

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 (CVS) is the term used to describe all of these visual abnormalities. **Aim of the study:** This study aimed to evaluate the effect of structured teaching guidelines on nursing students' awareness regarding computer vision syndrome. **Study design:** Quasi-experimental pre/ post research design was used to conduct this study. **Setting:** This study was conducted in the Faculty of Nursing, Benha University, Qalyubia Governorate, Egypt. **Study subjects:** Convenience sample of the second year students (303) from both sexes in the previously mentioned setting during the time of data collection and agreed to participate in this study. **Tools of data collection:** Two tools were used; Tool (1) Structured interview questionnaire involving three parts: Part one: student's personal data, Part two: students' knowledge regarding computer vision syndrome and Part three: Presence of symptoms after using computer. Tool (2) Awareness level scale about CVS. **Results:** Regarding students' total knowledge about CVS pre and post teaching guidelines implementation, none of the students (0.0%) had good knowledge about computer specific preventive measures pre-teaching guidelines implementation. While it improved as (64.0%) had good knowledge post-teaching guidelines implementation. Nursing students' awareness mean score about CVS improved from 33.26 ± 10.31 pre-guidelines implementation to 36.81 ± 11.23 post-guidelines implementation. **Conclusion:** Teaching guidelines has proven to be highly effective in improving nursing students' awareness regarding CVS, which supports the research hypothesis. **Recommendations:** Developing an ergonomic training program as part of the initial training program of all computer users.

Keywords: Awareness, Computer Vision Syndrome, Nursing Students, Structured Teaching Guidelines.

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 et al., 2024).

More than seventy-five percent of a person's daily activities include computers. Worldwide, sixty million computer

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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).

Computer vision syndrome can also be caused by reduced blinking reflex with prolonged screen looking that 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 et al., 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 involve numerous strategies to reduce and stay away from CVS such as: the 20-20-20 Rule: every 20 minutes, stop and look at an object 20 feet away for 20 seconds. Ensuring sufficient lighting and glare control: Reduce screen glare and make sure the area is well-lit. Ergonomic Workspace: Ensure that the keyboard and chair are at the right heights and that the back and wrist supports are comfortable. Wearing certain glasses or using blue light filters on screens. Practice Blinking: Blink frequently to maintain moisture in eyes. Vision correction requires corrective lenses for refractive issues and wearing the right eyewear. Screen Distance and angle: Take acceptable breaks from and angles at which you see screens. 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 under developed nations because of inadequate accessibility and use of equipment for personal protection, the high workload and lack of 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 aimed to evaluate the effect of structured teaching guidelines on nursing

students' awareness regarding computer vision syndrome.

Research Hypothesis:

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

Subjects and Method:

Research Design:

A Quasi-experimental pre/post design (This design used to test causal relationships, often when it is not feasible to randomly assign participants to conditions **Tekin, 2024**) was used to conduct the study.

Study Setting:

This study setting was conducted in Faculty of Nursing, Benha University, Qalyubia Governorate, Egypt.

Study Subjects:

A Convenience sample of the second year students (303) from both sexes in the previously mentioned setting during the time of data collection who agreed 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: A Structured interviewing questionnaire: This questionnaire was designed by the researcher after reviewing the related literature and scientific references **Muma et al., (2021)**, **Al Tawil, et al., (2020)**, **Pabitha, (2019)** and **Reddy, (2013)**. It was presented in simple Arabic structure items related to different aspects. It consisted of three parts as the following:

Part one: Student's personal data: It concerned with student's personal characteristics and consisted with 8 questions related to age,

gender, hobby, duration of computer uses per day, reason for computer use, wear glasses while using the computer, examination of the eye and presence of eye disease.

Part two: It concerned with assessment of students' knowledge regarding computer vision syndrome and it consisted of 2 parts as follows:

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

B) Preventive measures of CVS: It consisted of 23 multiple-choice questions which included the following questions: diagnosis of CVS (1question), treatment CVS (2 questions), proper position, diet and eye protection of person (10 questions) and proper use of computer (10 questions).

Part three: Signs and symptoms of CVS, including 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 correct answer and zero for incorrect answer. The total score was converted into percentage as the total knowledge score was 32. It was categorized as follows:

- ≥ 80 % graded as good level of knowledge (> 25 score).
- $60 < 80$ % graded as average level of knowledge (19-25 score).
- < 60 % graded as poor level of knowledge (< 19 score). **Suting et al., (2019)**.

Tool II: Awareness level scale about CVS. This scale was adopted from **Muma et al., (2021)** and it consisted of 10 statements about the causes and possible intervention about computer vision syndrome.

Scoring system:

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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. The total score of awareness level was categorized as follows:

- ≥ 80 % graded as good level of awareness.
- 60-< 80 % graded as average level of awareness.
- < 60 % graded as poor level of awareness.

Administrative design:

An official permission was obtained to collect the data, clarifying the aim of and nature the study, from the Vice Dean of Education and Student Affairs and the Director of the Faculty. A clear explanation was provided about importance and the expected outcomes of the 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, consisted of four Assistant Professors and one Lecture. 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 the tools was determined using Cronbach's alpha coefficient test. It was 0.838 for the structured interviewed questionnaire and was 0.914 for awareness scale level. This only proves that this tool is an instrument with good reliability.

Ethical considerations:

Approval to conduct this study was obtained from Scientific Research Ethical Committee in Faculty of Nursing, Benha University. Once the researcher granted approval, the students' oral and written approvals were taken after explanation of the aim, requirement, duration and anticipated benefits of the study. The students were 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.

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 the designed tools and to estimate the time needed to complete it items. A pilot study was carried out on 10% (30 students) in the second year of the Faculty of Nursing. According to the result of the pilot study, no change was required.

Field of work:

Data collection of the study was carried out through six months, from the beginning of October, 2023 till the end of March, 2024. Students were divided into 5 groups each group consisted of 60 students but last group 63 students.

The researcher first explained the aim of the study to the students and reassured 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 were collected three days/week.

Planning phase:

The structured guidelines were constructed by the researcher according to predetermined students' needs in their awareness. It was written in Arabic language and reviewed by the supervisors. Teaching materials were prepared e.g. discussion, lecture and various teaching media were used such as data show, power point. Feedback and reinforcement helped in covering theoretical information.

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 was 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 students' knowledge related to CVS as definition, signs & symptoms, causes, risk factors and diagnosing.

Practical part: It included how to prevent and manage CVS.

The implementation phase:

All available students during the time of data collection and agree to participate in this study was recruited into the study. Based on initial assessment of student knowledge the researcher constructed a booklet in Arabic language.

The teaching sessions were classified into groups. 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. At the beginning of the first session, students were oriented regarding the guideline's contents, its purpose and its impact. Nursing students were 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.

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

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

Session three: An explanation about the preventive measures, which should be followed to prevent CVS, including; ways of protection of eye, dietary guidelines and healthy food practices.

Evaluation phase:

Evaluation of the effect of the structured teaching guidelines on students' awareness was done by comparing the results pre and post (after 3 months) implementation of the guidelines by using same data collection tools through electronic questionnaire through this link:

(https://docs.google.com/forms/d/1GUaCpaH4ExhvJBqldY9qJ_ddoDko6uzpTc2n2g5oNtI/edit).

Results:

Table (1): Illustrates that more than two third of students (71.6%) their age ranged between 19-20 years, with mean 19.89 ± 0.89 years. Also, less than three quarters (70.3%) of the studied students were females and majority of them (98.7%) were using computer and

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(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 the studied students didn't perform any eye examinations and the majority of them (83.3%) didn't suffer from any eye diseases.

Table (2): 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 was highly statistically significance regarding the overall knowledge about CVS pre and post guidelines implementation at $p < 0.001$.

Figure (1): Illustrates that near half of the studied students (44.9%) had poor level of knowledge regarding CVS at pre-educational guidelines, while less than one quarters (10.9%) of them had poor level of knowledge regarding CVS post educational guidelines. While, minority (2%) of the studied students had good knowledge regarding CVS at pre-educational guidelines, while more than half of students (52.8%) had good level of knowledge regarding CVS post educational guidelines.

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, students' reported awareness improved from 33.26 ± 10.31 pre guidelines implementation to 36.81 ± 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 the 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 it improved to (83.2%) high level of awareness post guidelines implementation.

Figure (3): 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 didn't have 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 the educational guidelines.

Table (4): Shows 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, there was 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): Distribution of the studied nursing students according to their personal data and history of using computer (n = 303)

Students' personal data and history of using computer	No.	%
Age / years		
18-<19	21	6.9
19- 20	217	71.6
> 20	65	21.5
Mean ± SD	19.89 ± 0.89	
Gender		
Female	213	70.3
Male	90	29.7
Using computer / mobile daily		
Yes	299	98.7
No	4	1.3
Causes of using computer		
For Education	224	73.9
For Games	11	3.6
To watch movies	12	4.0
For Internet searching	56	18.5
Period of using computer during a day		
< 3 hours /day	79	26.1
3 to 6 hours /day	162	53.5
> 6 hours /day	62	20.5
Wearing glasses while using the computer		
Yes	65	21.5
No	238	78.5
Perform any eye examinations		
Yes	84	27.7
No	219	72.3
Suffer from any eye disease		
Yes	49	16.2
No	254	83.8

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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 implementation (n=303)			Post teaching guidelines implementation (n=303)			x ² P-value
	Good > 80%	Average 60%-80%	Poor < 60%	Good > 80%	Average 60%-80%	Poor < 60%	
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	
Basic knowledge about computer vision syndrome	59(19.5)	153(50.5)	91(30.0)	198(65.3)	92(30.4)	13(4.3)	13.171 (0.010*)
Knowledge about general preventive measures	54(17.8)	155(51.2)	94(31.0)	194(64.0)	85(28.1)	24(7.9)	57.454 (< 0.001**)
Knowledge about computer specific preventive measures	0(0.0)	68(22.4)	235(77.6)	194(64.0)	42(13.9)	67(22.1)	13.471 (0.001**)
Total knowledge	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 ≤0.05.

**Highly significant at p <0.001.

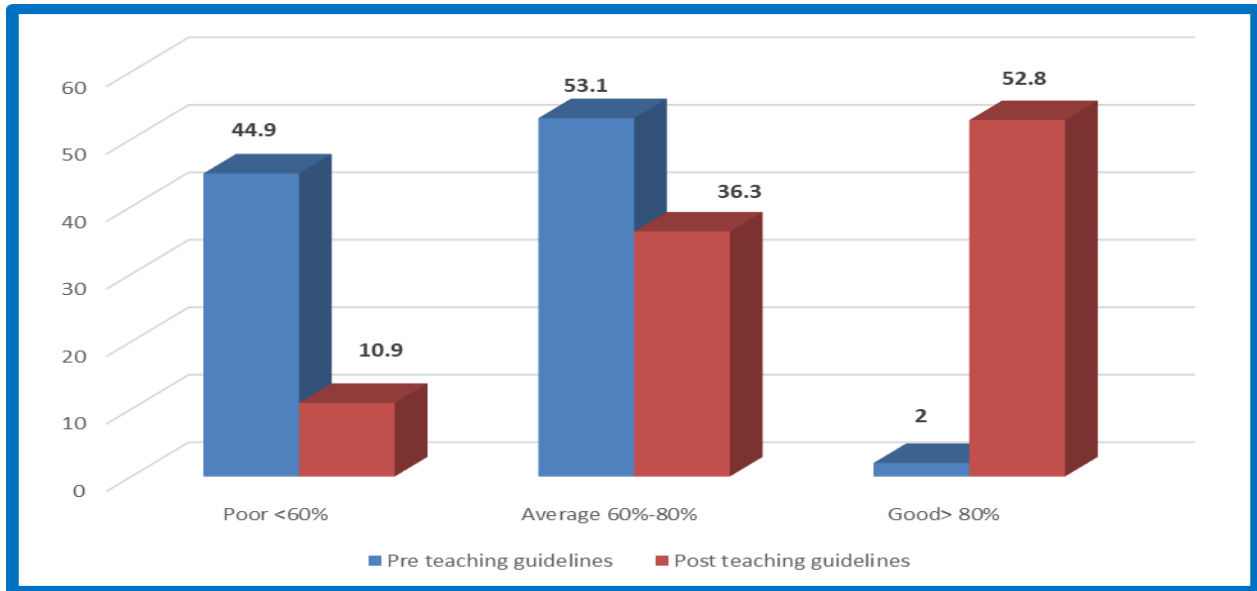


Figure (1): Distribution of total knowledge level among the studied nursing students regarding computer vision syndrome pre and post teaching guidelines implementation (n=303).

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 implementation) (n= 303)	Awareness (post guidelines implementation) (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 $p < 0.001$.

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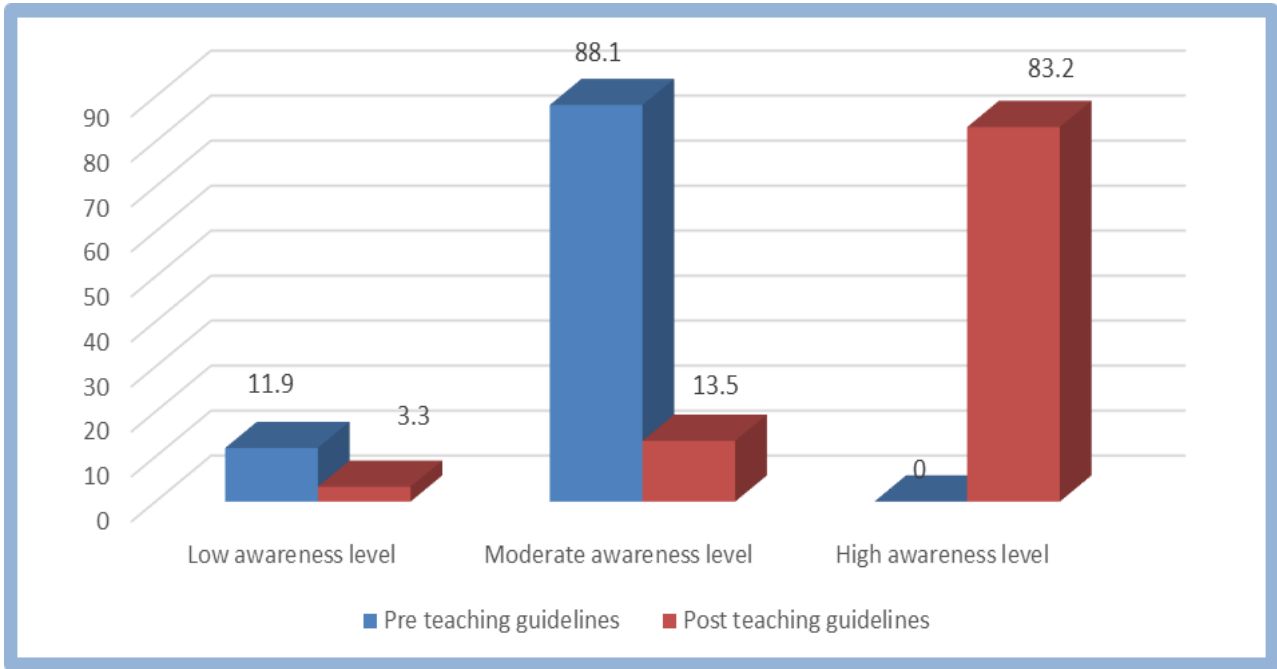


Figure (2): Distribution of total awareness level among the studied nursing students regarding computer vision syndrome pre and post teaching guidelines implementation (n=303).

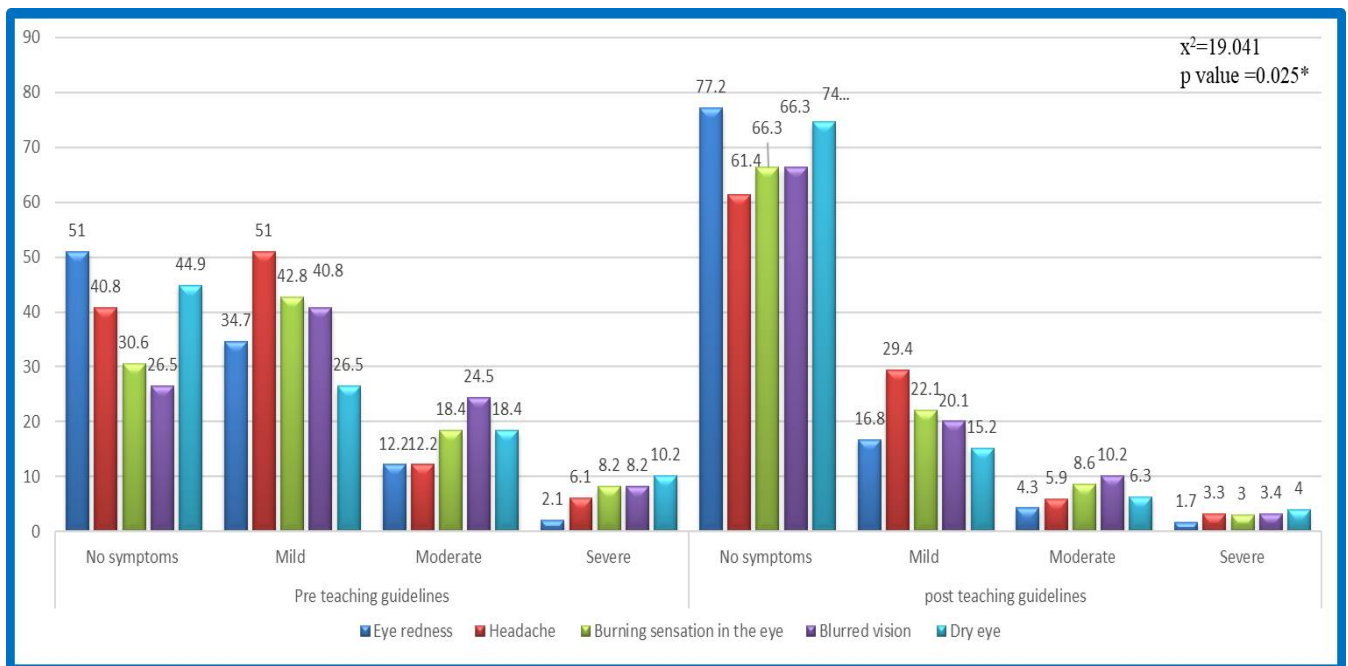


Figure (3): Difference between the studied nursing students' according to severity of experienced symptoms after using computer pre and post teaching guidelines implementation (n=303).

Table (4): Correlation between total knowledge, awareness and presence of symptoms among the studied nursing students during pre and post teaching guidelines implementation (n=303)

r-\ p values variable	Periods	Total knowledge		Presence of symptoms	
		R	P value	r	P value
Total awareness	Pre guidelines implementation	0.357	<0.001**	0.125	0.029*
	Post guidelines implementation	0.491	<0.001**	0.132	0.021*
Total knowledge	Pre guidelines implementation	-	-	0.287	<0.001**
	Post guidelines implementation	-	-	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 the studied students 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 the second year of the Faculty of Nursing, Benha University and their ages ranged between 19-20 years. This result is in the same line with Altalhi et al., (2020) in a study about "Computer vision

syndrome among health sciences students in Saudi Arabia: prevalence and risk factors", who reported that the median age of the participants was 20 years of age.

The results of the current study disagree with Ismiani, et al., (2023) in a study "The Effect of a 20-20-20 Rule Educational Intervention on Computer Vision Syndrome", who revealed that more than half participants age was thirty to thirty-nine years old.

As regard gender, 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 by Mahmoud & Sabbour, (2021) about "Effect of Educational Intervention about Computer Vision Syndrome on the Severity of Eye Complaints among Computer Users" who showed that more than two thirds of the studied students were female.

On the other hand, the current study is incongruent with a study conducted by Tesfaye et al., (2022) in a study entitled

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"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 were male.

Concerning using mobile/ computer daily, the current study showed that, most of participants using computer/ mobile daily, because the need for it has increased especially with e-learning. It also an easy, fast and effective way to obtain information. This result is similar to **Manjusha, (2023)**, in a study entitled "Effectiveness of educational pamphlet on knowledge regarding computer vision syndrome among higher primary children in a selected urban school Mangalore" who showed that, less than two thirds of participants using computer daily. This study disagreed with **Mondal & Shirin, (2021)**. In a 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 the studied students used it for education. From the researcher's point of view, because of the ease and speed of access to information, most students use computers to quickly access information and conduct research. This result is compatible 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" who showed that, the majority of students use computer for reading and writing teaching material. While this result incongruent with **Zulkiflee & Ali, (2022)** about

"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 used computer for 3-6 hours per day. Due to majority of students use 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 by **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 among IT workers in Kathmandu, Nepal" who found that most of participants using computer >10 hours/ day.

Regarding wearing glasses, the current study showed that, more than three quarters of the studied students were not wearing glasses when using computer. From researcher's point of view, it may be due to lack of awareness of dangers produced by electronic devices and its negative effect in eyes. This study supported by **Astuti et al., (2020)** in a study entitled "The determinant factors affecting the event of computer vision syndrome (CVS) on helpdesk employees at PT", which showed that, more than two thirds of the studied subjects 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" and announced about more

than half of participants were wearing eye glasses while working at the computer.

Regarding performing any eye examination, the current study showed that less than three quarters of the studied students didn't make eye examination. From researcher's point of view, it may be due to lack of awareness of the dangers of blue light emitted from electronic devices to eyes. This finding is supported by **Sayed et al., (2020)** who 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" and illustrated that majority of participants didn't perform any eye examinations. Also, this study different with **Chauhan et al., (2018)** who conducted a study entitled "Knowledge, awareness and practice of CVS in digital device users" who found that almost two thirds performed past consultation for eye examination.

In relation to suffering from any eye diseases, the results of the current study revealed that the majority of the studied students didn't suffer from eye disease. From researcher's view, it may be due to the studied students are young and therefore rarely suffer from eye diseases. This result agrees with **Poudel & Khanal, (2020)**, in a study entitled "Magnitude and determinants of computer vision syndrome (CVS) among IT workers in Kathmandu, Nepal" who showed that more than half of participants didn't suffer from eye disease.

On the other hand, this finding disagreed with **Abudawood et al., (2020)** in a 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 students' total knowledge level, the present study illustrated that there was 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. It reflects the positive effect of the educational guidelines on improving of students' knowledge. According to researchers' opinion, this improvement is 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, this finding is 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" who 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. These findings disagree with **Dessie et al., (2018)** in a study "Computer vision syndrome and associated factors among computer users in Debre Tabor Town, Northwest Ethiopia" who illustrated that more than half of participants had good level of knowledge without implementation of guidelines.

Regarding students' awareness level. the result of current study noticed that, students' awareness improved from 33.26 ± 10.31 pre guidelines implementation to 36.81 ± 11.23 post guidelines implementation. In addition, there were highly statistical differences

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between their mean scores pre guidelines implementation as compared to post guidelines implementation $p < 0.001$. From researcher's 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 years and had university educational level. This can aid in better knowledge synthesis and retention. This finding is supported by **Muma et al., (2019)** who performed a study about "Level of Awareness, Perception and Uptake of Interventions for Computer Vision Syndrome Among University Students, Maseno, Western Kenya" and mentioned that there was significant difference into students' awareness between pre and post intervention.

This finding disagreed with **Alatawi et al., (2022)** who conducted a study about "Self-reported student awareness and prevalence of computer vision syndrome during COVID-19 pandemic at Al-Baha University" who 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.

This study is supported by **Mahmoud & Sabbour, (2021)** who 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 revealed 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 are in agreement with **Sayed et al., (2020)** in Egypt, which aimed 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" and found that the entire study sample had moderate or severe complaints. After implementation of program show improvement in eye complains.

The current study revealed that, there was a highly significant correlation between total knowledge and awareness during pre and post guidelines ($p\text{-value} = <0.001$), also with presence of symptoms ($p\text{-value} = <0.001$ & 0.002 , respectively). Moreover, there was a significant correlation between presence of symptoms and awareness ($p\text{-value} = 0.029^*$) pre guidelines and ($p\text{-value} = 0.021^*$) post guidelines. From researcher's point of view, 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.

The same finding was reported by **Dessie et al., (2018)** who conducted a study entitled "Computer Vision Syndrome and Associated Factors among Computer Users in Debre Tabor Town, Northwest Ethiopia" who

conferred that knowledge was a significant predictor of digital eye strain 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. This result is 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" who illustrated that a significant negative correlation between total reported eye complaints and the total knowledge score of the studied computer users.

Conclusion:

Implementation of teaching guidelines has proven to be highly effective in improving students' awareness regarding computer vision syndrome with high statistically significance differences between pre and post teaching guidelines, which supported the research hypothesis.

Recommendations:

For education:

- 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.

- Organizing university-based awareness programs regarding CVS for students and working personnel.

For research:

- The need for continuous educational and training programs for prevention of computer vision syndrome.
- Establishing awareness campaigns about digital eye strain 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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تأثير إرشادات التدريس المنظم في توعية طلاب التمريض تجاه متلازمة الرؤية الحاسوبية

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في هذه الأيام، أصبح استخدام الكمبيوتر أو أي جهاز عرض مرئي آخر أمرًا ضروريًا تقريبًا. ونتيجة لذلك، يعاني عدد كبير من الأشخاص في جميع أنحاء العالم من مجموعة من الأعراض البصرية، مثل جفاف العين، وإجهاد العين، وتهيج العين، واحمرار العين. متلازمة رؤية الكمبيوتر هي المصطلح المستخدم لوصف كل هذه التشوهات البصرية. هدفت هذه الدراسة إلى تقييم تأثير إرشادات التدريس المنظمة على وعي طلاب التمريض فيما يتعلق بمتلازمة رؤية الكمبيوتر. وتم استخدام تصميم شبه تجريبي قبل/ بعد البحث لتحقيق هدف هذه الدراسة. وقد أجريت هذه الدراسة في كلية التمريض، جامعة بنها، محافظة القليوبية، مصر على عينة ملائمة من طلاب الفرقة الثانية (303) من كلا الجنسين في المكان المذكور سابقًا خلال وقت جمع البيانات ووافقوا على المشاركة في هذه الدراسة. وتم استخدام أداتين لجمع البيانات؛ الأداة الأولى (1) استبيان المقابلة المنظمة: يتضمن الجزء الأول البيانات الشخصية للطلاب، الجزء الثاني: يهتم بتقييم معرفة الطلاب فيما يتعلق بمتلازمة الرؤية الحاسوبية والجزء الثالث: وجود الأعراض بعد استخدام الكمبيوتر و الأداة الثانية (2) مقياس مستوإالوعى حول متلازمة الرؤية الحاسوبية. وظهرت النتائج انه فيما يتعلق بإجمالى معلومات الطلاب حول تطبيق إرشادات التدريس قبل وبعد تطبيق متلازمة الرؤية الحاسوبية, لا يوجد أحد من الطلاب (0.0%) لديه معلومات جيدة حول التدابير الوقائية الخاصة بالكمبيوتر قبل تنفيذ إرشادات التدريس. بينما تحسنت بعد تنفيذ إرشادات التدريس, حيث أن 64.0% لديهم معلومات جيدة. وكذلك, تحسن متوسط وعي طلاب التمريض حول متلازمة الرؤية الحاسوبية من 10.31 ± 33.26 قبل تنفيذ إرشادات التدريس إلى 11.23 ± 36.81 بعد تنفيذ إرشادات التدريس. كما أثبتت إرشادات التدريس فعاليتها العالية في تحسين وعي طلاب التمريض بخصوص متلازمة الرؤية الحاسوبية، مما يدعم فرضيات البحث. واوصت الدراسة بتطوير برنامج تدريبي مريح كجزء من برنامج التدريب الأساسى لجميع مستخدمي الحاسوب.