significance regarding the overall

knowledge about CVS pre, post guidelines implementation at  $p < 0.001$ .

**Figure (1):** This figure shows total knowledge level pre-post teaching guidelines. It illustrates that near half of the studied students (44.9%) were poor level of knowledge regarding CVS at pre-educational guidelines, while less than one quarters (10.9%) of them were poor level of knowledge regarding CVS post educational guidelines. While minority (2%) of studied students had good knowledge regarding CVS at pre-educational guidelines while more than half of students (52.8%) were good level of knowledge regarding CVS post educational guidelines improvement.

**Table (3):** Clarifies total mean score and standard deviation of students' reported awareness regarding computer vision syndrome pre and post guidelines implementation. It noticed that, improved from  $33.26 \pm 10.31$  pre guidelines implementation to  $36.81 \pm 11.23$  post guidelines implementation. In addition, there were highly statistical differences between their mean scores pre guidelines implementation as compared to post guidelines implementation  $p < 0.001$ .

**Figure (2):** This figure shows total awareness level pre-post teaching guidelines. It demonstrates that (11.9%) of studied students had low level of awareness regarding computer vision syndrome, while (0.0%) of them had high level of awareness regarding computer vision syndrome pre guidelines implementation, while improved to (83.2%) high level of awareness post guidelines implementation.

**Table (4):** Show difference between the studied nursing students' according to severity of experienced symptoms after using computer pre- and post-teaching guidelines implementation. It demonstrates that half of the studied students' (51%) had mild headache at pre implementation of guidelines, while improved as less than two thirds (61.4 %) of students hadn't headache, only (29.4%) had mild headache, (5.9%) had moderate

headache, (3.3%) had severe headache post implementation of guidelines, in addition there was an improvement regarding severity of symptoms post implementation of educational guidelines with highly statistical significance at  $p < 0.001$ .

**Fig (3):** Show difference between the studied nursing students' according to severity of experienced symptoms after using computer pre and post teaching guidelines implementation. It demonstrates that half of the studied students' (51%) had mild headache at pre implementation of guidelines, while improved as less than two thirds (61.4 %) of students hadn't headache, only (29.4%) had mild headache, (5.9%) had moderate headache, (3.3%) had severe headache post implementation of guidelines, regarding to burning sensation, it demonstrates that less than half of the studied students' (42.8%) had mild burning sensation at pre implementation of guidelines, while improved as almost two thirds (66.3 %) of students hadn't burning sensation, only less than quarter (22.1%) had mild burning sensation, (8.6%) had moderate burning sensation, (3%) had sever burning sensation post implementation of guidelines, in addition there was an improvement regarding severity of symptoms post implementation of educational guidelines.

**Table (5):** This table shows correlation between total knowledge, awareness about CVS and presence of symptoms among the studied nursing students, it reveals that there was highly significant correlation between total knowledge and awareness during pre and post guidelines ( $p$  value =  $< 0.001^*$ ), also with presence of symptoms with  $p$  value =  $< 0.001$  &  $0.002$ , respectively) moreover a significant correlation between presence of symptoms and awareness with ( $p$  value =  $0.029^*$ ) pre guidelines and ( $p$  value =  $0.021^*$ ) post guidelines.

**Table 1: Number and percentage distribution of the studied nursing students according to their personal data (n = 303)**

Students' personal data	No.	%
<b>Age / years</b>		
18-<19 y	21	6.9
19- 20 y	217	71.6
> 20 y	65	21.5
Mean $\pm$ SD	19.89 $\pm$ 0.89	
<b>Sex</b>		
Female	213	70.3
Male	90	29.7

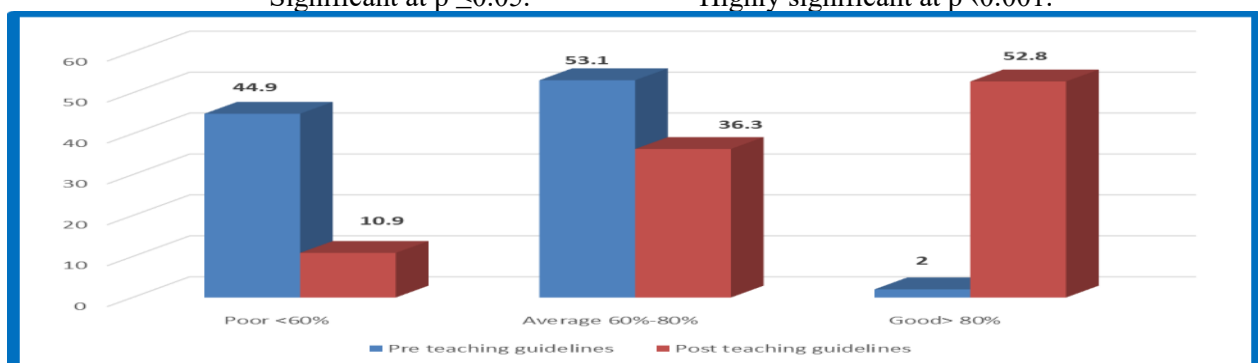
<b>Using computer / mobile daily</b>		
Yes	299	98.7
No	4	1.3
<b>Causes of using computer</b>		
For Education	224	73.9
For Games	11	3.6
To watch movies	12	4.0
For Internet searching	56	18.5
<b>Period of using computer during a day</b>		
< 3 hours /day	79	26.1
3 to 6 hours /day	162	53.5
> 6 hours /day	62	20.5
<b>Wearing glasses while using the computer</b>		
Yes	65	21.5
No	238	78.5
<b>Perform any eye examinations</b>		
Yes	84	27.7
No	219	72.3
<b>Suffer from any eye disease</b>		
Yes	49	16.2
No	254	83.8

**Table (2): Difference between the studied nursing students' total knowledge about computer vision syndrome pre and post teaching guidelines implementation (n=303).**

Knowledge about computer vision syndrome	Pre- teaching guidelines (n=303)			Post teaching guidelines (n=303)			x <sup>2</sup> P value
	Good > 80%	Average 60%-80%	Poor < 60%	Good > 80%	Average 60%-80%	Poor < 60%	
	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	
<b>Basic knowledge about computer vision syndrome</b>	59(19.5)	153(50.5)	91(30.0)	198(65.3)	92(30.4)	13(4.3)	13.171 (0.010*)
<b>Knowledge about general preventive measures</b>	54(17.8)	155(51.2)	94(31.0)	194(64.0)	85(28.1)	24(7.9)	57.454 (< 0.001**)
<b>Knowledge about computer specific preventive measures</b>	0(0.0)	68(22.4)	235(77.6)	194(64.0)	42(13.9)	67(22.1)	13.471 (0.001**)
<b>Total knowledge</b>	6(2.0)	161(53.1)	136(44.9)	160(52.8)	110(36.3)	33(10.9)	42.972 (< 0.001**)

\* Significant at  $p \leq 0.05$ .

\*\*Highly significant at  $p < 0.001$ .



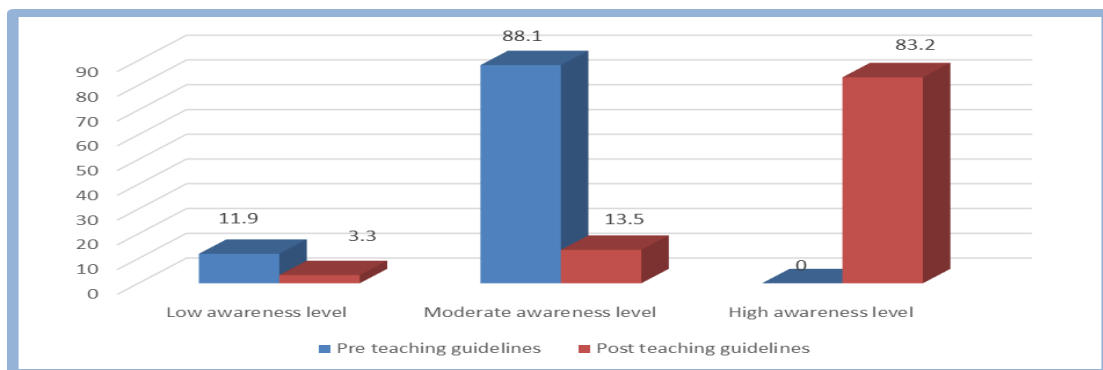
**Fig 1. Distribution of total knowledge level among the studied nursing students regarding computer vision syndrome pre and post teaching guidelines implementation (n=303).**

**Table (3):** Difference in mean score of awareness about computer vision syndrome among the studied nursing students pre and post teaching guidelines implementation (n=303)

Awareness about computer vision syndrome	Awareness (pre guidelines) (n= 303)	Awareness (post guidelines) (n= 303)	Paired t test	P value
	$\bar{x} \pm SD$	$\bar{x} \pm SD$		
Caused by prolonged computer use.	3.59 ± 1.49	3.95 ± 1.41	-2.955	0.003*
Caused by poor sitting posture while using a computer	3.31 ± 1.41	3.75 ± 1.43	-3.787	<0.001**
Caused by viewing a computer screen at a distance of less than arm's length.	3.54 ± 1.38	3.85 ± 1.42	-2.557	0.011*
Caused by viewing a computer screen below eye level	2.93 ± 1.36	3.39 ± 1.58	-3.066	0.002*
Occurs when the screen brightness is higher than that in the room.	3.30 ± 1.46	3.74 ± 1.45	-3.687	<0.001**
A computer user can reduce computer vision syndrome by taking regular breaks.	3.59 ± 1.42	4.04 ± 1.34	-3.973	<0.001**
A computer user can reduce computer vision syndrome by viewing the computer screen below eye level.	2.61 ± 1.43	3.08 ± 1.59	-3.846	<0.001**
A computer user can reduce computer vision syndrome by using computer glasses with anti-glare.	3.55 ± 1.43	3.80 ± 1.44	-2.097	0.037*
A computer user can reduce computer vision syndrome by maintaining balanced contrast between the computer screen and room lighting	3.53 ± 1.43	3.76 ± 1.44	-1.986	0.048*
A computer user can reduce computer vision syndrome by correcting nearsightedness or farsightedness.	3.30 ± 1.54	3.55 ± 1.50	-2.046	0.042*
Total	33.26 ± 10.31	36.81 ± 11.23	-3.969	<0.001**

\* Significant at  $p \leq 0.05$ .

\*\*Highly significant at  $p < 0.001$ .



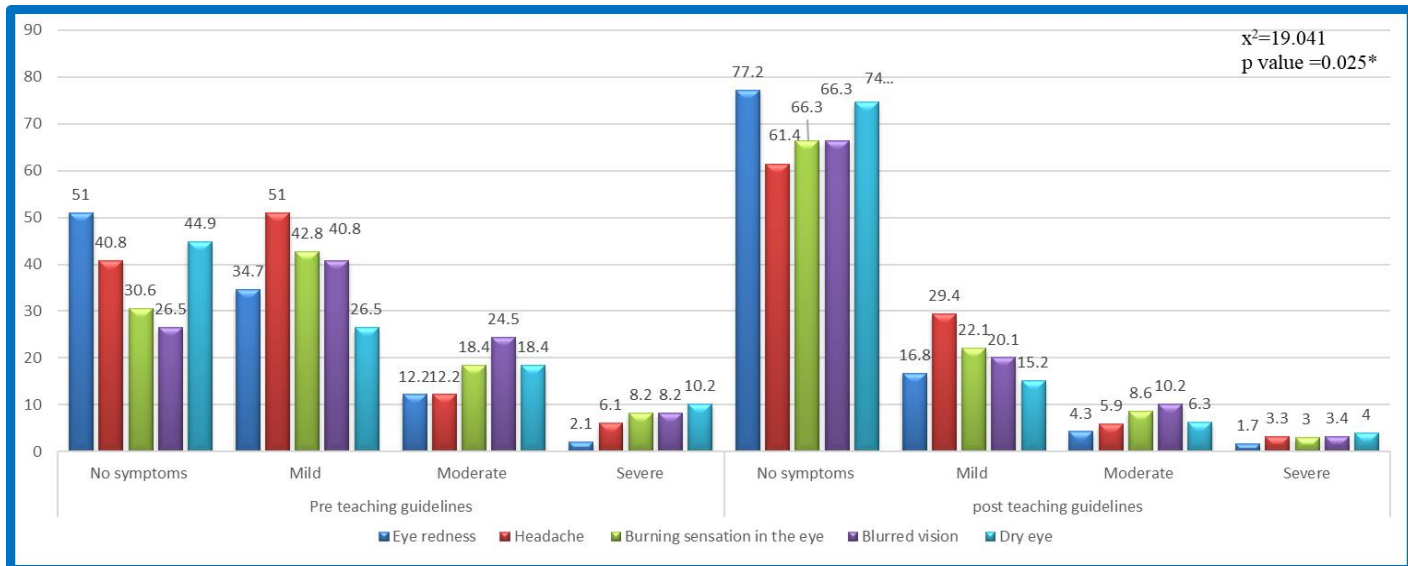
**Fig 2. Distribution of total awareness level among the studied nursing students regarding computer vision syndrome pre and post teaching guidelines implementation (n=303).**

**Table (4): Difference between the studied nursing students' according to severity of experienced symptoms after using computer pre and post teaching guidelines implementation (n=303).**

Experienced symptoms severity	Pre- teaching guidelines (n=303)				Post teaching guidelines (n=303)				$\chi^2$ P value
	No symptoms	Mild	Moderate	Severe	No symptoms	Mild	Moderate	Severe	
	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	
Eye redness	154(51.0)	105(34.7)	37(12.2)	7 (2.1)	234(77.2)	51(16.8)	13(4.3)	5(1.7)	9.14 0.002*
Headache	93(30.7)	154(51.0)	37(12.2)	19 (6.1)	186(61.4)	89(29.4)	18(5.9)	9(3.3)	7.81 0.005*
Burning sensation	93(30.6)	130(42.8)	56(18.4)	24(8.2)	201(66.3)	67(22.1)	26(8.6)	9(3.0)	13.83 <0.001**
Blurred vision	81(26.5)	123(40.8)	75(24.5)	24(8.2)	201(66.3)	61(20.1)	31 (10.2)	10 (3.4)	15.65 <0.001**
Eye dryness	136(44.9)	81(26.5)	56(18.4)	30(10.2)	225(74.5)	46(15.2)	19(6.3)	13(4.0)	5.85 0.015*

\* Significant at  $p \leq 0.05$ .

\*\*Highly significant at  $p < 0.001$ .



**Fig 3. Difference between the studied nursing students' according to severity of experienced symptoms after using computer pre and post teaching guidelines implementation (n=303).**

**Table (5) Correlation between total knowledge, awareness and presence of symptoms among the studied nursing students during pre and post teaching guidelines implementation (No=303)**

variable	Periods	Total knowledge		Presence of symptoms	
		r	P value	r	P value
Total awareness	Pre guidelines	0.357	<0.001**	0.125	0.029*
	Post guidelines	0.491	<0.001**	0.132	0.021*
Total knowledge	Pre guidelines	-	-	0.287	<0.001**
	Post guidelines	-	-	0.179	0.002*



## Discussion

Digital eye strain is a global swift escalating health issue concomitant with advanced technology. Human eyes can maintain focus on the printed materials than computers as it has better contrast and well-demarcated edges. In contrast, computers have ill-defined edges with less contrast which is brighter at the center and decreased in intensity toward edges. Prolonged computer use can cause ocular muscle strain to maintain focus and numerous eye complaints, which can be avoided with appropriate ergonomic practices and workplace design for computers (*Artime-Ríos, et al 2022*).

Regarding age, the current study revealed that more than two thirds of studied patients were recorded within age group of nineteen to twenty years old. From the researcher's point of view these results may be due to sample from second years of faculty of nursing Benha University and their ages range between 19, 20 years. This result in the same line with *Altalhi et al., (2020)* study about " Computer vision syndrome among health sciences students in Saudi Arabia: prevalence and risk factors ", reported that the median age of the participants is 20 years of age.

The results of the current study not supported by *Ismiani, et al., (2023)* in their study "The Effect of a 20-20-20 Rule Educational Intervention on Computer Vision Syndrome (CVS). " their results age was 'revealed that more than half participants thirty to thirty-nine years old.

As regard to sex, the current study results showed that more than two thirds of the studied students were female. From researcher point of view due to the number of students enrolled at faculty of nursing was more female than male students, this finding is in line with a study *Mahmoud & Sabbour (2021)* stated by a study about " Effect of Educational Intervention about Computer Vision Syndrome on the Severity of Eye Complaints among Computer Users " showed that more than two thirds of the studied students were female. On the other hand, the current study incongruent with a study conducted by *Tesfaye et al., (2022)* in their study entitled "Prevalence and associated Factors of computer vision syndrome among academic staff in the University of Gondar, Northwest Ethiopia: An institution-based cross-sectional study" who reported that less than three quarters of the studied students (71.6) were male.

Concerning using mobile/ computer daily, current study show that most of participants using

computer/ mobile daily, because it can't be dispensed with, need for it has increased especially with e- learning, it also an easy, fast and effective way to obtain information. This result similar to *Manjusha, (2023)*. "Effectiveness of educational pamphlet on knowledge regarding computer vision syndrome among higher primary children in a selected urban school Mangalore" showed that less than two thirds of participants using computer daily. This study disagreed with *Mondal & Shirin (2021)*. In their study about "Assessment of Knowledge and Awareness About Computer Vision Syndrome Among IT Professionals and College Students" that illustrated that majority of college students not used computer or mobile daily.

In respect to the reported reason for using computer, the current study showed that less than three-quarter of studied students using it for education. Regarding to researcher, because of the ease and speed of access to information, most students use computers to quickly access information and conduct research. This result similarly with *Tesfaye et al., (2022)* whose study about "Prevalence and associated Factors of computer vision syndrome among academic staff in the University of Gondar, Northwest Ethiopia: An institution-based cross-sectional study" showed that the majority of students using computer for reading and writing teaching material. While this result incongruent with *Zulkiflee, (2022)*. "Effects of portable computing device usage on posture and health among university students" who mentioned that almost three quarters of student using computer for work.

As regards to period of using computer during a day the current study showed that more than half of participants for 3-6 hours per day. Due to majority of student using electronic device for education and distance, electronic learning this indeed increase time spent into computer and digital devices, this finding is in the same line with a study *Zalat et al, (2022)*, that titled "Computer vision syndrome, visual ergonomics and amelioration among staff members in a Saudi medical college" who stated that, more than two thirds used it for 3-6 hours per day. The same result is not in agreement with *Poudel & Khanal (2020)*, "Magnitude and determinants of computer vision syndrome (CVS) among IT workers in Kathmandu, Nepal" who found that most of participants using computer >10 hours/ day).

Regarding wearing glasses the current study show that, more than three quarters of studied students were not wearing glasses when using computer. From researcher point of view due to lack of awareness of dangers produced by electronic devices and its negative effect in eyes. This study supported with **Astuti et al (2020)**, entitled "the determinant factors affecting the event of computer vision syndrome (CVS) on helpdesk employees at PT". That show that more than two thirds of studied sample were not wearing glasses during using computer. Conversely, the study disagreed with **Zalat et al, (2022)**, that titled "Computer vision syndrome, visual ergonomics and amelioration among staff members in a Saudi medical college" announced about more than half of participants were wearing eye glasses while working at the computer.

Regarding perform any eye examination current study showed that less than three quarters of studied students not made eye examination, related to researcher due to lack of awareness of the dangers of blue light emitted from electronic devices to eyes. This finding supported with **Sayed, Abd El Wahed & Madian. (2020)** studied "Effect of interactive digital-based educational intervention about digital eye strain on the severity of eye complaints, knowledge and preventive ergonomic practices among computer users" that illustrated majority of participants no performed any eye examinations. Also, this study different with **Chauhan, Dhasmana & Raj (2018)** conducted study" Knowledge, awareness and practice of CVS in digital device users" who founded that almost two thirds performed past consultation for eye examination.

In relation to suffer from any eye disease, the results of the current study revealed that the majority of studied students not suffered from eye disease. From researcher view because studied students are young and therefore rarely suffer from eye diseases this accepted with **Poudel & Khanal, (2020)**. "Magnitude and determinants of computer vision syndrome (CVS) among IT workers in Kathmandu, Nepal" that show more than half of participants not suffered from eye disease.

On the other hand, this finding is disagreed with **Abudawood, Ashi & Almarzouki, (2020)** who study about " Computer vision syndrome among undergraduate medical students in King Abdulaziz University" who mentioned that minority of students had dry eye disease.

As regard to total students' total knowledge level the present study illustrated that a statistically significant improvement in students' knowledge about CVS post implementation of structured teaching guidelines in preventive measures and total knowledge between pre, post intervention. Which reflect the positive effect of the educational guidelines on improving of students' knowledge. According to researchers' opinion, this improvement was significant associated with more familiarity and understanding the educational guidelines, reinforcement of sessions, uses of multiple media as booklet with colorful and laptop with data show to increase clarification and understanding, successful method to increase students' knowledge, take feedback during every session. Also finding of study supported by **Manjusha, (2023)** who conducted a study about " Effectiveness of educational pamphlet on knowledge regarding computer vision syndrome among higher primary children in a selected urban school Mangalore" proved that after administration of educational pamphlet on CVS, most of the higher primary school students had average knowledge and more than one third of them had good knowledge regarding CVS. This findings in disagree with **Dessie et al (2018)** in their study " Computer vision syndrome and associated factors among computer users in Debre Tabor Town, Northwest Ethiopia" illustrated that more than half of participants had good level of knowledge without implementation of guidelines.

Regarding students' awareness level. Result of current study it noticed that, improved from  $33.26 \pm 10.31$  pre guidelines implementation to  $36.81 \pm 11.23$  post guidelines implementation. In addition, there were highly statistical differences between their mean scores pre guidelines implementation as compared to post guidelines implementation  $p < 0.001$ . From researcher point of view this could be ascribed to the efficacious designation of the current educational guidelines and the young age of the studied computer users, where the highest percent of them aged between 19-20 yrs and had university educational level. This can aid in better knowledge synthesis and retention. This finding supported with **Muma, Aduda & Onyango (2019)** performed study about "Level of Awareness, Perception and Uptake of Interventions for Computer Vision Syndrome Among University Students, Maseno, Western Kenya" they mentioned that significant difference into students' awareness between pre and post intervention. This finding disagreed with **Alatawi et al. (2022)**

conduct study about "Self-reported student awareness and prevalence of computer vision syndrome during COVID-19 pandemic at Al-Baha University" they noticed that CVS awareness is high among students without implementation of educational guidelines.

Regarding severity of eye complaints. The results of the current study highlighted the effectiveness of the current interactive digital-based educational intervention about CVS on reducing the severity of eye complaints among the studied students. A statistically significant mean change in the total score of the reported eye complaints next to the educational guidelines. This could be ascribed to the fitting designation and presentation of the program content which might has a great role in enhancing computer users' knowledge and compliance with the preventive ergonomic practices which by their role can assist in reducing the severity of their eye complaints.

Study supported by **Mahmoud & Sabbour. (2021)** whose study was about "Effect of Educational Intervention about Computer Vision Syndrome on the Severity of Eye Complaints among Computer Users" reported that before the educational intervention, the research revealed that about two-thirds of them had moderate eye complaints, and about one-third had severe eye strain and reveals that there were highly statistically significant differences related to mean scores of total eye strain, a burning feeling, headache, eye redness, eye dryness, and total improvement after educational intervention. The results of the present research also were in agreement with those of a very recent study by **Sayed et al. (2020)** in Egypt, which aims to "assess the effectiveness of an interactive digital educational intervention about computer ocular fatigue on the severity of eye symptoms and protective ergonomic knowledge and applies between computer handlers". They found that the entire study sample had moderate (57.1%) or severe (42.9%) complaints. After implementation of program show improvement in eye complaints.

The current study reveals that there was highly significant correlation between total knowledge and awareness during pre and post guidelines ( $p$  value =  $<0.001^*$ ), also with presence of symptoms with  $p$  value =  $<0.001$  &  $0.002$ , respectively) moreover a significant correlation between presence of symptoms and awareness with ( $p$  value =  $0.029^*$ ) pre guidelines and ( $p$  value =  $0.021^*$ ) post guidelines.

The same finding was reported by **Dessie A et al (2018)**, who conducted study entitled " Computer Vision Syndrome and Associated Factors among Computer Users in Debre Tabor Town, Northwest Ethiopia " conferred that knowledge was a significant predictor of DES where computer users who had good knowledge about safety measures for computer use had less frequent eye symptoms.

This result was consistent with **Khatri & Kharel (2018)** in the study entitled " Knowledge, Attitude and practice of Computer Vision Syndrome among medical students and its impact on ocular morbidity "who found that there was significant reduction in eye symptoms by taking rest breaks, frequent blinking and lower computer screen level during computer use.

The current study different with **Ranasinghe, et al (2019)** whose study about "Computer vision syndrome among computer office workers in a developing country: An evaluation of prevalence and risk factors "this study illustrated that a significant negative correlation between total reported eye complaints and the total knowledge score of the studied computer users.

### Conclusions

**According to the findings of this study, it concluded that:** the implementation of teaching guidelines has proven to be highly effective in improving students' awareness regarding computer vision syndrome, which supports the research hypotheses. with high statistically significance differences ( $p = <0.05$ ), which supported the research hypotheses.

### Recommendations

**This study was recommended as the following:**

#### For education:

- Promotion of physical activity should be advocated and encouraged by the school and college.
- Developing an ergonomic training program as part of the initial training program of all computer users.
- Developing hotline and web-based educational sites about visual ergonomics for digital users to facilitate interaction and communication.
- It's recommended to organize university-based awareness programs regarding CVS for the working personnel.

#### For research:

- The need for continuous educational and training programs for
- prevention of computer vision syndrome.
- Establishing awareness campaigns about DES and its preventive
- ergonomic practices.
- Performing larger studies including many universities in Egypt, provided that the future studies should include both objective and subjective examination tools.

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