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PREVALENCE OF COMPUTER VISION SYNDROME AMONG MEDICAL STUDENTS OF BAHIR DAR UNIVERSITY NORTHWEST ETHIOPIA

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BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCE GRADUATE STUDY PROGRAM

PREVALENCE OF COMPUTER VISION SYNDROME AMONG MEDICAL STUDENTS OF BAHIR DAR UNIVERSITY NORTHWEST ETHIOPIA

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A RESEARCH PAPER SUBMITTED TO BAHIR DAR UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCE SCHOOL OF MEDICINE, IN PARTIAL FULFILLMENT FOR THE PROGRAM OF SPECIALITY IN OPHTHALMOLOGY

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Summary Table

Title of proposal	Prevalence of computer vision syndrome among Medical students of Bahir Dar university
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Total budget	26,145 Eth birr
Study period	From October 2025 to December 2025 G.C
Study area	Tibebe Ghion Specialized Hospital, Bahir Dar, Ethiopia

Declaration

I hereby declare that this thesis entitled *"Prevalence of Computer Vision Syndrome and Associated Factors among Medical Students at Bahir Dar University"* is my original work and has not been submitted to any other university or institution for the award of any degree. All sources of information used in this study have been properly acknowledged and cited.

Ethical clearance was obtained from the Institutional Review Board of the College of Medicine and Health Sciences at Bahir Dar University prior to data collection.

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Abstract

Introduction: Computer Vision Syndrome (CVS) is a common occupational health problem among individuals who use digital devices for prolonged periods, particularly university students. Computer Vision Syndrome encompasses a range of ocular and extra-ocular symptoms that may negatively affect academic performance and quality of life.

Objective: To determine the magnitude of Computer Vision Syndrome and identify associated factors among medical students at Bahir Dar Universityfrom October 2025 to December 2025.

Methods: An institution-based cross-sectional study was conducted at Bahir Dar University among 356 medical students from October 2025 to December 2025. Data were collected using a structured, self-administered questionnaire for assessing socio-demographic characteristics, digital device use, health and behavioral factors, and CVS-related symptoms, with participants selected through stratified random sampling.Descriptive statistics were used to summarize the data. Bivariate and multivariable logistic regression analyses were performed using SPSS version 27.0 to identify factors associated with CVS. Statistical significance was declared at $P < 0.05$.

Results: Among 356 medical students, 274 students (77%; 95% CI: 72.3–81.0) reported experiencing at least one symptom of Computer vision syndrome. The most commonly reported symptoms were eye strain or pain (28.4%), itching sensation (26.7%), burning sensation and eye redness (25.3% each), and headache (24.7%). Nearly half of the participants (49.4%) experienced a mild symptom burden, while 27.0% and 11.2% reported moderate and high symptom burdens, respectively. In multivariable logistic regression, independent predictors of the outcome included smartphone use (AOR = 2.48, 95% CI: 1.30–4.75, P= 0.033), computer use >8 hours/day (AOR = 2.39, 95% CI: 1.18–2.95, P= 0.018), daily caffeinated beverage consumption (AOR = 2.24, 95% CI: 1.05–4.77, P = 0.036), and poor self-rated eye health (AOR = 3.20, 95% CI: 1.50–6.80, P< 0.001) were significantly associated with CVS.

Conclusion and recommendation: Computer Vision Syndrome was highly prevalent among university students. Prolonged screen exposure, smartphone use, poor perceived eye health, and caffeinated beverage consumption were significant predictors. Preventive strategies, including awareness creation, behavioral modification, and promotion of healthy screen-use practices, are strongly recommended.

Keywords: Computer Vision Syndrome, Digital Device Use, University Students, Eye Health, Ethiop

Acknowledgment

I would like to express my heartfelt gratitude for department of public health and department of ophthalmology of CMHS Bahir Dar University for allowing me to conduct this research paper. Next, I would like to sincerely thank my SPH advisors Dr. Amha Admasie and clinical advisors Dr.Yordanos Tsehay and Dr Demeke Tsegaye for your invaluable support and guidance in writing my proposal and final research paper. Your expertise, feedback, and encouragement have been instrumental in shaping my ideas and enhancing the quality of my work.

Acronyms and abbreviation

AOA- American Optometric Association

BDU-Bahir Dar University

CMHS-college of medicine and health sciences

COVID 19- Coronavirus Disease 2019

CVS- Computer vision syndrome

CVS-Q- Computer Vision Syndrome Questionnaire

ED- Electronic devices

GC- Gregorian Calendar

NPC- Near point of convergence

SARS COV2- Severe Acute Respiratory Syndrome Coronavirus 2

SPH- School of Public Health

VDT- Visual Display Terminal

VIF- Variance inflation factor

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1. INTRODUCTION

1.1 Background

Computers are one of the most popular workplace tools in the globe. In the twenty-first century, it has become a requirement and is commonly used in a range of organizations, including academic institutions, government agencies, and the financial sector (1-4).
The American Optometric Association (AOA) defines CVS as a group of eye and vision-related problems resulting from prolonged usage of digital screen (5, 6). It's a set of visual and ocular symptoms that affect people who use electronic devices (ED) for extended periods. These devices include computers, laptops, tablets, e-readers, and smart phones (1, 5, 7). Research indicates that there are two types of risk factors linked to CVS: personal factors, which include things like bad sitting posture, a misaligned eye-screen distance, an incorrect viewing angle, medical conditions, and extended computer use; and computer and environmental factors, which include things like inadequate workstations, poor lighting, low contrast and resolution, a rise in screen glare, excessive brightness, and an uneven distribution of light between the screen and the surrounding workspace(1, 7-9).

A constant use of computer for 3 hours and more per day can cause CVS, which is defined as a complicated eye and vision difficulty linked to the activities that stress the nearby vision during the use of a computer(2). Three possible processes could be blamed for the symptoms of computer vision syndrome(7): First extra-ocular mechanisms, second; accommodative mechanisms, and third ocular-surface mechanisms. Extraocular mechanisms cause musculoskeletal symptoms like shoulder pain, backache, headache, and stiffness in the neck (10-12). These symptoms are closely linked to incorrect computer screen placement and improper postural habits, which result in muscle sprains(11, 12) .Blurred vision, double vision, myopia, hypermetropia, and sluggish focus change are all brought on by accommodative mechanisms(5, 7). After their shift ended, 20% of those who used computers displayed temporary nearsightedness, according to one study(7). Many persons may have minor accommodative or binocular issues that do not create symptoms when performing routine, less stressful visual tasks, but these problems are exacerbated by prolonged digital screen use (7, 8). Ocular surface mechanisms result in symptoms like dry eyes, gritty sensations, burning sensations, and redness following prolonged digital screen use (5, 7).Age, sex, monthly income, occupational status, and years of computer use are among the sociodemographic factors associated with CVS(13). While, alcohol drinking, cigarette smoking(14), and khat chewing are among behavioral factors(13).

Human eyes have various focusing mechanisms for visual display units and printed text; they respond to different stimuli. There are significant differences between reading materials on a computer and printed paper in terms of viewing distance, gaze angles, blinking rate, text appearance, accommodation requirements, and the enlargement of the palpebral fissure during reading. While VDT letters are composed of pixels that are the outcome of the electronic beam striking the screen's phosphor-coated back surface, printed letters are composed of distinct characters throughout their entire surface (15, 16). Each pixel is bright at its center and with decreasing brightness towards the periphery. So that the human eyes cannot sustain focus on the pixel characters(17). Instead the focusing system lags behind the computer screen due to the vertical position of gaze which is preferred position by computer user relative to reading a printed text(18). This point is called the dark focus. Hence the eyes are constantly relaxing to resting point of accommodation or dark focus and struggling to gain focus on the pixels character frequently. This frequent focusing and refocusing of the eye by the ciliary body creates fatigue to the eye and causes accommodative symptoms related to CV(19). This lag of accommodation so leads ocular symptoms related to CVS. In addition to these the images formed by pixels and raster lack sharp edges in turn which creates an under stimulation of accommodation and causes lag of accommodation behind the screen due to blurred characters of texts(17, 19).Therefore, visual work in a computer is demanding and includes frequent saccadic eye movements (ocular motility), accommodation (continuous focusing) and vergence (alignment demands), all of which involve continuous relaxation and contraction of the eye muscles(5).

Some important factors in preventing or reducing the symptoms of CVS have to do with the computer and how it is used. This includes lighting conditions, chair comfort, location of reference materials, the position of the monitor, and the use of rest breaks(5). Most people find it more comfortable to view a computer when the eyes are looking downward. Optimally, the computer screen should be 15 to 20 degrees below eye level (about 4 or 5 inches) as measured from the center of the screen and 20 to 28 inches from the eyes. These materials should be located above the keyboard and below the monitor (5, 20). If this is not possible, a document holder can be used beside the monitor. The goal is to position the documents, so the head does not need to be repositioned from the document to the screen. Position the computer screen to avoid glare, particularly from overhead lighting or windows. Use blinds or drapes on windows and replace the light bulbs in desk lamps with bulbs of lower wattage(5). If there is no way to minimize glare from light sources, consider using a screen glare filter. These filters decrease the amount of light reflected from the screen. Chairs should be comfortably padded and conform to the body. Chair height should be adjusted so the feet rest flat on the floor(20). Arms should be adjusted to provide support while typing and wrists shouldn't rest on the keyboard when typing. To prevent eyestrain, try to rest eyes when using the computer for long periods. Resting the eyes for 15 minutes after two hours of continuous computer use(20). Also, for every 20 minutes of computer viewing, look into the distance for 20 seconds to allow the eyes a chance to refocus. To minimize the chances of developing dry eye when using a computer, try to blink frequently. Blinking keeps the front surface of the eye moist (5, 20).

1.2 Statements of the Problem

Computer vision syndrome (CVS) is the most common 21st-century occupational hazard, which affects more than 70% of all computer users (1, 7, 8, 13, 14). One out of 6 patients requiring eye examinations has computer-related eye problems (9, 10). Without proper vision correction, worker productivity can decrease by as much as 20%(10). CVS is a serious public health issue that results in decreased workplace productivity, higher error rates, lower job satisfaction, and compromised visual ability (14). According to literature approximately 60 million individuals globally suffer from CVS, with 1 million new instances occurring each year (2, 13). The problem of CVS is extremely high in underdeveloped nations because of the inadequate accessibility and use of equipment for personal protection, the high workload, and the restricted break time when using a computer (2, 4, 13, 21).

According to the Vision Council, at least 60% of American men and 65 % of American women reported symptoms of CVS, 80% of adults use digital devices for at least 2 hours daily and more than 65% of adults use at least 2 devices simultaneously. Around 80% of adults use digital devices just before sleep and atleast 70% of adults report that their children have a screen exposure time of at least 2 hours. Simultaneous use of 2 or more devices increased the risk of

CVS compared to the use of 1 device at a time and the reported prevalence was 75 % and 53 % respectively(5, 11). According to systematic review and meta-analysis regarding CVS among computer users in Ethiopia shows, overall prevalence of 73.21%(1) .With reports of 4-8% worse performance on work tasks as a result of visual issues, CVS has been dubbed arguably the most significant contemporary occupational hazard(7). According to different studies University students have more than 71.3% prevalence of CVS, which increases with more than two hours of computer use (7, 10, 11).

Today, nearly all institutions, including homes, colleges, and universities, frequently utilize computers since using computers has become a necessity in the 21st century (1, 7, 11). However, even three hours of use every day increases the chance of developing computer vision syndrome (2). CVS is not well-known or recognized among university students, and there is a high prevalence of poor posture (shoulder hunching) and neck pain among them (7, 9, 11).

CVS is increasingly prevalent due to widespread use of digital devices (11, 13, 22). Understanding its prevalence is essential for public health interventions aimed at preventing and managing ocular health issues among computer users. CVS-related healthcare costs, absenteeism, and reduced productivity impose economic burdens. High prevalence rates indicate a significant burden on healthcare systems, necessitating targeted strategies for early detection, prevention, and treatment of CVS-related symptoms (1, 5, 7, 13, 14). With a large percentage of the workforce affected, CVS can impact productivity and efficiency (11, 13, 23, 24). Despite growing evidence on the association between prolonged screen use and Computer Vision Syndrome (CVS), research in African and Ethiopian contexts had remained limited. Previous studies had focused mainly on office workers, leaving university medical students underrepresented despite their high visual and cognitive demands. Key modifiable risk factors—such as posture, viewing distance, break frequency, multi-device use, and preventive awareness—had not been adequately assessed locally.This study aimed to address these gaps by generating institution-specific evidence among Ethiopian medical students.

1.3 Significance of the study

The findings of the study can lead to the development of health promotion programs focused on educating students about proper ergonomics, screen time management, and eye care practices. Insights may also inform curriculum changes that incorporate training on digital device use and eye health. If a high prevalence of CVS is identified, the university might allocate resources for eye care services, including vision screenings and partnerships with local optometrists. Additionally, understanding CVS's prevalence can address and encourage healthier habits, ergonomic improvements, and potential collaborations with local health organizations.

2. LITERATURE REVIEW

2.1 Magnitude of computer vision syndrome

According to a systematic review and meta-analysis carried out in Turkey during the COVID-19 pandemic, the prevalence of computer vision syndrome was 74% worldwide (14), with Pakistan having the highest prevalence at 99% (25)and Turkey having the lowest at 48%(26). Another systematic review and meta-analysis of 103 cross-sectional studies in Peru revealed the prevalence of CVS 69.0% ranging from 12.1 to 97.3% across studies (6).

Cross-sectional study was conducted among undergraduate students at the American University of Armenia, CVS prevalence was 78.3%, predominantly affecting women 79.7%. Common symptoms included eye redness 74.6%, headache 72.5%, itching 71.2%, burning 70.5%, tearing 66.7%, and blurred vision 63.4%(11).

According to descriptive cross-sectional design study among the general population in the eastern region of Libya, 38.6% of the general population reported having computer vision syndrome. Neck Pain, which was reported by 57.5% of participants, indicating a common discomfort associated with prolonged computer use (9). While cross-sectional survey of medical students at the University of Khartoum in Sudan, 94% reported at least one symptom and 72.4% reported at least three symptoms of CVS. The most common symptoms were neck and shoulder discomfort (78.5%) and headache (70.5%), with eye redness being the least common (36.2%)(7).

A systematic review and meta-analysis regarding Computer Vision Syndrome (CVS) among computer users in Ethiopia shows, overall prevalence of 73.21% and Bank employees had the highest prevalence of CVS at 73.76%.Blurred vision was the most frequently reported symptom of CVS, with a prevalence of 34.26% (1).

A Web-Based Cross-Sectional Study among instructors in Ethiopian Universities, 70.4% was reported to have CVS. And most of those affected 54.6% were aged 24–33 years. Blurred vision, pain in and around the eye, and eye redness were the predominant symptoms (2).

According to an institution-based cross-sectional study of academic personnel at the University of Gondar in Northwest Ethiopia, the prevalence of CVS was 78.8%, with the majority of participants (71.60%) being male(13).However, another institution-based cross-sectional study design among Engineering Students at Hawassa University in Hawassa, Ethiopia, found a 41.7% prevalence of Computer Vision Syndrome (10).

A cross-sectional study was conducted in Debre Tabor town from February to March, 2016 and the prevalence of CVS 69.5%. Blurred vision, eyestrain, and eye irritation were the commonest reported symptoms of CVS with proportion of 62.60%, 47.63%, and 47.40%, respectively (3).

2.2 Associated factors with computer vision syndrome

A systematic review and meta-analysis of cross-sectional studies in Peru reveals a substantially high frequency of CVS among women (71.4%), university students (76.1%), and in specific geographical locations like Africa (71.2%), Asia (69.9%), with additional characteristics such as contact lens use (73.1%)(6).

Undergraduate students at the American University of Armenia completed a cross-sectional study, revealing that 62.2% had refractive errors and 17.5% mentioned allergies as their most common chronic disease. A smoking rate of 9.0% was one of the lifestyle variables. It is noteworthy that participants used computers or visual display terminals (VDT) for an average of 5.5 hours per day before the SARS-CoV-2 epidemic, although only 10.7% took break every 20 minutes(11).

According to a descriptive cross-sectional study in eastern Libya, computer vision syndrome was considerably prevalent among the general population over 45 years old, with 69% of women. In terms of occupation, 64.1% were students, 17.2% were non-healthcare workers, and 11.3% were healthcare employees. A significant majority (86.7%) reported using a computer daily, with 45.9% doing so for more than six hours per day, highlighting a strong association between prolonged computer use and the risk of developing CVS(9).

A systematic review and meta-analysis regarding Computer Vision Syndrome (CVS) among computer users in Ethiopia shows Previous history of eye disease, inappropriate sitting position, frequent use of a computer, using eyeglasses/spectacles were significantly associated with CVS among computer users in Ethiopia(1).

A Web-Based Cross-Sectional Study among instructors in Ethiopian Universities, Working in third-established universities, Being female, age 44 years and above, frequent computer use and sitting in a bent back position were significantly increased the odds of CVS(2).

An institution-based cross-sectional study design among Engineering Students at Hawassa University Hawassa, Ethiopia, found that factors significantly associated with CVS included urban residence, not using glasses, frequent reading and playing games on a Visual Display Terminal (VDT), frequent reading and watching movies on a VDT, not using a smartphone, and moderate VDT screen size(10).

An another institution-based cross-sectional study at the University of Gondar, Northwest Ethiopia discovered that being male, using a computer for more than 9 years, using visual display terminals, and working in improper illumination levels (<300 and >500 lux) increased the odds of CVS. However, using eye droplets and taking rest breaks were protective factors(13).

A cross-sectional study was conducted in Debre Tabor town from February to March, 2016 and Officer and secretary, daily computer usage, and preexisting eye disease were risk factors for CVS(3).

3. Conceptual framework

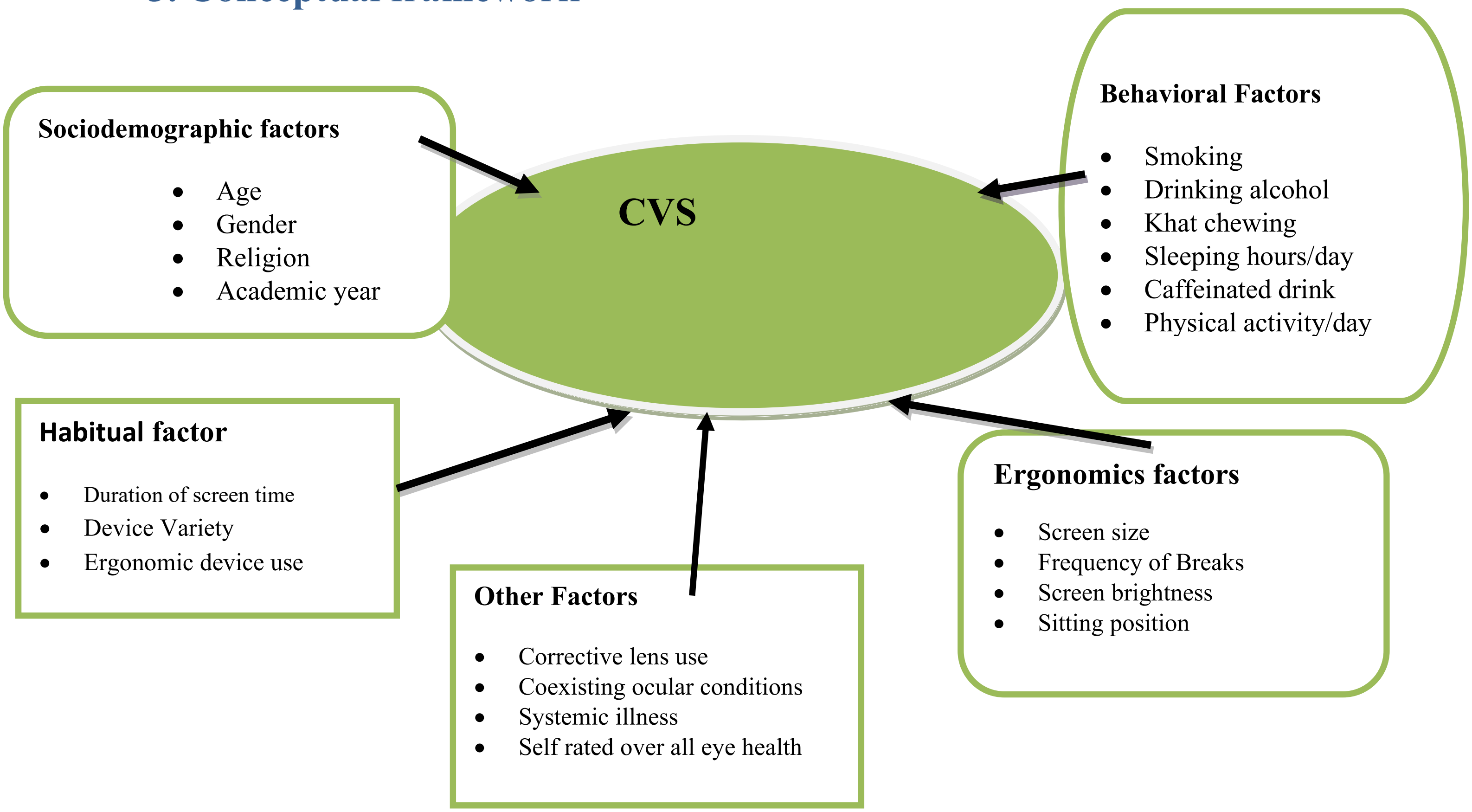

Figure 1: schematic presentation of conceptual framework of CVS and risk factors

4. Objectives of the study

4.1 General Objectives

To determine the prevalence of computer vision syndrome and associated factorsamong medical students in Bahir Dar University, Bahir Dar, Amhara regional state, Ethiopia, from October 2025 to December 2025 G.C.

4.2 Specific Objectives

- To determine the overall prevalence of CVS among the medical students in BDU.
- To identify associated risk factors of CVS among the medical students in BDU.

5. METHODOLOGY

5.1 Study designand period

An institution-based cross-sectional study design was employed to assess the prevalence of CVS among medical students at Bahir Dar University (BDU), College of Medicine and Health Sciences. The study was conducted from October 2025 to December 2025 G.C.

5.2 Study area

The study was conducted at the College of Medicine and Health Sciences of Bahir Dar University, located in Bahir Dar city, Amhara Regional State, northwest Ethiopia. Bahir Dar city is approximately 495.8 kilometers from Addis Ababa, the capital city of Ethiopia. According to the 2007 national census projection, the city has an estimated population of 332,856. Bahir Dar University consists of two academies, five schools, four institutions, seven faculties, and four colleges. The College of Medicine and Health Sciences, established in 2007, is one of the five colleges. During the study period, a total of 525 medical students were enrolled in the college, of whom 257 were male and 268 were female. These included 84 first-years, 94 second-year, 60 third-year, 90 fourth-year, 94 fifth-year, and 103 sixth-year students.

5.3 Source population

The source population comprised all students at the CMHS enrolled at Bahir Dar University during the study period.

5.4 Study population

The study population included medical students at Bahir Dar University from first year to sixth year.

5.5 Exclusion and Inclusion Criteria

5.5.1Inclusion Criteria

All medical students of Bahir Dar University who had been enrolled for at least six months, used visual display terminal (VDT) devices such as computers, laptops, tablets, e-readers, and smartphone, and were available during the data collection period were included in the study.

5.5.2. Exclusion Criteria

Those with a history of advanced ocular diseases associated with severe visual impairment, and students younger than 18 years of age (minors requiring parental consent) were excluded from the study.

5.6Sample Size

The sample size was determined using a single population proportion formula, assuming a prevalence of CVS of 70%(2) based on previous studies, a 95% confidence level (Z = 1.96), and a margin of error of 5%. A 10% non-response rate was added to compensate for possible non-participation.

The formula used was:

$n = (Z^2 \times p \times (1 - p)) / d^2$

Where:

n = initial sample size

Z = 1.96 (Z-score for 95% confidence level)

p = estimated prevalence of CVS (0.70)

d = margin of error (0.05)

Accordingly:

$n = (1.96)^2 \times [0.70 \times (1 - 0.70)] / (0.05)^2$

$n = 322.68 \approx 323$

After adding a 10% non-response rate, the final sample size became 356.

5.7Sampling Technique

The study population consisted of 525 medical students, and the calculated sample size required was 356. Stratified randomsamplingwas employed, with each of the six academic years forming a separate stratum. To ensure fair representation across all years, proportional allocation was applied: the number of participants selected from each academic year was determined by dividing the number of students in that year by the total population (525) and then multiplying by the total sample size (356). Finally,participants within each stratum were selected using random sampling, ensuring that every student had an equal chance of being included in the study. Twelve selected students declined to participate, nine lost the questionnaire, and four could not be traced. Replacements were therefore selected from other participants who met the same inclusion criteria within the same academic year stratum. Figure 2 illustrated the procedure of the sampling technique.

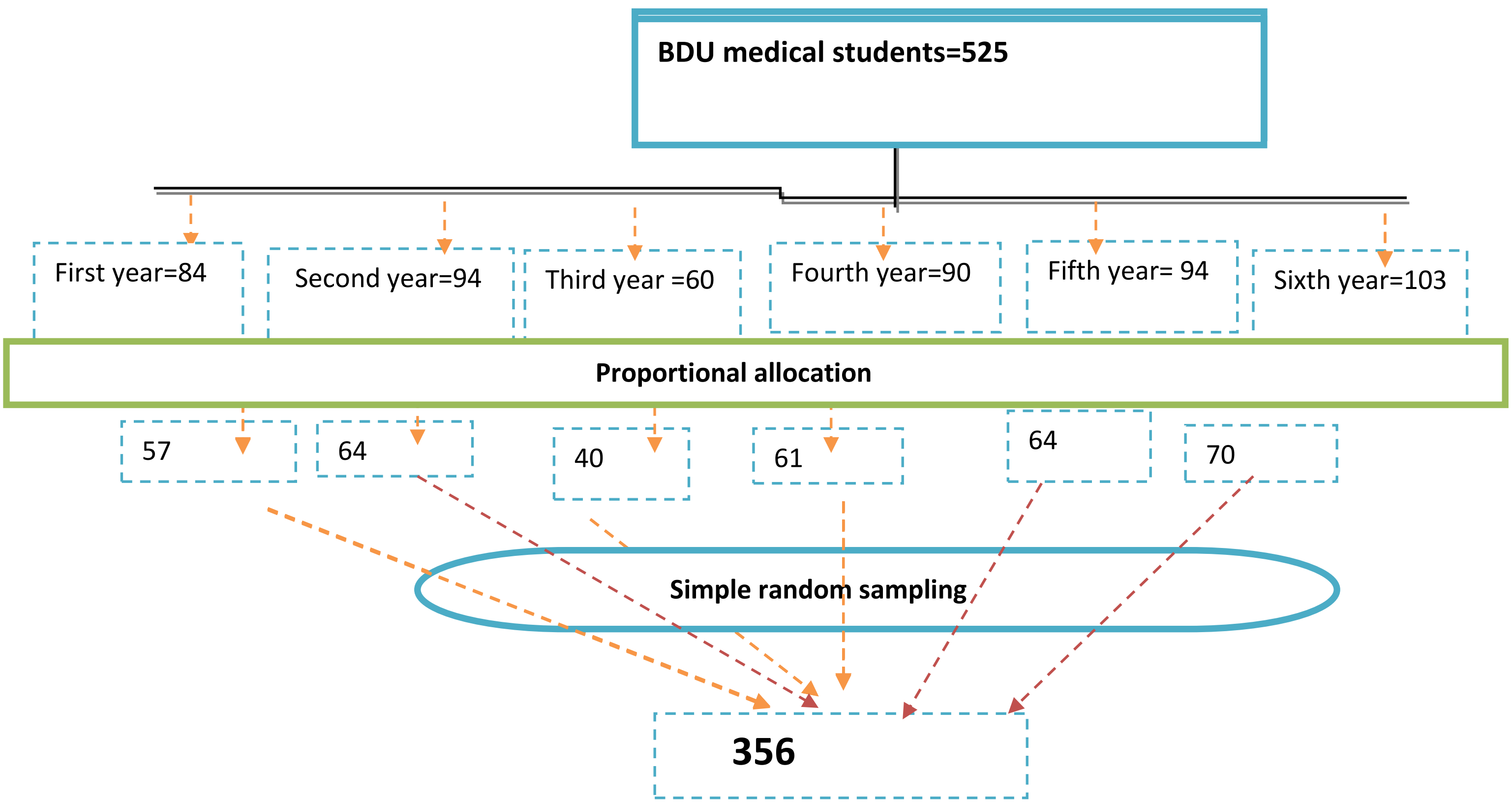

Figure 2: schematic presentation of sampling procedures

5.8Variables of the study

5.8.1 Dependent variable

- CVS(all 16 Symptoms)

5.8.2 Independent variable

- Sociodemographic factors
  - Age
  - Gender
  - Academic year
  - Religion
- Ergonomics factors
  - Breaks
  - Blinking rate
  - Screen brightness
  - Sitting position
- Behavioral Factors
  - Smoking
  - Drinking alcohol
  - Khat chewing
  - Caffeinated drink
  - Exercise activity
- Habitual factor
  - Duration of screen time
  - Device Variety
  - Ergonomic device use
- Other Factors
  - Refractive error
  - Corrective lens use
  - Coexisting ocular conditions
  - Systemic illness
  - Self rated over all eye health

5.9Operational definitions

Computer vision syndrome (CVS):the presence of at least one symptom in one or 2 eyes at any time during the last 12 months. The symptoms include eye strain or pain, burning sensation, feeling of eye dryness, blurred vision, headaches, neck or shoulder pain, difficulty focusing for near vision, watery eyes or tearing, increased sensitivity to light, itching sensation, eye redness, heavy eyelids, excessive blinking, feeling of a foreign body, colored halos around objects, and double vision(5, 13).

Viewing distance*:* the distance from the eye of the user to the computer screen in centimeters(13)

A habit of taking rest breaks*:* a brief rest break taken every 60 to 120 minutes. During this break, a respondent may stand up, move around, or do something else, get a beverage, take coffee or tea, chat up a coworker, or take a lap around the office(13)

Screen time:duration of time an individual spends looking at digital screens, such as computers, tablets, smartphones, or televisions (5, 7)and quantified in hours and digital screen use for less than 3 hrs perday is optimal(7).

Seating position; Chairs should be comfortably padded and conform to the body. Chair height should be adjusted so the feet rest flat on the floor. Arms should be adjusted to provide support while typing and wrists shouldn't rest on the keyboard when typing(5)

Severe visual impairment; best corrected visual acuity less than 6/60 based on Snell's Chart or counting finger at 6 meter and below (5)

5.10. Data Collection

Data were collected using a structured, self-administered questionnaire (CVS-Q). Senior physicians supervised the data collection process, and trained optometrists served as data collectors. The questionnaire was pretested on 5% (approximately 18) of the total sample size, and necessary modifications were made based on the pretest findings. The questionnaire required approximately five to ten minutes to complete and consisted of several sections. These included sociodemographic information, symptoms of CVS (such as dry eyes, headache, burning sensation, blurred vision, red eyes, and neck or shoulder pain….), and patterns of electronic device usage. The tool also evaluated corrective lens use and ergonomic practices, including viewing distance, sitting posture, screen brightness, use of screen filters, total daily screen time, and the frequency and duration of breaks. In addition, information on existing ocular or systemic conditions, as well as self-rated overall eye health, was collected. Lifestyle-related factors assessed comprised sleep duration, physical activity, and intake of caffeinated beverages, tobacco use, alcohol consumption, and khat chewing. Supervision by senior physicians ensured data accuracy and completeness, while the involvement of optometrists facilitated effective communication with participants and clarification of eye-related questions.Participants who self-reported symptoms of CVS that interfered with their daily activities informed the investigator. These participants were referred to the university hospital ophthalmology clinic, where they received a professional eye examination and appropriate treatment.

5.11 Data Analysis

Categorical variables were first coded numerically, and data were entered into statistical package for social sciences (SPSS) version 27.0. The dataset was then checked for completeness, consistency, and accuracy. Finally, the data were analyzed using the same software. Binary logistic regression was used for both bivariate and multivariate analyses to examine associations between independent variables and the outcome variable. In the bivariate analysis, each independent variable was assessed separately, and variables with a P-value of less than 0.25 at the 95% confidence level were selected for inclusion in the multivariable model. In the multivariate analysis, variables with a p-value of less than 0.05 were considered statistically significant predictors of the outcome.

5.12 Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board (IRB) of the College of Medicine and Health Sciences at Bahir Dar University, and a letter of cooperation was secured. Prior to data collection, participants were informed about the purpose, procedures, potential benefits, and risks of the study. Written informed consent was obtained from all participants. Confidentiality was maintained by excluding personal identifiers, and all collected data were used solely for research purposes.

5.13 Dissemination of results

The findings of the study will be presented to the Bahir Dar University community and submitted to the Department of Ophthalmology as well as the College of Medicine and Health Sciences Research Office. Additionally, the results will be disseminated through presentations and posters at scientific conferences and meetings and may be shared with relevant academic and health institutions to contribute to the existing body of knowledge and inform future research and practice.

6. Results

6.1 Socio-demographic characteristics of the participants

Overall, 356 medical students provided complete responses, of whom 274 (77%; 95% CI: 72.3–81.0) reported experiencing at least one symptom related to CVS. The mean age was 23.2 years (median 23 years), with 53.1% male and 46.9% female participants. Most identified as Orthodox Christian (80.6%), with smaller groups of Muslims (10.7%) and Protestants (7.6%); Catholics and other faiths made up less than 1%. Students came from every academic year, with the biggest shares in sixth year (19.7%) followed by fifth and second years (18.0% each). Overall, 75.1% of the male (142 out of 189) and 79.0% of the female (132 out of 167) described at least one symptom of computer vision syndrome, but the difference between genders wasn't significant. Looking at age, religion, or year of study produced the same pattern: symptom rates stayed steadily high—generally between 71% and 80%—with no subgroup standing out as more or less affected. The consistent picture across the board points to CVS being extremely common among these young adultsas shown in Table 1.

Table 1: Demographic characteristics and prevalence of Computer Vision Syndrome (CVS) among medical students at Bahir Dar University(n=356)

Characteristic	Category	CVS Yes (n=274)	CVS No (n=82)	Total (n=356)	Prevalence of CVS (%)
Age (years)	18–28 (range)	—	—	356	77.0% overall
Gender	Male	142	47	189	75.1%
	Female	132	35	167	79.0%
Religion	Orthodox	225	62	287	78.4%
	Muslim	27	11	38	71.1%
	Protestant	20	7	27	74.1%
	Catholic /Others	2	2	4	50.0%
Year of study	6th year	56	14	70	80.0%
	5th year	47	17	64	73.4%
	4th year	48	13	61	78.7%
	3rd year	29	11	40	72.5%
	2nd year	50	14	64	78.1%
	1st year	44	13	57	77.2%

6.2 Digital devices and purpose of use

Among therespondents, most people reported using one or two screens, with 43.8% using just one and 42.1% using two, while only a small number used three (12.6%) or four screens (1.4%). When looking at the types of devices, Smartphone were by far the most popular (71.9%), followed by laptops (58.1%), tablets (32.9%), anddesktop computers (8.4%), showing that most participants relied onportable devices. In terms of what people used their screens for, the majority focused onacademic activities, with 93.5% reporting this purpose. Social media was also common (62.1%), while streaming videos (14.0%) and gaming (8.7%) were less frequent. Overall, it appears that most respondents use one or two devices primarily for academic and social purposes, with smartphones and laptops being the go-to devices for daily screen use. Table 2 summarizes the pattern of screen usage.

Table 2: Screen Usage Patterns amongmedical students at Bahir Dar University (n=356)

Characteristic	Category	Total (n=356)
Number of screens used	One screen	156 (43.8%)
	Two screens	150 (42.1%)
	Three screens	45 (12.6%)
	Four screens	5 (1.4%)
Types of devices	Smartphone	256 (71.9%)
	Laptop	207 (58.1%)
	Tablet	117 (32.9%)
	Desktop computer	30 (8.4%)
Primary purposes of screen use	Academic activities	333 (93.5%)
	Social media	221 (62.1%)
	Streaming videos	50 (14.0%)
	Gaming	31 (8.7%)

6.3 Health and behavioral characteristics of the participants

Most medical students (90.2%) had no prior eye conditions; among those who did, refractive errors (5.1%) and dry eye syndrome (2.5%) were most common as shown in Figure 3. Only 11.2% wore corrective lenses. The majority sat <50 cm from screens (64.6%) with low ergonomic equipment use (8.7%). Brightness was adjusted by 81.2%, but blue light filters (26.1%) and larger text (11.0%) were uncommon. Other health conditions were rare (2.5%), and eye health was rated positively (53.9% good, 31.5% excellent).Table 3 shows the summary of Health and Behavioral Characteristics of Participant.

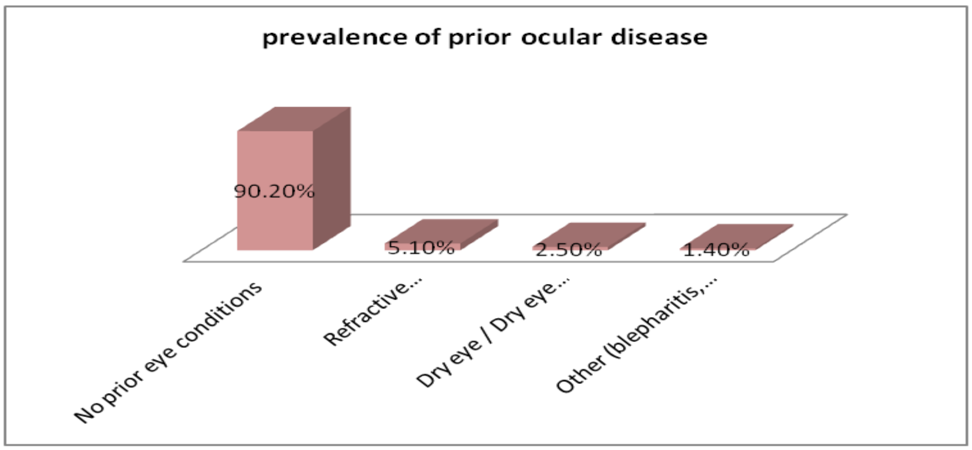

Figure 3; Prevalence of Prior Eye Conditions

Table 3; Health and behavioral characteristics among medical students at Bahir Dar University (n=356)

Category	Key Finding	Percentage
Corrective Lenses Use	Wear corrective lenses	11.2%
	Sometimes	48.8%
	Always	34.1%
Screen Distance	Sit < 50 cm from screen	64.6%
Ergonomic Equipment	Use ergonomic equipment	8.7%
Screen Adjustments	Adjust brightness	81.2%
	Use blue light filters	26.1%
	Increase text/icon size	11.0%
Other Medical Conditions	Other conditions (asthma, diabetes, hypertension, allergic rhinitis, migraine, sinusitis, et.)	2.5%
Self-Rated Overall Eye Health	Excellent	31.5%
	Good	53.9%
	Fair	12.1%
	poor	2.5%

6.4 Magnitude of computer vision syndrome

A total of 356 participants were assessed for symptoms related to Computer Vision Syndrome (CVS). Overall, 274 participants (77%; 95% CI: 72.3–81.0) reported experiencing at least one CVS-related symptom, while 82 participants (23.0%) reported no symptoms. Cross tabulation of gender and CVS symptoms showed that a slightly higher proportion of females (132/167, 79.0%) reported CVS symptoms compared to males (142/189, 75.1%), indicating that CVS symptoms are common in both genders, with a slightly higher prevalence among females.

The most commonly reported individual symptoms were eye strain or pain (101 participants, 28.4%), itching sensation (95 participants, 26.7%), burning sensation and eye redness (each 90 participants, 25.3%), and headaches (88 participants, 24.7%). Other symptoms included neck or shoulder pain (22.2%), increased sensitivity to light (21.9%), eye dryness (20.2%), watery eyes/tearing (19.9%), blurred vision (18.5%), feeling of a foreign body (15.2%), excessive blinking (12.1%), heavy eyelids (8.4%), difficulty focusing for near vision (5.6%), double vision (2.2%), and colored halos around objects (1.7%). Table 4 and figure 4show the summarized individual symptoms.

Table 4: prevalence of self-reported computer vision syndrome symptoms among medical students at Bahir Dar University (n=356)

Symptoms of CVS	Number of students reporting symptomN (%)	Number of students not reporting symptomN (%)
Eye strain/pain	101 (28.4)	255 (71.6)
Itching sensation	95 (26.7)	261 (73.3)
Burning sensation	90 (25.3)	266 (74.7)
Eye redness	90 (25.3)	266 (74.7)
Headaches	88 (24.7)	268 (75.3)
Neck or shoulder pain	79 (22.2)	277 (77.8)
Increased sensitivity to light	78 (21.9)	278 (78.1)
Feeling of eye dryness	72 (20.2)	284 (79.8)
Watery eyes/tearing	71 (19.9)	285 (80.1)
Blurred vision	66 (18.5)	290 (81.5)
Feeling of foreign body	54 (15.2)	301 (84.6)
Excessive blinking	43 (12.1)	313 (87.9)
Heavy eyelids	30 (8.4)	326 (91.6)
Difficulty focusing for near vision	20 (5.6)	336 (94.4)
Double vision	8 (2.2)	348 (97.8)
Colored halos around objects	6 (1.7)	350 (98.3)

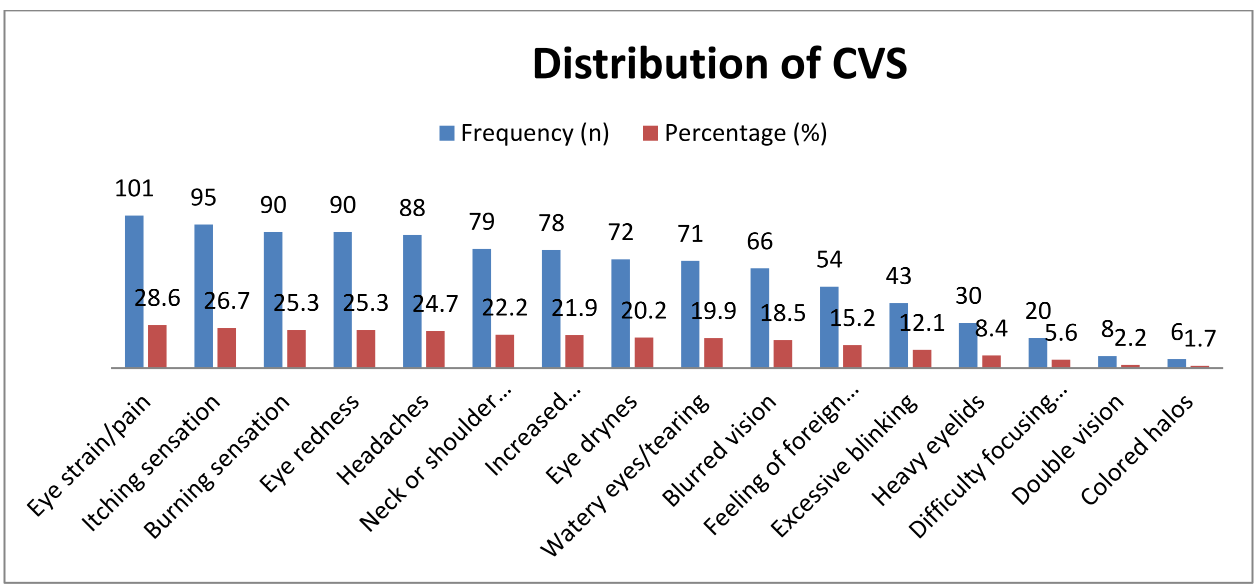

Figure 4: Distribution of CVS symptoms

Among the 274 students with at least one CVS symptom, 176 (64.2%) had a mild burden (1–3 symptoms), 96 (35.0%) had a moderate burden (4–6 symptoms), and 40 (14.6%) had a high burden (≥7 symptoms).which could realistically affect their concentration, study sessions, or overall daily well-being as illustrated in figure 5. Despite how common these symptoms were, only 79 participants (22.2%) said CVS actually interfered with their routine activities or schoolwork, while 195 (54.8%) noticed no real impact. Most strikingly, just 61 students (17.1%) had ever sought medical advice for their symptoms, compared to 213 (59.8%) who had never consulted a healthcare professional.

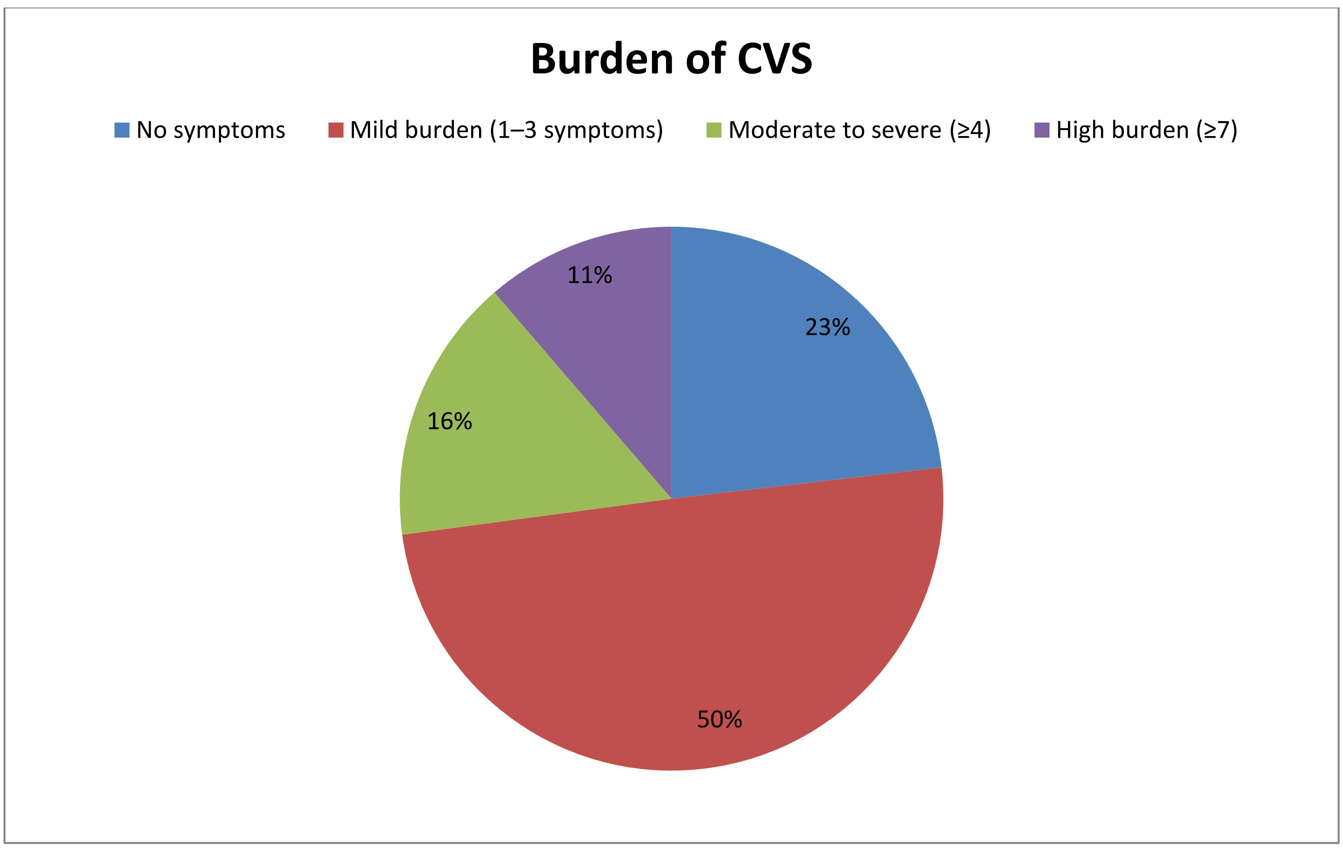

Figure 5: Burden of computer vision syndrome among medical students at Bahir Dar University (n=356)

6.5 Bivariate and Multivariate analysis of associated factors with computer vision syndrome

In the bivariate analysis, several factors appeared to increase the likelihood of the outcome. Participants who rated their eye health as good were more likely to experience the outcome compared with those who rated their eye health as excellent (COR = 8.44, 95% CI: 4.66–15.29, $p < 0.001$). Those who rated their eye health as fair showed an even stronger association (COR = 13.82, 95% CI: 4.03–47.41, $p < 0.001$). Participants who rated their eye health as poor also had higher odds of the outcome (COR = 8.29, 95% CI: 2.97–70.78, $p = 0.053$). Daily consumption of caffeinated drinks (COR = 2.10, 95% CI: 1.12–4.77, $p = 0.114$) and khat chewing (COR = 2.43, 95% CI: 1.18–2.96, $p = 0.122$) were also associated with higher odds. Sleeping below 5 hours per day (COR = 1.99, 95% CI: 1.86–5.20, $p = 0.16$), using a smartphone (COR = 2.75, 95% CI: 1.59–4.75, $p = 0.033$), wearing corrective lenses (COR = 6.44, 95% CI: 1.53–27.10, $p = 0.004$), spending more than 8 hours a day on screens (COR = 1.28, 95% CI: 1.12–1.47, $p = 0.20$), or using ergonomic equipment (COR = 2.13, 95% CI: 1.81–22.3, $p = 0.161$) were all linked to increased odds. Laptop use showed only a weak association (COR = 1.11, 95% CI: 1.03–2.12, $p = 0.107$). These variables were considered for inclusion in multivariate analysis, but all participants with diagnosed eye conditions reported CVS, resulting in a crude odds ratio that was effectively undefined, with the confidence interval and p-value unable to be reliably estimated due to the zero cell. Table 5 summarizes the results of the bivariate analysis showing factors associated with CVS.

Table 5: Bivariate Logistic Regression analysis of CVS among medical students at Bahir Dar University

Variable	Category	CVS Yes	CVS No	Total	COR (95% CI)	p-value
Laptop Use	Yes	161	46	207	1.11 (1.03–2.12)	0.107
	No	113	36	149	Ref	—
	Total	274	82	356	—	—
Smart phone Use	Yes	211	45	256	2.75 (1.59–4.75)	0.033
	No	63	37	100	Ref	—
	Total	274	82	356	—	—
Corrective lens use	Yes	38	2	40	6.44(1.53–27.10)	0.004
	No	236	80	316	Ref	—
	Total	274	82	356	—	—
Ergonomic Use	Yes	27	4	31	2.13(1.81–22.3)	0.161
	No	247	78	325	Ref	—
	Total	274	82	356	—	—
Khat chewing	Yes	8	1	9	2.43(1.18–2.96)	0.122
	No	266	81	347	Ref	—
	Total	274	82	356	—	—
Diagnosed eye disease	Yes	35	0	35	undefined	_
	No	239	82	321	Ref	—
	Total	274	82	356	—	—
Hours/day	1–3 hrs	11	4	15	Ref	—
	3–5 hrs	48	15	63	1.16 (1.07–4.17)	0.27
	5–8 hrs	101	30	131	1.22(1.06–4.11)	0.25
	>8 hrs	109	31	140	1.28 (1.12–1.47)	0.20
Self-rated Eye Health	Excellent	55	57	112	Ref	—
	Good	171	21	192	8.44 (4.66–15.29)	<0.001
	Fair	40	3	43	13.82 (4.03–47.41)	<0.001
	Poor	8	1	9	8.29 (2.97–70.78)	0.053
Caffeine Use	No	53	13	66	Ref	—
	Yes, daily	77	9	86	2.10 (1.12–4.77)	0.114
	Occasionally	144	60	204	0.59 (0.30–0.6)	0.129
Sleep Duration	>7 hrs	88	34	122	Ref	—
	5–7 hrs	155	42	197	1.43 (1.25–2.91)	0.18
	<5 hrs	31	6	37	1.99 (1.86–5.20)	0.16

The multivariable logistic regression model was statistically significant (Omnibus $\chi^2 = 70.78$, df = 8, $p < 0.001$) and demonstrated good fit (Hosmer–Lemeshow $\chi^2 = 1.72$, df = 8, $p = 0.989$), explaining 27.3% of the variance in Computer Vision Syndrome (Nagelkerke R^2) with an overall classification accuracy of 78.4%. Multicollinearity was not a concern, as tolerance values ranged from 0.940 to 0.994 and VIF values ranged from 1.006 to 1.064, indicating that all predictors were sufficiently independent. In the analysis, smartphone use was significantly associated with higher odds of the outcome (AOR = 2.48, 95% CI: 1.30–4.75, p = 0.033). Participants who used computers for more than 8 hours per day had increased odds (AOR = 2.39, 95% CI: 1.18–2.95, p = 0.018). Poor self-rated overall eye health was a strong independent predictor (AOR = 3.20, 95% CI: 1.50–6.80, p <0.001). Daily caffeinated beverage consumption was also significantly associated with the outcome (AOR = 2.24, 95% CI: 1.05–4.77, p = 0.036). Conversely, laptop use (AOR = 1.02, 95% CI: 0.54–1.95, p = 0.944), use of ergonomic equipment (AOR = 0.35, 95% CI: 0.10–1.19, p = 0.093), corrective lens use (AOR = 0.28, 95% CI: 0.05–1.54, p = 0.144), khat chewing (AOR = 0.245, 95% CI: 0.03–1.75, p = 0.162), and sleeping ≤5 hours per day (AOR = 1.08, 95% CI: 0.31–3.73, p = 0.900) were not significantly associated after adjusting for other factors. Diagnosed eye conditions were excluded from the multivariate analysis due to zero cells, but their perfect occurrence in bivariate results suggests potential relevance as a risk factor for CVS.Table 6 shows the results of the multivariate logistic regression analysis of factors independently associated with CVS.

Table 6: Multivariate Logistic Regression analysis of CVSamong medical students at Bahir Dar University

Variable	Category	AOR (95% CI)	p-value
Laptop use	Yes vs No	1.02(0.54–1.95)	0.944
Smartphone use	Yes vs No	2.48(1.30 – 4.75)	0.033
Hours/day using computer	1–3 hrs	0.77(0.31–1.94)	0.581
	3–5 hrs	0.90(0.59–1.38)	0.631
	5–8 hrs	0.98(0.74–1.30)	0.865
	>8 hrs	2.39(1.18–2.95)	0.018
Corrective lenses	Yes vs No	0.28(0.05–1.54)	0.144
Ergonomic equipment use	Yes vs No	0.35(0.10–1.19)	0.093
Self-rated eye health	Poor vs excellent	3.20 (1.50 – 6.80)	<0.001
Sleep hours	>7 hrs Vs(5–7 hrs ,<5 hrs)	1.08(0.31–3.73)	0.900
Caffeinated beverages	daily vs No	2.24(1.05–4.77)	0.036
Khat chewing	Yes vs No	0.245(0.03 – 1.75)	0.162

7. Discussion

This study examined the prevalence, symptom profile, and associated factors of Computer Vision Syndrome (CVS) among medical students at Bahir Dar University in Ethiopia. The findings revealed that (77%; 95% CI: 72.3–81.0) of participants experienced at least one CVS symptom, a figure that aligns closely with both national and global estimates, while also highlighting several important risk factors.

The overall prevalence of CVS in this study is consistent with several previous reports from Ethiopia. For example, a systematic review and meta-analysis of CVS among computer users in Ethiopia reported a pooled prevalence of 73.21% (95% CI: 70.14–76.28%), with the highest rates observed among bank employees (73.76%)(1). similarly, institution-based studies have documented comparable figures among academic staff at the University of Gondar (78.8%)(13)and university instructors across Ethiopia (70.4%)(2). these results confirm that CVS is a widespread concern in educational and professional settings within the country.

Globally, the prevalence in this study is also in line with broader estimates, such as the 74% worldwide rate reported during the COVID-19 pandemic (14)and the 69.0% pooled prevalence from a large Peruvian meta-analysis covering 103 studies (6). The slightly higher prevalence observed here compared to some Ethiopian studies (e.g., 69.5% in Debre Tabor (3) and 41.7% among engineering students at Hawassa University(10) may be explained by the particularly intensive digital demands placed on medical students. In this sample**,** 93.5% used computers primarily for academic purposes, and43.5% reported spending 5–8 hours per day on screens.

Some studies have reported considerably lower prevalence rates, such as 38.6% among the general population in Libya (9)and a minimum of 48% in Turkey (26). These differences likely reflect variations in occupational exposure and screen time intensity, as well as differences in study populations (e.g., general public vs. students vs. professionals). Additionally, many of the higher global estimates come from studies conducted during the COVID-19 pandemic (14, 25, 26), when remote learning and work-from-home arrangements dramatically increased screen exposure. This study, conducted under more typical academic conditions, offers a valuable baseline showing that CVS remains highly prevalent even outside of pandemic-related disruptions.

Females in this study reported a slightly higher prevalence of CVS (79.0%) than males (75.1%), a pattern that is consistent with much of the existing literature. For instance, studies have reported elevated risks among female undergraduates in Armenia (79.7%)(11), female instructors in Ethiopia(2), and women in the Peruvian meta-analysis (71.4%)(6). Possible explanations include physiological factors (e.g., greater susceptibility to dry eye) and behavioral differences (e.g., more frequent use of smartphones for social media, reported by 62.1% of participants here). However, not all studies have found significant gender differences—for example, a study among medical students in Sudan reported no notable disparity(7)suggesting that cultural, methodological, or contextual factors may also play a role.

The most commonly reported symptoms in this study were eye strain or pain (28.4%), itching (26.7%), burning sensation (25.3%), eyeredness (25.3%), and headaches (24.7%). These findings partially align with previous reports but also show some distinct patterns. While blurred vision is frequently cited as a leading symptom in Ethiopian studies (e.g., 34.26% in the national meta-analysis (1)and 62.6% in Debre Tabor(3), it was less prominent here (18.5%). Instead, ocular surface symptoms such as itching, burning, and redness were more prominent—possibly influenced by environmental factors like Ethiopia's dry climate or underreported allergies (only 1.4% reported allergies in this sample).

Musculoskeletal symptoms, particularly neckorshoulder pain (22.2%), were also notable and consistent with high rates reported in other settings, such as 57.5% in Libya (9) and 78.5% in Sudan(7). These findings highlight the importance of recognizing the musculoskeletal dimension of CVS, which is sometimes underemphasized in studies focused primarily on ocular symptoms.

Among the 274 students who reported at least one symptom of Computer Vision Syndrome (CVS), the symptom burden varied considerably. Nearly half of the participants (49.4%) experienced a mild symptom burden, characterized by one to three symptoms that were generally occasional and of low intensity. A further 27.0% reported a moderate level of burden, with four or more symptoms that were more frequent or disruptive. Notably, 11.2% of students experienced a high symptom burden, reporting seven or more symptoms that could plausibly impair concentration, academic performance, and overall daily functioning. Despite the high prevalence of symptoms, only 22.2% of participants indicated that CVS interfered with their routine activities or academic work, while the majority (54.8%) perceived little or no impact. Furthermore, health-seeking behavior was low, with only 17.1% of students having sought medical consultation for their symptoms, suggesting that CVS may be under recognized or normalized among students, potentially leading to delayed management and increased untreated morbidity. These findings strengthen the well-established connection between prolonged screen time and Computer Vision Syndrome (CVS), aligning closely with previous Ethiopian studies (3, 10, 13) and global research (6, 11). Notably, four independent risk factors emerged from the multivariable analysis. Regular Smartphone use nearly doubled the odds of CVS (AOR = 2.48), likely because Smartphone encourage closer viewing distances—64.6% of participants reported sitting less than 50 cm from the screen—and with 71.9% Smartphone ownership in this group, mobile devices are clearly playing a growing role. Using a computer for more than 8 hours per day also more than doubled the odds (AOR = 2.39), reinforcing the dose-response relationship seen in many earlier studies. Poor self-rated eye health emerged as the strongest predictor, more than tripling the odds (AOR = 3.20), highlighting how pre-existing eye discomfort amplifies vulnerability. Finally, regular consumption of caffeinated beverages was associated with more than doubling the odds (AOR = 2.24), possibly through dehydration worsening dry eye symptoms. Together, these modifiable factors underscore the need for targeted awareness and practical interventions among medical students. The association with **poor self-rated eye health** aligns with prior reports linking pre-existing eye conditions to increased CVS risk (1, 3). Interestingly, **caffeinated beverage consumption** emerged as a novel risk factor in this study. This may be explained by caffeine's potential to contribute to dehydration and worsen dry eye symptoms—a relationship that has received limited attention in previous CVS research. Unlike some earlier studies, factors such as gender, inappropriate sitting postures, or refractive errors, were not significant after adjustment in this sample. This may be due to the relatively homogeneous nature of the study population (young medical students) or low adoption of ergonomic practices (**8.7%** used recommended sitting positions).

8. Strength and limitation

The comprehensive symptom evaluation, full data collection with no missing responses, and use of multivariable regression to reliably identify independent risk factors set this study noteworthy. Its cross-sectional design, which makes it unable to demonstrate causality, its reliance on self-reported data, which is prone to bias, and its single-institution sample, which limits generalizability, are its limitations.

9. Conclusion

This study shows that Computer Vision Syndrome affected a large proportion of Ethiopian medical students (77.0%), with modifiable factors such as prolonged smartphone use, extended screen time, poor self-rated eye healthand daily habits like high caffeine intake contributing significantly.

10. Recommendations

Based on the study findings, universities and educational institutions should raise awareness about proper screen use, posture, and eye health, and improve study environments with ergonomic furniture, as most students sat close to screens and few used ergonomic equipment. Public health programs and eye care professionals can support regular vision screenings, guidance on managing refractive errors and dry eye and education on modifiable risk factors such as smartphone use, prolonged screen time, and high caffeine intake. Students themselves should adopt healthier screen habits, take breaks, and monitor their eye health. Policy makers and university administrators should allocate resources for ergonomic spaces and accessible eye care services and support further research, given the high prevalence of CVS (77.0%) and its associated behaviors.

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College of Medicine and Health Sciences
Institutional Review Board
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IRB's Decision

Meeting No.: 004/2025 **Date:- January 30, 2026**
Protocol number: 6002/2026 **assigned No: 003**

Protocol Titile:- **PREVALENCE OF COMPUTER VISION SYNDROME AMONG MEDICAL STUDENTS OF BAHIR DAR UNIVERSITY NORTHWEST ETHIOPIA, 2025**	
Principal Investigator:	Hailemariam Behulu
Co PIs	Amha Admasie, Dr Demeke Tsegaye
Institute:	***College of Medicine and Health Sciences, Bahir Dar University***
Elements Reviewed (CMHS/IRB 01 - 008) :	☑ **Attached** ☐ Not attached
0Review of Revised Application ☑ **Yes** No ☐	Date of Previous review:
Decision of the meeting;	☑ **Approved** ☐ **Approved with Recommendation** ☐ Resubmission ☐ Disapproved

Elements approved:

1. Protocol Version No.: **01**
2. Protocol Version Date **January 30, 2026**
3. Informed Consent Version: **01**
4. Informed Consent Version Date: **January 30, 2026**

Obligations of the PI:

- ✓ Comply with Standard National and International Ethical Guidelines
- ✓ All Amendments and Changes made in the Protocol and Consent Needs IRB Approval
- ✓ Report SAE within 10 days of the event
- ✓ End of the study, including manuscript and thesis works should be reported to IRB

To NRERC ☐

Institutional Review Board (IRB) Approval: Period from **30/01/*2026* to 30/*06/2026***

Follow-up Report Expected in:
3months______ 6months ✓ ____ 9months ______ One Year______

Chairperson, IRB
Dr Yeshalem Mulugeta
Signature__________ **January 30, 2026**

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College of Medicine and Health Sciences Institutional Review Board