ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH, DEPARTMENT OF PREVENTIVE MEDICINE

COMPUTER VISION SYNDROME AND OCCUPATIONAL RISK FACTORS AMONG EMPLOYEES OF COMMERCIAL BANK OF ETHIOPIA IN ADDIS ABABA, ETHIOPIA, 2018.

BY: HAILE DERBEW (BSc, MPH candidate)

A RESEARCH THESIS SUBMITTED TO GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, DEPARTMENT OF PREVENTIVE MEDICINE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH IN ENVIRONMENTAL AND OCCUPATIONAL HEALTH

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APPROVAL BY THE BOARD OF EXAMINATION

This thesis by Haile Derbew (BSc) is accepted in its present form by board of examiners as satisfying thesis requirement for the degree masters in environmental and occupational health

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LIST OF ACRONYMS

Abbreviations	Descriptions
AAU	Addis Ababa University
BSc	Bachelor of Science
Cm	Centimeter
CD-RW	Rewritable Compact Disc
CVS	Computer Vision Syndrome
DC	Data Collector
ETB	Ethiopian Birr
EPI-INFO	Epidemiological information
G.C	Gregorian calendar
Hrs.	Hour
IBM	International business machine
MPH	Master of Public Health
NORHED	The Norwegian program for capacity development in higher education and research for development.
PI	Principal Investigator
SPSS	Statistical Package for Social Sciences
VDT	Visual Display Technologies

ABSTRACT

Background: Computer vision syndrome (CVS) is an amalgam of visual symptoms caused by continued use of the computer, mobile Internet and other technology gadgets that strain the eye. Worldwide, up to 70 million workers are at risk for computer vision syndrome resulting in reduced productivity at work and reduced quality of life of computer user. Bank employees are among 70 million workers who are at risk with unknown magnitude of the syndrome. Therefore, the main aim of this study is to determine the prevalence of Computer Vision Syndrome and its associated factors among employees of Commercial Bank of Ethiopia.

Methods: A total of three hundred fifty-nine bank workers have participated in this study between February and March 2018. Structured self-administered questionnaire to measure personal exposure, an observational check list to measure glare, the medical examination to measure blurred vision and the light meter to measure workplace illumination was used for data collection. Data entry and analysis were done via Epi Info™ 7 and Statistical Package for the Social Sciences (SPSS) version 21 respectively. Binary logistic regression and multivariable logistic regression were performed to see the association and control the potential confounders.

Result: the prevalence of computer vision syndrome in the last 12 months among the total study subjects 359 (98% response rate) was 262 (74.6%) (95% confidence interval [CI] = 70.1, 79.5). Risk factors that can't be intervened were sex (AOR: 1.8; 95% CI (1-3)) and older age group (AOR: 3.11; 95% CI (1.2-8)). Causal factors that can be intervened were using electronic materials outside work (AOR: 3.11; 95% CI (1.15-8.36) and presence of glare (AOR: 4.1; 95% CI (2-8.3)). Protective factors that can be intervened were using window curtain (AOR: 0.44; 95% CI (0.23-0.84)), the habit of taking a break (AOR: 0.44; 95% CI (0.3-0.8)), distance between face and monitor ((AOR: 0.22; 95% CI (0.08-0.6)).

Conclusion and recommendation: Three-fourth employees of commercial bank of Ethiopia were at risk. Sex, age, presence of glare, the habit of taking a break, using electronic materials outside work, using window curtain, monitor distance were significantly associated. Remedial actions need to be considered at individual and organizational level.

Keywords: Computer vision syndrome, Prevalence, associated factors, Ethiopia.

1. INTRODUCTION

1.1. Background

A rapid development in information technology is one of the marks for the 21st century. Among those technologies, the computer has become a commonest and essential office tool for schools, colleges, universities, and workplaces. It plays a great role in professional, personal and educational lives [1, 2].

The computer is quite different from other office tools such as telephone and written or printed page in its demand for vision. When the first International Business Machine (IBM) personal computer was manufactured in 1981, the company did not take into consideration the possible potential health hazards the users may consequently experience [2].

Today, a condition known as Computer Vision Syndrome (CVS) has emerged. Even though using the computer doesn't cause permanent changes or damage to the eyes or visual system it is a common problem to millions of computer users around the world and a possible occupational epidemics of the 21st century in its temporary discomfort, loss of work efficiency and productivity. That is why researchers come to an agreement to put the possible prevention strategies [3-7].

An American Optometric Association has defined CVS, also referred to as Digital Eye Strain, "as a complex of eye and vision-related problems that result from the prolonged computer, tablet, e-reader and cell phone use. The level of eye discomfort and vision problems experienced while using the computers for longer durations" [8]. Its symptoms are dry and irritated eyes, eye strain/fatigue, blurred vision, red eyes, burning eyes, excessive tearing, double vision, headache, light/glare sensitivity, slowness in changing focus and changes in color perception [9].

According to works of literature the factors contributing to CVS are poor sitting position, improper viewing distances, ocular diseases, medical diseases, aging, environment, poor lighting, imbalance of light between the computer screen and the surrounding, poor resolution, poor contrast, glare at the display and slow refresh rate [10-12].

1.2. Statement of the problem

CVS is a significant public health problem as it affects computer users from all walks of life. The health effects among users are expressed in terms of stress, postures, health performance, and occupational productivity [12] and visual comfort [13]. Globally, a million new cases of CVS occur each year. According to the Seattle Times Company "Worldwide, up to 70 million workers are at risk for computer vision syndrome, and those numbers are only likely to grow. The report has indicated 70 percent to 90 percent of people who use computers extensively, whether for work or play, have one or more symptoms of computer vision syndrome [14].

Awareness of visual problems from computer use and utilization of preventive measures has also been minimally stressed in most industrially developing countries. Researchers revealed that visually and physically fatiguing work [6, 15] result in lowered productivity, increased error rate, reduced job satisfaction and quality of life. Many Computer tasks are repetitive and can become stressful both mentally and physically after an extended period of continuous work. Besides this, it can reduce productivity by as much as 40 % [16]. Currently in Ethiopia, in every institution computer is provided to all professional employees without considering the health effects related to eyes and the negative impacts of working environment [17]. As indicated by a research bank employees as compared to other employees are more affected by eye problem and consulted a doctor or eye specialist for their problem [18]. Hence, the researcher expected that it is likely the Ethiopian bank employees also to have a significant prevalence of CVS [15, 17].

The study done among bank workers in Gondar city, Ethiopia have limitations such as; it had included all private banks (hence, this underestimates the prevalence result), contrast and brightness of computer was not properly measured and association of environmental factors such as workplace lighting and computer vision syndrome was not seen. Over all literatures different factors have been found to affect computer vision syndrome. However, there are kinds of literature which support the statement CVS is more prevalent among men and others support the reverse. On the like manner, factors such as adjusting the brightness of the screen [15, 19, 20], distance from the computer [20-22] and wearing eyeglass [15, 17, 19, 23] are controversial to be the factors for CVS. To fill such gap this study was

conducted in Addis Ababa commercial bank workers to assess the prevalence and associated factors of computer vision syndrome.

1.3. Significance of the study

It is known that CVS is a worldwide problem. The more time spend working at the computer, the knowledge of how to use the computer screen by itself has a great contribution for the problems related with computer users. Works of literature found that CVS is associated with age, duration of computer use, seating position, taking a break while working and other environmental factors.

Some factors studied have not reached a similar agreement. Beside to this in Ethiopia, there is no enough evidence to prove the magnitude and risk of the problem as well as association of environmental factor with CVS are not studied especially for those people who spent most of their time on computer use, like bank workers.

Therefore this study fills the existing research gap in the pieces of literature and contribute as evidence-based information to the little literature available on CVS in Ethiopia. The possible prevention methods of CVS generated from this study are helpful for ophthalmic professionals, health, and other training institutions in planning, developing and revising training curricula that enhances knowledge and level of awareness regarding CVS among computer users.

2. Literature Review

2.1. Definition of CVS

‘‘The complex of eye and vision problems related to near work, which are experienced during or related to computer use has been termed “CVS”[6]. In all of the literatures the eye symptoms considered as CVS were eye redness, burning sensation of eye, headache, blurred vision, dry eyes, double vision, sore/irritated eyes, double vision and watering eyes [1, 7, 13, 17, 20, 21, 24] and in addition to the above symptoms neck and shoulder pain were considered as CVS [7, 13, 23, 24].

In most of the studies duration of the exposure was not specified [1, 17, 21]. Other study considered within the past 1 month duration [7] and other considered within the past one year [20].

2.2. Prevalence of Computer Vision Syndrome

The prevalence of CVS is quite different from place to place and study subjects. Different studies put a conclusion that, as the number of computer user's increase time to time they are at risk of computer vision syndrome. Depending on the sample size, study design and data collection tools used prevalence of vision-related problems associated with Visual Display Technologies (VDTs) are vary exceedingly [21, 24]. In a systematic review of CVS, Thomson disclosed that up to 90% of users may have symptoms of CVS after long exposure of computer usage [24].

Previously, it has discovered that between 64 and 90 prolonged users of the computer are at risk of CVS with visual symptoms such as eye fatigue, headache, eye discomfort, eye dryness and blurred vision[16]. A lower eye strain (fatigue) has been observed in Italy (n = 212; 31.9 %) [25] and India (n = 400; 46.3 %) [22]. But, most of the studies had conducted among a limited number of computer user study subjects and a single organization.

The prevalence varies depending on the study subjects. Studies with study participants of office workers revealed CVS to be 25% in Islamabad [26], (74%) in Abuja Nigeria [1], (73.9%) of Secretaries and Data Processors [15] and (73%) of bank workers in Gondar city [17], Ethiopia. Study with study participants of both office workers and students in AbbasiShaheed Hospital and Department of Community Medicine, Karachi Medical and

Dental College revealed that prevalence of CVS is 75% [5], (63%) administrative staff in public university, Malaysia [27]. Studies with inclusion of university students revealed that CVS to be (89.9%) in Nepal [23] and (81.9%) in Chennai [7].

Generally speaking, the incidence of CVS vary from place to place but the point on which every study agrees is that long a person works with the computer, the more visual discomfort complaints he experiences.

2.3. Factors Associated with Computer Vision Syndrome

2.3.1. Socio-Demographic factors

2.3.1.1. **Gender and Age**

Many studies indicated that males had a higher risk of developing dry eyes and at lower risk of developing headache compared to females. Beside to this prevalence of CVS significantly increased with increasing age of the computer user [7, 15, 26].

In contrary to the above study, others studies revealed that dry eye is more prevalent in older patients and more marked in women than men. The increase in the dry eye with aging is traditionally thought to be associated with a decrease in tear production enhanced by hormonal changes. In relation to this female patients as compared to male patients tend to have a reduction in the tear film's aqueous layer with increasing age, thus may be more susceptible to CVS as they grow older [28].

2.3.1.2. **Work experience**

Work experience makes a difference between workers with severe CVS and workers with mild-moderate CVS according to a study done in Nigeria [1].

2.3.1.3. **Occupational difference**

According to the comparative study of CVS in India, more bank employees as compared to other employees were confessed the problem of Combination of a headache, eyestrain and blur vision that occur as a result of prolonged computer usage. Bank employees as compare other employees were more affected by redness and dryness eyes. Maximum bank employees have checked up the eyes after six months [18].

2.3.2. Work-related factors

2.3.2.1. **Duration of working hours in computer per day**

Computer users for more than 2 hours experienced symptoms of CVS significantly more often than those who used the computer up to 2 hours per day [23].

Computer users who were using the computer for more than 4hrs were at significantly higher risk of developing redness, burning sensation, and dry eyes compared to those who use the computer for less than 4 hrs. This means that there was a significant association between computer use duration and symptoms of CVS [1, 7, 19, 29].

Such kind of correlation is expressed in other study done in Ethiopia on Secretaries and data processors in a way that computer users for > 7 hours-per-day were 2 times more likely to have suffered from CVS as compared to those who used computers < 7 hours-per-day [15]. Even though most studies concluded that an increase in the number of hours spent on computer increases the risk of CVS significantly; the association is not related to the severity of CVS. In like fashion with this, staring at the computer without a break, contrast, and brightness of computer and usage of a screen filter was not correlated with the severity of CVS [20].

2.3.2.2. **Distance from computer**

A Community-based cross-sectional study from India (n=150) found that eyestrain and headache had a significant association with subjects not maintaining proper distance from the computer [29]. Similarly, a study on Computer Use and Vision-Related Problems in Ajman, United Arab Emirate, revealed that dry/tired/sore eyes were more in students viewing the screen at a distance less than 50 cm. When the screen was viewed at distance more than 50 cm, the prevalence of headaches decreased by 38% compared with students who were using a viewing distance of less than 50 cm [17, 26]. In the same fashion, to those studies study done in Ethiopia revealed that viewing distance were significantly associated with CVS. Notwithstanding, distance from the computer is not associated with CVS [20].

2.3.2.3.**Screen level above the eyes**

From the study, it was shown that when subjects maintained top of the screen level below the eyes there was less eyestrain prevalence [19]. There was the significant reduction in symptoms of CVS among students who viewed the computer screen below eye level than those who viewed the screen at or above the eye level [23].

2.3.2.4.**Not taking break during computer use**

Different studies [7, 17, 19] conducted elsewhere indicated that significant correlation was found between working on the computer without break and being more exposed to symptoms of CVS. For example, the study conducted in Chennai showed that Students who took a break after every 2 hrs of continuous use of computer had a higher risk of developing blurred vision, dry eyes and neck and shoulder pain as compared to those who took a break every hour. A similar study in India showed eyestrain and burning of eyes were found with subject's not taking breaks during computer use. Comparatively, the study in Ethiopia showed that those working on the computer for more than 20 minutes without break were nearly 2 times more likely to suffer from CVS as compared to those taking a break within 20 minutes.

2.3.2.5.**Workplace illumination**

As indicated by Surveys workplace lighting is one of the most significant environmental factor affecting computer work. Many computer users report problems with general workplace lighting, glare, and images reflected on the computer screen [30, 31].

Wolska A. studied luminous flux per unit area of the visual field of operators. Visual fatigue was objectively studied and it found that surrounding illuminance shows bigger changes in visual functions, with no variation between the types of VDT. The study showed that luminance of the surrounding visual field influences in the reduction of amplitude of accommodation. Increase in illuminance also has a negative effect on reaction time (RT) [32].

The effect of various luminance levels has been studied at the VDT workstation and it recommended illumination higher than 200 lux. Illumination of 300 lux is found most

comfortable for entry of figures, whereas 500 lux of luminance is comfortable for an edition of text displayed on VDT [33, 34].

2.3.3. Personal factors

2.3.3.1.**Eyeglass using**

Association of Wearing eyeglass and CVS is a controversial issue. A study from Ethiopia (n=304) stated that bank workers who wore eyeglasses were 3 times more likely exposed for CVS when compared with those not wearing eyeglasses. In conjunction with this, Students who were wearing spectacles experienced symptoms significantly more often than those who were not wearing spectacles [17, 23].

On the other hand, wearing eyeglass were not significantly associated with CVS. Study show that symptom of CVS like, eye redness was more frequent with glass nonusers [15, 19].

2.3.3.2. **Adjusting the screen brightness or contrast**

Adjusting the screen brightness is one factor for CVS. It was observed from the study that eyestrain and watering eye were reported by more number of subjects who work with computers without adjusting the brightness of the screen [19, 20]. However, study shows that as there is no a significant association between adjustment of the brightness of the computer and CVS [15].

Conceptual frame work;

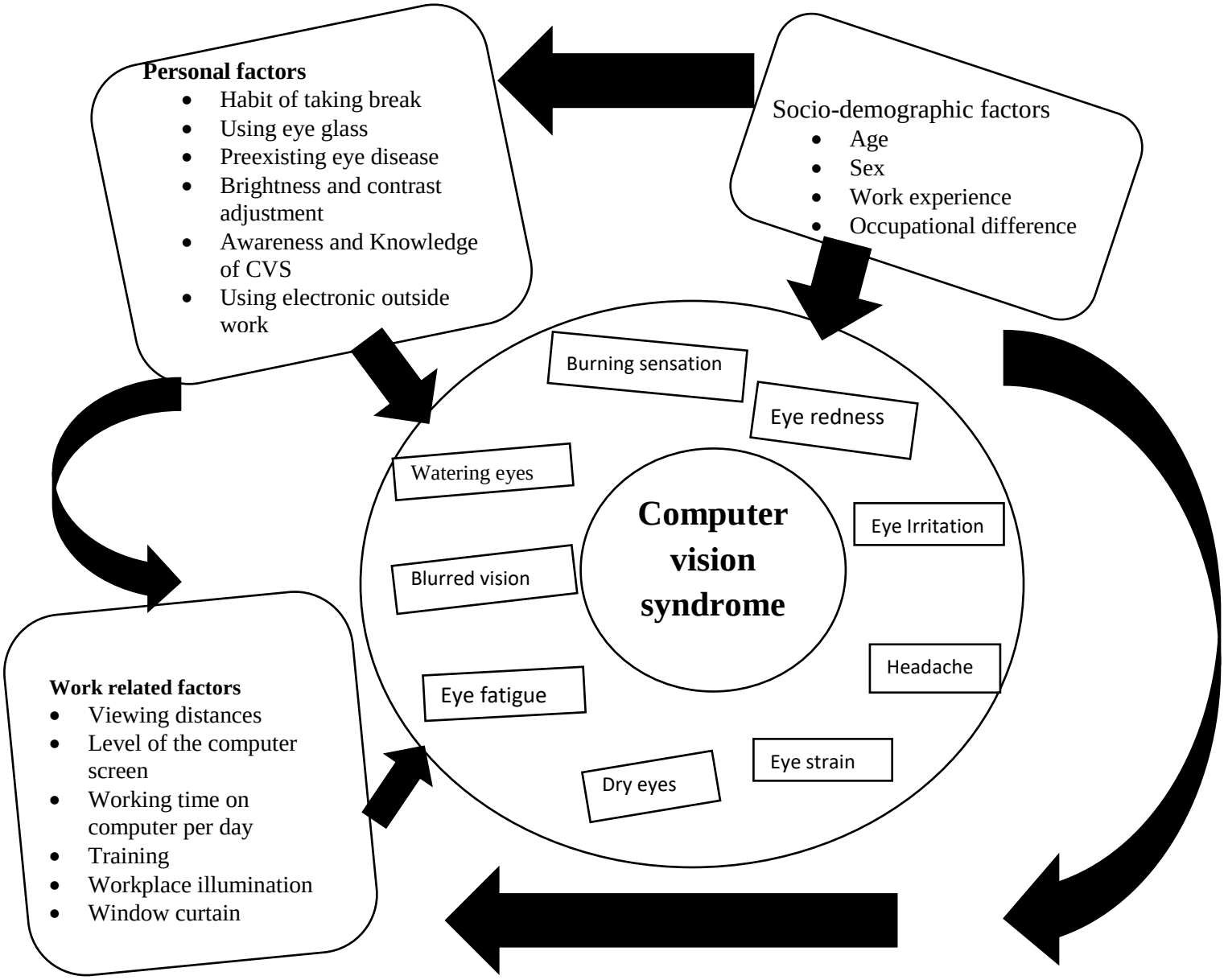

Figure 1 Conceptual frame work of CVS among commercial bank workers in Addis Ababa, Ethiopia

This was developed after reviewing different literatures about factors that has been contributing for the occurrence of computer vision syndrome. As shown above symptoms of computer vision syndrome can be associated directly with socio demographic, personal and work related factors. There is also an interaction between the factors.

2.4. Research questions

- What is the prevalence of computer vision syndrome among computer user bank employees in Ethiopia?
- What are the factors predicting computer vision syndrome?

3. Objectives of the study

3.1. General objective

The main aim of this study is to assess the prevalence of Computer Vision Syndrome (CVS) and associated factors among employees of Commercial Bank of Ethiopia, in Addis Ababa, Ethiopia, 2018.

3.2. Specific objectives

- To determine the prevalence of CVS among employees of Commercial Bank of Ethiopia in Addis Ababa, Ethiopia.
- To identify associated factors of CVS among employees of Commercial Bank of Ethiopia in Addis Ababa, Ethiopia.

4. Methods and materials

4.1. Study area and period

This study were conducted among bank workers of CBE in Addis Ababa, the capital city of Ethiopia. The country holds 18 types of banks with over 2357 branches. Among those banks, the oldest one is CBE (which has 4 districts, 400branches and 10914 employees at Addis Ababa).

The Commercial Bank of Ethiopia is the largest, oldest, government owned bank, leading African bank and Pioneer to introduce modern banking to the country. It has more than 1160 branches stretched across the country (have 4 districts, 400 branches and 10914 employees at Addis Ababa) and over 13.3 million account holders [35].

The study was conducted from February 2018 to March 2018.

4.2. Study design

An institution-based cross-sectional study was employed to assess the prevalence and associated factors of CVS among employees of commercial bank of Ethiopia in Addis Ababa. Professionals, clerical, managerial and administrative workers who are computer users were enlisted in the study.

4.3. Source population and Study Population

4.3.1. Source population

Source population were all employees of commercial bank of Ethiopia in all (Four Districts) who are computer users in Addis Ababa, Ethiopia.

4.3.2. Study population

All bank employees who are working in the North and East Districts of CBE.

4.3.3. Study Subjects

Bank workers who were computer users and selected as a sample based on the sampling strategy.

4.4. Inclusion and Exclusion criteria

4.4.1. Inclusion criteria

All bank workers who used computers to complete their tasks for at least 2hours per day during the working days and had worked with the use of the computer for at least 12 months.

4.4.2. Exclusion criteria

Bank workers who had eye problem due to other medical problems.

4.5. Sample size determination and sampling technique

4.5.1. Sample size determination

The sample size for the prevalence of CVS among CBE workers is determined using a single population proportion formula with the following assumptions: level of significance (α) =5% (at a confidence level of 95%), marginal error d=5% and P=0.73 (previous study on Computer Vision Syndrome using bank workers at Gondar city) [17]. The Z value is 1.96 (n=sample size, P=proportion and d=marginal error).

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

$n= (1.96)^2 \times 0.73 \times 0.27/ (0.5)^2$

n= 303

By considering 10% non-responses the total sample size is **333**.

The sample size to determine factors associated with CVS among CBE was calculated using double population proportion formula in EPI INFO by taking three Independent factors of CVS from the previous study to come up with the maximum sample size. The maximum sample size was selected. Therefore the sample size for this study was **359.**

Independent factors at multi variable analysis	Exposed	Non exposed	OR	Sample size	10% non-responders
Sitting position	67.17	83.9	2.547	230	253
Taking break	62.5	77.3	2.04	326	359
Eye glass	71	88.57	3.16	184	202

4.5.2. Sampling technique

Currently, in Ethiopia, there are 18 types of private and government banks. Considering its age, employee's level of exposure to computer, a number of employees and customers it has the researcher wants to study among employees of CBE in Addis Ababa.

CBE has four (4) districts (total of 400 branches), from which two districts (East and North district) were randomly selected by simple random sampling (lottery method) by considering the representativeness of the sample and logistics issues. With assumption 20% of the branches, 40 banks were selected from both districts using lottery method and then the samples of study participants were allocated proportionally to the number of branches. The allocated study participants of each bank again proportionally allocated to managerial and others (clerical and professionals). Finally, the study participants of each bank were selected using simple random sampling.

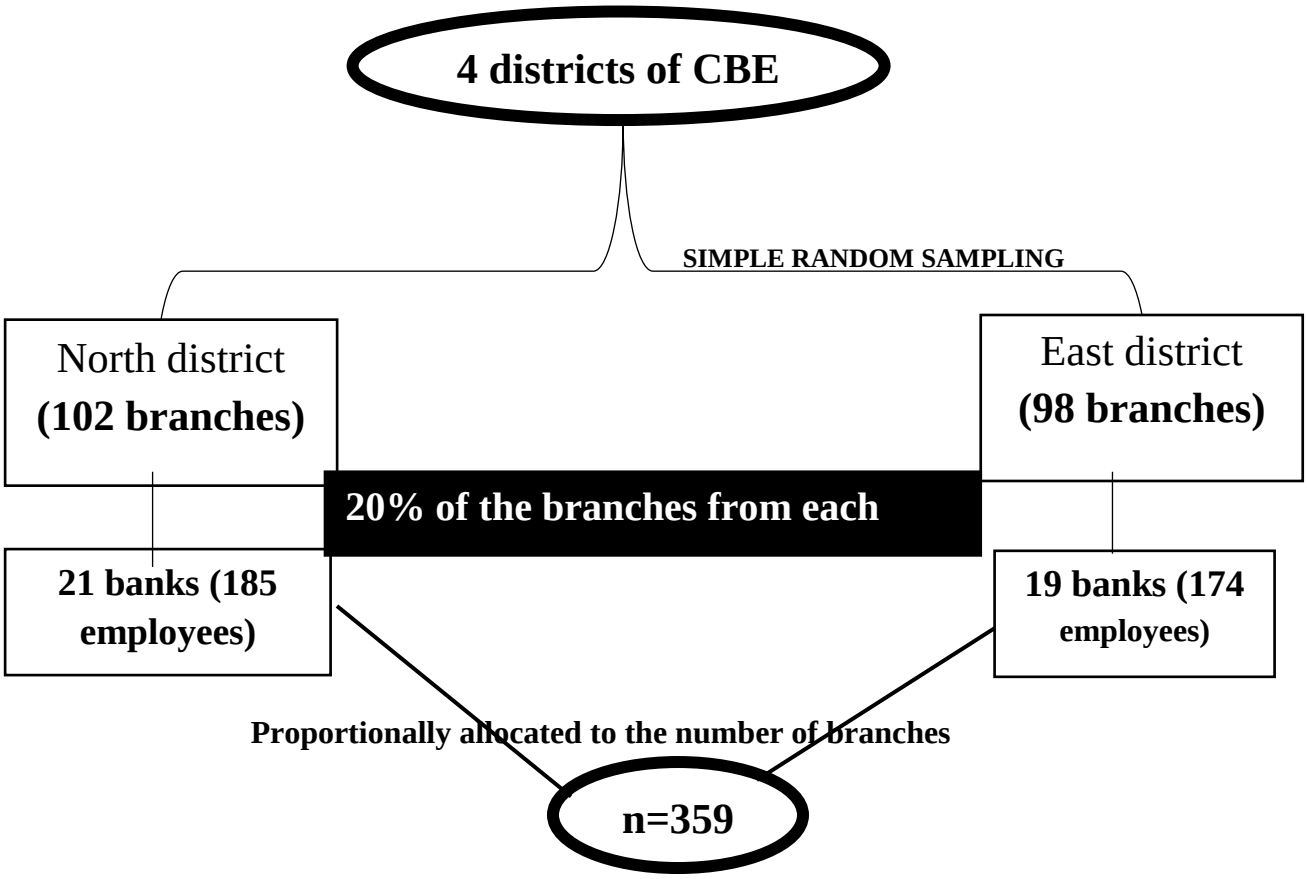

Figure 2 Schematic presentation of sampling procedure for the study of CVS among employees of commercial bank of Ethiopia, Addis Ababa, Ethiopia.

4.6. Measurements

4.6.1. Variables

4.6.1.1. **Dependent variable**

Computer vision syndrome

4.6.1.2. **Independent variables**

- **Socio-demographic factors: -** it includes sex, age, occupational difference and work experience.

- **Personal Factors: -**using computer eyeglass, presence of preexisting eye disease, habit of taking break while using computer, awareness and knowledge about CVS risk factors, using electronic outside work and adjustment of contrast and brightness.

- **Work-related factors**
  - Viewing distances (distance from computer)
  - Level of the top of the computer screen
  - Working time on computer per day (hrs. /day)
  - Workplace illumination
  - Window curtain
  - Glare
  - Antiglare screen
  - Training

4.6.2. Data collection Tools

4.6.2.1. **Pre-tested structured questionnaire**

A self-administered structured questionnaire which is adapted from available different kinds of literature was used. The questionnaire includes variables and symptoms associated with computer use. The questionnaire was prepared first in English and then after it was translated first to Amharic (the national language of the study area) to make data collection process simple and translated back to the English language by language experts to check its consistency in the meaning of words and concepts. Cross checking was done to fill the missed information and ensure the quality of the data.

4.6.2.2. **Observational checklist**- were used to assess work related factors such as presence of glare, window curtain and antiglare screen. The data collector observes and

records the position of the artificial and natural light against the user, and the situation of window curtain in the working room.

4.6.2.3. **Snellen chart Measurement:-** This chart was used for testing distance vision or near blurred vision. The chart was placed on a wall or easel 10 feet away from the participant. The participant covered one eye with his hand without applying pressure to the covered eye, as it might affect that eye's vision. The assistant (ophthalmic nurse) stands near the chart and record participants accuracy. The participant identifies a line on the chart which can be comfortably read and tried to read the letters on that line aloud. The participant continues trying to read the letters on each successively smaller line and have his/her assistant stop him/her when he/she fail to correctly identify at least 50 percent of the letters on a line. The participant switches his/her other eye and repeats the procedure again.

4.6.2.4. **Meter**

- This was used for viewing distance measurement between the monitor and face of the worker.

4.6.2.5. **Workplace illumination measurement**

Light meter or lux meter were used to measure illumination level of the computer task area.

Two measurement points was taken at the keyboard position, 20cm apart, and two others on the top of the screen, 10 cm apart, as shown in the figure below. The average of these measurements is then calculated as the average illuminance at the task position [36].

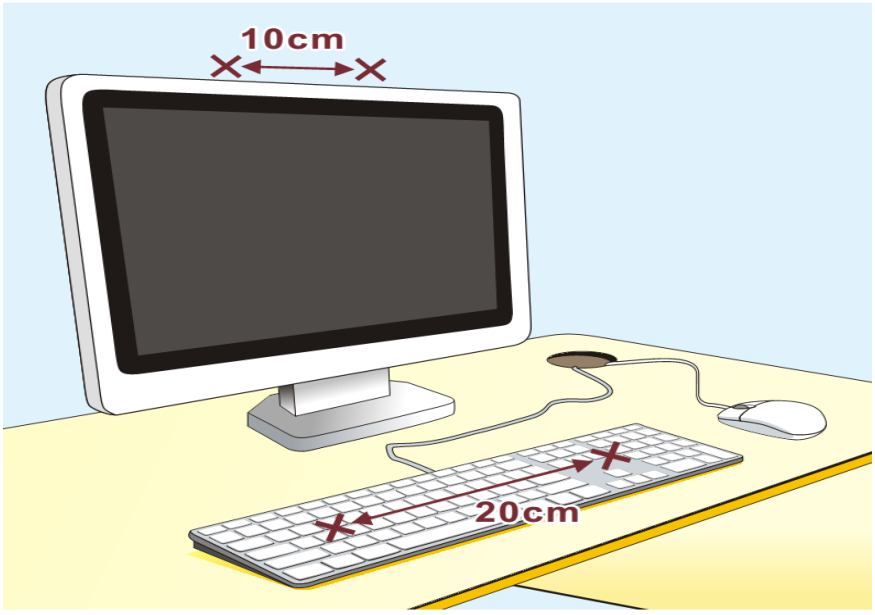

Figure 3 The way of illumination measurement for computer workstation to see the association with computer vision syndrome.

4.7. Quality Assurance of the Data

4.7.1. Pre-test

Before the actual data collection, the questionnaire was pre-tested on 5% of the total sample size in Addis Ababa southern district of CBE. The purpose of the pre-testing is to ensure that whether the questions are understandably phrased; whether the data collectors understand the questions and the instructions; whether the design of the data collection tool in translated version allows for legible recording of the data, as they were collected and to see if the logic and skip order of the questions are in a sensible way to the data collectors. And necessary modifications in the questionnaire were made based on the nature of gaps identified.

4.7.2. Training of data collectors

Three data collectors, who are ophthalmic nurses, one BSc optometrist supervisor and one environmental health professionals, were recruited and they were given training for two days (one day training and one day field practice) on objectives of the study, the concepts of using the proposed sampling technique and eligibility criteria; structure of the data collection tool and the purpose of each item included in the tool, techniques and ways of collecting the data as well as roles and responsibilities of the field team members.

Finally, having a brief discussion and taking corrective measures on the problems observed during the field practice, data collectors and supervisors were ready to start the actual data collection and therefore data collection was begun at February.

4.7.3. Data Collection Procedures

Three ophthalmic nurses and one environmental health professional were involved in the data collection procedure. Informed written consent were taken from the study participants. By asking a permission from branch managers the team was accomplished the examination and measurement using self-administered pre-tested questionnaires, eye segment examination using a Snellen chart, direct observations with a structured checklist, workplace illumination measurement using lux meter and viewing distance measurement using meter.

The self-administered questionnaire were filled by the participants at their home. The questionnaire were received from the participants by the supervisor with roughly checking the questionnaires for the consistent responses after 24 hours. Hence, the data collection period was taken 20 working days. The measurement of the computer workstation and related checklists were done by the environmental health professional.

The illumination level of the workstation was measured both at the top of the screen (two measurements, 10 cm apart) and at the keyboard position (20cm apart). The distance was measured by first looking at the sitting position of the participants and asking them how they always sit while use computer. Observationally checking the direction of the workplace illumination and computer screen glare was measured.

4.7.4. Data processing and analysis

After coding, the collected data were entered into a database using EPI INFO and were exported, cleaned (for any inconsistencies and missing values) and analyzed using SPSS version 21. Descriptive statistics (frequency, percentage) were used to describe main variables of interest.

Binary logistic regression analysis were done to see which variables are associated with the main outcome of interest at $P < 0.05$ level of significance. Then after to determine independent predictors of CVS multi variable logistic regression model were used

including all variables with significant association during the bivariate analysis to control the potential confounders.

4.7.5. Operational Definitions

- **Awareness**- having heard of computer vision syndrome [37].
- **Blurred vision-** difficulty in seeing near/far away objects
- **CVS**- Presence of at list one symptoms, either intermittently or continuously during the previous 12 months in one or two eyes. Symptoms of CVS are presence of blurred vision, eye strain, eye fatigue, redness of eyes**,** watery eyes**,** eye dryness**,** double vision**,** eye irritation, burning sensation and headache [20].
- **Computer users-** bank workers who are working with a computer for more than two hours in an institution for five consecutive working days.
- **Clerk bank workers**- are customer service officers who are makers and checkers.
- **Direct glare**- when light shines directly into the users eyes [38].
- **Indirect glare**- occurs when light is reflected from a surface, side and back of the user [38].
- **Knowledge of CVS**- acknowledging having some understanding of CVS by putting the symptoms [37].
- **Managerial bank workers**- are customer service manager and branch managers.
- **Mild cases-** subjects having three or fewer symptoms with all the symptoms disappearing after a short rest.
- **Moderate cases**- subjects having seven or fewer symptoms with all the symptoms disappearing after a short rest [20].
- **Professional bank workers**- workers who are senior customer service office auditor, accountant, and cashers.
- **Severe cases**- subjects reported more than 7 symptoms and/or subjects having at least one symptom that does not disappear even after a short rest [20].

4.7.6. Ethical Consideration

Ethical approval were obtained from research ethics committee of Addis Ababa University. Official letter of co-operation from AAU and research center of CBE were written to respective study districts and branches. Informed consent were obtained from all study subjects to allow the use of anonymous personal and clinical data in research. The supervisors and data collectors were health workers which is an advantage for study subjects to ensure health status of their eye. Health education regarding the prevention method of CVS on the spot during the data collection time and directions were given for those people with CVS. Confidentiality of the information were maintained thoroughly by excluding names as identification in the questionnaire and keeping their privacy during data collection and also results were kept securely.

4.7.7. Dissemination of Findings

The finding will be communicated with different stakeholders including AA University, MoH, banks, and health officials, studied bank institution management, NGOs, students and it will be communicated to the whole communities and reader who will in need of it. Finally, an effort will be made to publish in international journal for dissemination worldwide.

5. RESULTS

5.1. Socio-demographic characteristics

In this study, a total of three hundred fifty-nine (359) (216 male and 135 female respondents) employees of the CBE, Ethiopia over a three week period from February 2018 to March 2018 were participated (response rate 98%). Out of the total subjects, 8(2%) were non-responders or they provided incomplete responses. Majority of the study subjects 250 (71.2%) were in the age group range 21-29 years old. The highest number of the study subjects 216 (61.5%) were males. Majority of the respondents 227 (64.7%) spent more than 7 hours on the computer daily. The lowest number of study participants 63 (17.9%) were managerial and administrative workers (Table 1).

Table 1 Socio demographic characteristics of computer-user bank workers in Addis Ababa, Ethiopia, 2018, (n=359)

Variables	**Categories**	**Frequency**	**Percent (%)**
Age	20-29 years	250	71.2
	30-39 years	80	22.8
	≥40 years	21	6
Work Experience	<5 years	224	63.8
	>=5 years	127	36.2
Job Title	Managerial and administrative	63	17.9
	Clerical and professional	288	82.1
Working hours per day	3-7h	124	35.3
	Above 7h	227	64.7
Sex	Female	135	38.5
	Male	216	61.5

5.2. Awareness and Knowledge of Study Subjects Regarding CVS

The highest number of the respondents 187 (53.3%) were aware of the syndrome. Of those 187 (53.3%) participants the awareness of the least participants 28(15%) was not with knowledge.

5.3. Visual acuity

The study reported that 343 (97.7%) have a right eye normal vision and 342 (97.4%) left eye normal vision while 8 (3.1%) have right eye low vision and 9 (2.6%) left eye low vision (Table 2).

Table 2 Distribution of the study subjects according to the visual acuity

Categories	**Male**		**Female**		**Total**	
	Right eye	Left eye	Right eye	Left eye	Right eye	Left eye
Normal (6/6-6/18)	212	212	131	130	343	342
Low vision (6/18-6/60)	4	4	4	5	8	9

5.4. Work place illumination measurement

317 (90.3%) of workers were working at lower illumination level, only 1 (0.3%) worker was working at normal illumination level and 33 (9.4%) of workers were working at high illumination level.

5.5. Prevalence of CVS

The prevalence of CVS experienced in the last 12 months during computer use was 74.6% (95% [CI] = 70.1, 79.5) which was significantly greater in males 170 (64.9%) than in females 92 (35.1%). Most of the symptoms of CVS were commonly reported among males than females. The least complaints of the study subjects were eye dryness 39 (15.1%) and double vision 27 (10.5%). The prevalence of each symptoms of CVS on both male and female participants are as shown in (Figure 4).

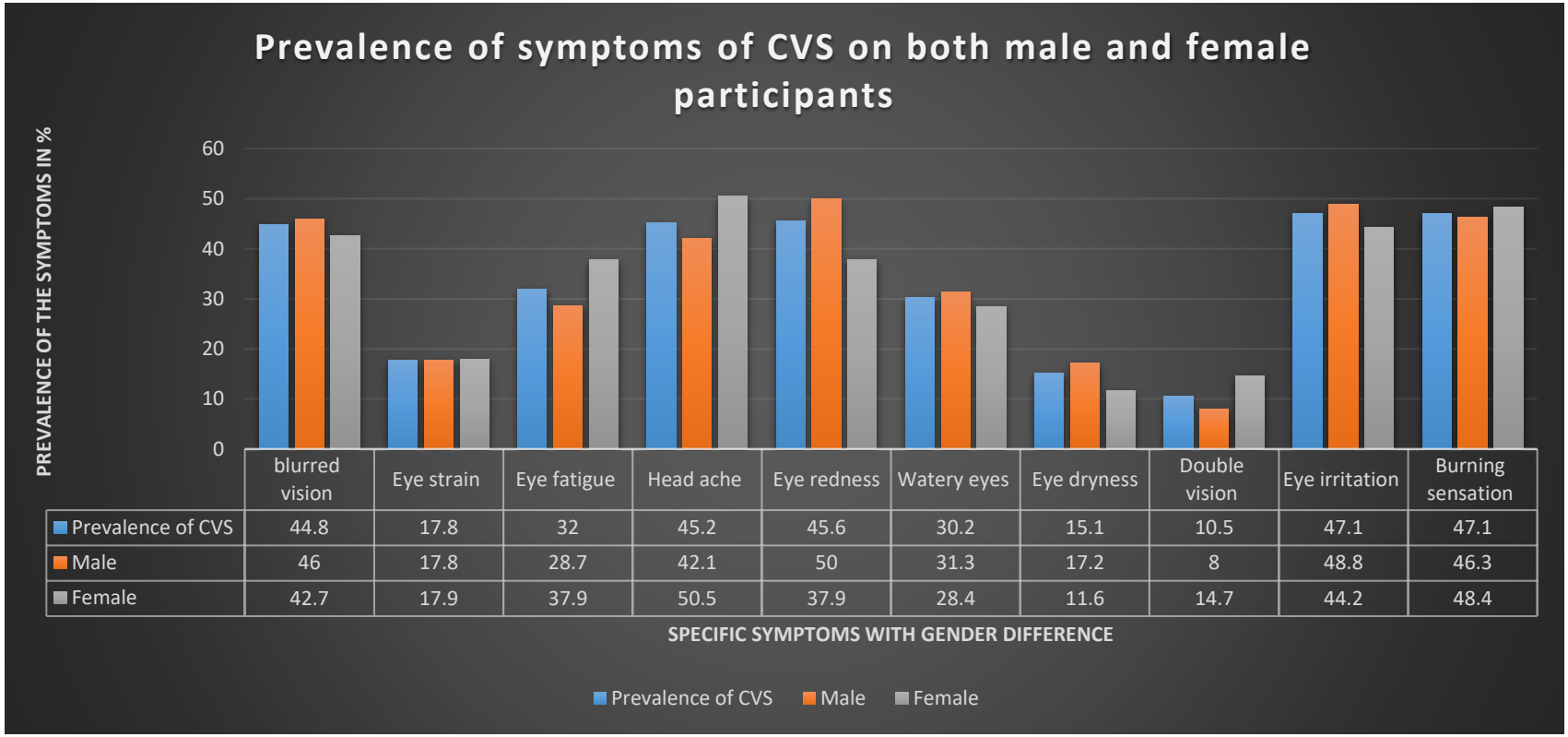

Figure 4 One year prevalence of CVS symptoms among male and female commercial bank employees in Addis Ababa, Ethiopia, 2018.

This study found that majority of the respondents (47.1%) were affected from eye irritation and burning sensation. 45.6% and 45.2% bank employees were affected by eye redness and headache respectively. 44.8% of the bank employees were suffered from blurred vision.

Severe symptoms of CVS were more prevalent among males 127 (65.1%) than females 68 (34.9%). From the study subjects who have CVS, 195 (74.4%) of subjects had severe symptoms. The overall severity status of CVS among the study subjects is as shown in Figure 5.

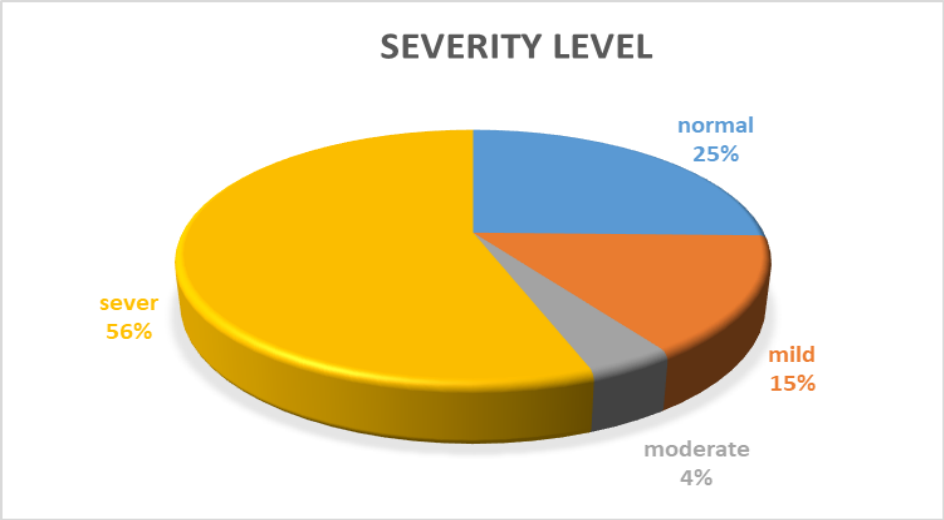

Figure 5 Severity status of computer vision syndrome among bank workers Addis Ababa, Ethiopia, 2018.

Among the study participants, small numbers 40 (11%) were used eyeglass while they work with computer. Of those eyeglass users, 39 (82.5%) were with severe symptoms of CVS. Pre-existing eye diseases were present in (28) 8 % of the study participants.

In this study all computers on the study area were not covered with anti-glare screen and all of the participants were working on computer without taking training regarding the prevention method of computer vision syndrome. High numbers 189 (53.8%) of participants had habit of adjusting computer brightness and contrast. Majority 233 (66.4%) of the study participants have not habit of taking break while using computer. Majority of the respondents 290 (82.6%) were used computer at a distance less than or equal to 50cm. The high number of participants 259 (73.8%) were working with exposure of direct and indirect glare. Majority 345 (98.3%) of the participants have used the computer on the level of the computer screen. On the other hand, few number of participants 26 (7.4%) were not

used electronic materials apart from work area. Lower number of participants 152 (43.3%) were working in curtain/blind-covered windows.

5.6. Factors associated with CVS

5.6.1. Bivariate logistic regression

A binary logistic regression analysis was performed with 'presence of CVS' as the dichotomous dependent variable and work experience (years), working hours per day (hours), pre-existing eye disease, habit of adjusting brightness and contrast of screen, age, sex, occupational difference, use of electronics out of work, having awareness, the habit of taking a break, using computer eye glass, monitor distance, glare and window curtain as the continuous/dichotomous independent variables.

Variables which showed association in the bivariate analysis at $p<0.2$ were 11 variables such as; work experience (years), working hours per day (hours), pre-existing eye disease, age, sex, job title, use of electronics out of work, habit of taking break, monitor distance, glare and window curtain. Those variables were moved in to the multivariable logistic regression (Table 3).

Prevalence of CVS among those who are working at lower illumination level task area (below 300lux) and higher illumination level (above 500 lux) were 89.7% and 9.9% respectively.

Table 3 Bivariate analysis for computer vision syndrome among bank workers in Addis Ababa, Ethiopia, 2018, n=359(n=sample size)

	Categories	Computer vision syndrome		COR (95% CI)	P-value
		Yes (%)	No (%)		
Age	<=29	171 (65.3)	79 (88.8)	1	
	30-39	72 (27.5)	8 (9.0)	4.16 (1.9-9.04)	0.000 (<0.001)*
	≥40	19 (7.3)	2 (2.2)	4.39 (0.99-19.38)	0.05*
Sex	Female	92 (35.1)	43 (48.3)	1	
	Male	170 (64.9)	46 (51.7)	1.73 (1.06-2.8)	0.028*
Work experience	<5 years	138 (52.7)	86 (96.6)	1	
	>=5 years	124 (47.3)	3 (3.4)	25.7 (8-84)	0.000 (<0.001)*
Job title	Managerial	54 (20.6)	9 (10.1)	1	
	Others	208 (79.4)	80 (89.9)	2.31 (1.1-4.89)	0.029*
Awareness	No	122 (46.6)	42 (47.2)	1	
	Yes	140 (53.4)	47 (52.8)	1.025 (0.63-1.67)	0.919
Working hours per day	1-7h	103 (39.3)	21 (23.6)	1	
	Above 7	159 (60.7)	68 (76.4)	0.477 (0.275-0.825)	0.008*
Use of electronics out of work	No	15 (5.7)	11 (12.4)	1	
	Yes	247 (94.3)	78 (87.6)	2.322 (1.024-5.265)	0.044*

Habit of taking break	No	183 (69.8)	50 (56.2)	1	
	Yes	79 (30.2)	39 (43.8)	0.55 (0.337-0.908)	0.019*
Using computer eye glass	No	223 (85.1)	88 (98.9)	1	
	Yes	39 (14.9)	1 (1.1)	15.4 (2-114)	0.007*
Preexisting disease	No	244 (93.5)	78 (87.6)	1	
	Yes	17 (6.5)	11 (12.4)	0.494 (0.222-1.1)	0.084
Monitor distance	Above 50	54 (20.6)	7 (7.9)	1	
	1-50	208 (79.4)	82 (92.1)	0.329 (0.144-0.752)	0.008*
Glare	No	60 (22.9)	32 (36)	1	
	Yes	202 (77.1)	57 (64.0)	1.89 (1.12-3.2)	0.016*
Habit of Brightness and contrast adjustment	No	120 (45.8)	42 (47.2)	1	
	Yes	142 (54.2)	47 (52.8)	1.057 (0.653-1.712)	0.820
Window curtain	No	163 (62.2)	36 (40.4)	1	
	Yes	99 (37.8)	53 (59.6)	0.413 (0.25- 0.67)	<0.001*

*- Variables which were significant in the first model, 1- reference, COR- Crude odds ratio, CI-confidence interval.

5.6.2. Multivariable logistic regression

According to the multivariable analysis age, sex, using electronic materials outside of work, glare, the habit of taking a break, monitor distance, and window curtain were significantly associated with CVS.

Being male was 1.8 times (AOR: 1.8; 95% CI (1-3)) more likely to develop CVS compared to females. Using electronic materials outside work was 3.1 times (AOR: 3.11; 95% CI (1.15-8.36) more likely to develop CVS compared to not using electronic materials outside the work area. Participant in the age group range 30-39 years were 3.1 times (AOR: 3.11; 95% CI (1.2-8)) more likely to develop CVS compared to age group range 21-29 years. Working with direct and indirect glare was 4.1 times (AOR: 4.1; 95% CI (2-8.3)) more likely to develop CVS compared to working without glare. Workers who use computer at a distance of more than 50cm were 78% ((AOR: 0.22; 95% CI (0.08-0.6)) less likely to develop CVS compared to who use at a distance of less than or equal to 50cm. Workers who have the habit of taking a break were 56% (AOR: 0.44; 95% CI (0.3-0.8)) less likely to develop CVS compared to who have not habit of taking break. Participants who use window curtain were 56% (AOR: 0.44; 95% CI (0.23-0.84)) less likely to develop CVS compared to who don't use (Table 4).

Table 4. Multivariate analysis for computer vision syndrome among bank workers in Addis Ababa, Ethiopia, 2018, n=359

Variables	Categories	Computer vision syndrome status		COR (95% CI)	AOR (95% CI)	P-value
		Yes (%)	No (%)			
Age	<=29	171 (65.3)	79 (88.8)	1	1	
	30-39	72 (27.5)	8 (9.0)	4.16 (1.9-9.0)	3.1 (1.2-8)	0.022*
	≥40	19 (7.3)	2 (2.2)	4.39 (1-19.4)	3.4 (0.6-18.4)	0.159
Sex	Female	92 (35.1)	43 (48.3)	1	1	
	Male	170 (64.9)	46 (51.7)	1.7 (1.1-2.8)	1.8 (1.0-3.0)	0.039*
Use of electronics out of work	No	15 (5.7)	11 (12.4)	1	1	
	Yes	247 (94.3)	78 (87.6)	2.3 (1.0-5.3)	3.11 (1.2- 8.4)	0.025*
Habit of taking break	No	183 (69.8)	50 (56.2)	1	1	
	Yes	79 (30.2)	39 (43.8)	0.55(0.34-0.9)	0.44(0.3-0.8)	0.004*
Monitor distance	1-50	54 (20.6)	7 (7.9)	1	1	
	Above 50	208 (79.4)	82 (92.1)	0.33 (0.14-0.75)	0.22(0.08-0.6)	0.002*
glare	No	60 (22.9)	32 (36)	1	1	
	Yes	202 (77.1)	57 (64.0)	1.89 (1.12-3.2)	4.1 (2.00-8.31)	<0.001*
Window curtain	No	163 (62.2)	36 (40.4)	1	1	
	Yes	99 (37.8)	53 (59.6)	0.41 (0.25- 0.67)	0.44 (0.23-0.84)	0.013*

*- Variables which were significant in the final model, 1- reference, AOR- Adjusted odds ratio, CI-confidence interval.

6. DISCUSSION

From this study it has been observed that age, sex, use of electronics out of work, habit of taking break, monitor distance, glare and window curtain were the significant associated factors for computer vision syndrome with a prevalence of 74.6% (95% confidence interval [CI] = 70.1, 79.5) among the studied population.

The prevalence of CVS in this study is analogous to other reports such as; 74% in Abuja; Nigeria among computer users at the Securities and Exchange Commission (SEC)[1]; 73.9% in University of Gondar among secretaries and data processors[15]; 73% among bank workers in Gondar City, northwest Ethiopia[17]; 72% in Ajman, United Arab Emirates, among computer workers [26]; and 67.4 % among computer office workers from a South Asian country [20] have been demonstrated similarly. The similarity might possibly related with similar symptoms of CVS were considered.

On the contrary, higher prevalence of CVS reports has been disclosed in Chennai among medical and engineering students (81.9 %)[7], in Malaysia Reddy et al. [23] reported 89.9% of 795 university students had CVS symptoms. On the other hand lower prevalence of CVS (59.9 %) has been reported in Mauritius among keyboard users[39]. The reason for the highest prevalence may be due to comfortable situations to take break and blink eyes. As shown above the highest prevalence is among university students who might be at higher tension to read, write and preparing projects in different workplaces proximal to environmental factors as well as they might use other electronics materials other than computer such as tablets and mobiles for educational and recreational purpose than bank workers who have an opportunity to take rest during customer service, counting birr and printing the vouchers.

On the other hand, the definitions given for CVS is not consistent. For example the studies in Chennai and Malaysia includes musculoskeletal symptoms such as neck and shoulder pain as computer vision syndrome in addition to the visual symptoms. Whereas the definition of CVS in this study consisted only of eye/visual symptoms. The other reason might be the exposure duration used. The study in china used an exposure duration of one month which might not be exposed to recall bias relative to the current study which uses the past 12 months as exposure duration. The reason for the lowest prevalence might be

due to lowest response rate. A questionnaire-based survey which was carried out among 362 computer users in Mauritius was resulted with 200 (62%) completed questionnaire[39].

Similar to the other studies in this study eye irritation and burning sensation are the most commonly reported symptoms. This is in line with study done by Megwas and Daguboshim [40] (31.6 %) of Pain and (28.7 %) pain in and around the eyes by P. Ranasinghe [20]. Even though the two studies presented that pain in and around the eyes was most common symptom, it is less in prevalence when it compared with the current study. The reason may be related with counting money. Day to day money is transferred from people to people. When it reaches bank offices it is counted by bank workers without considering the dirty it holds and without mitigating the dirty. The bank employees might want to blink or refresh their eyes by their hands which was already exposed to the dirty of the money. Due to this eye irritation and burning may happen.

Higher prevalence of 40.2%, 40.7%, 40.8% symptoms of eye redness were reported in India by Shrivastava and bobhate (2012) [41] Talwar et al. (2009) [42] and Cheiemeke et al. (2007) [43]respectively. Which is in line with current study (45.6%). The reason for high prevalence of eye redness might be related with the way how methodologically measured eye redness, genetic background of the study participant, alcohol consumption of participants and environmental conditions of the study area.

In the current study, 45.2% of headache prevalence was reported. Likewise, headache was the most commonly reported symptom in the computer users in several other similar studies [1, 7, 23, 44].

In this study, the visual acuity of the employees was measured both in Snellen chart and questionnaire. Based on the standard categories of the Snellen chart[45] the result of this study shows almost all study participants were in the normal condition. Meaning that 3.1% of the study participant have right eye low vision and 2.6% have left eye low vision. But, using the definition of CVS given in this study blurred vision was seen in (44.8%) of the study population. In a similar context, the much higher prevalence of blurred vision

(59.4%) was reported by Edema and Akwukwuma [46] and in Chennai 31.6% among medical and engineering students [7].

In most studies eye strain was most commonly reported symptom but not here. The reason is agreed with the statement of Gowrisankaran et al. who said that "There is confusion among study population when reporting on eye strain because in some cases eye strain is reported as burning sensation. Eye strain or asthenopia is an ophthalmological condition that presents with nonspecific symptoms such as fatigue, pain in and around the eyes that are caused by reading or looking at a computer screen for too long [47].

In many studies it was observed that the proportion of females who developed CVS was more compared to the prevalence among males [20, 39, 48, 49]. However, in this study being male was significantly associated with the risk of developing CVS. This is supported by Logaraj et al. who reported individual symptoms such as redness, burning sensation, blurred vision and dry eyes were comparatively more in males than in females[7]. The reason why CVS is common in male in this study might be their exposure status outside work compared to those females who might be at work other than computer.

After adjusting for other confounding variables the results of the multivariate logistic regression analysis show that the most significant risk factor for development of CVS was glare followed by use of electronic materials outside work. Those participants working on computer with the exposure of direct and indirect glare of the natural and artificial light were 4 times more likely to suffer from CVS as compared to those who are working on computer with curtain closed windows and artificial light perpendicular to them. In similar fashion with this study, glare is an issue with all the monitors [38] and eyestrain was reported significantly by more number of subjects who do not use antiglare screens [19]. The best way to minimize the glare is to use an antiglare cover over the screen and the use of flat screens whenever possible [9]. But, the participants in this study were not used antiglare cover and flat screens. On the other hand, in this study workers who are users of electronic materials (computer, tablet and smart phone screen) outside work in addition to their work area was three times more likely to suffer from CVS as compared to those who are using electronic materials at work area only. This is possibly due to using the electronics in dark places and high exposure time for educational and recreational purpose.

Participants who have the habit of taking a break were 56% less likely to develop CVS compared to those who haven't habit of taking break. Likewise, studies shown that significant correlation was found between taking less frequent breaks or working on computer for more than 20 minutes without break and being more exposed for symptoms of CVS when compared with taking more frequent breaks within 20 minutes [7, 17, 19, 48, 50]. But in this study it was difficult to look associations between the specific time of taking break and CVS because the habit of taking break of participants were different. The reason why those with habit of taking break are preventive is that related with relaxing the muscles of the eyes which can then decreasing the eye fatigue and headache [51]. However, other studies demonstrated that taking a break was not significantly associated with prevalence of CVS [20, 23]. This may be due to the difference in giving definition for habit of taking break. Those studies who come up with association of taking break and prevalence of CVS uses definition for habit of taking break; taking 15 minutes break 1-2 hours interval and refreshing eye every 20 minutes while at computer at use.

The study also revealed that participants who use computer at a distance above 50cm were 78% less likely to develop CVS compared to participants who use computer at a distance of less than or equal to 50cm. Comparative to this study several studies reported a significant risk of getting visual symptoms when there is a change from a greater to a lesser viewing distance. Meaning that complaints of visual symptom was less in the subjects whose viewing distance were more than 50 cm (20 inches) and complaints of visual symptoms was highest in the subjects whose viewing distance were less than 50 cm (20 inches) [19, 22, 43, 52, 53]. In spite of it, other study revealed there is no significant association between distance from face to monitor and CVS [20]. This may be due to inaccurate measurements taken from inappropriate sitting position of the respondents and the viewing distance of the respondents might be dynamic.

Unlike to other studies results from a multivariate analysis disclosed that participants who used computer with fulfillment of window curtain was 56% less likely to develop CVS than those workers without fulfillment to window curtain. This might be possibly related with the level of glare inter into the working place when the window is not covered with curtain. Likewise, Study participants in the age group 30-39years were 3 times more likely

to suffer from CVS as compared to those who are in the age group 20-29years. Workers at age group more than 40 years were not associated with CVS. This is possibly due to the small number of study participants in age group more than 40 years.

In workplaces, the artificial lighting provided should be in between 300Lux-500Lux [34]. But in this study almost all of the measurement taken were below the standard. Due to this it was difficult to look the association between workstation illumination and CVS. Hence, other studies on a large sample size is required to identify as it is a risk factor for CVS.

Some other predictor variables such as using computer eye glass, awareness, work experience, occupational difference, working hours per day, pre-existing eye disease were not significantly associated with CVS. This may be due to inadequate sample size.

The study implies that awareness regarding the symptoms and prevention methods of computer vision syndrome among the study population and organization were low hence, the prevalence of CVS is high and the contributing factors were personal and work related.

7. STRENGTH AND LIMITATION OF THE STUDY

The strength of this study was using measurement instruments to measure workplace illumination, blurred vision and monitor distance of the user.

The main limitations of this study were that it was a cross-sectional study which limits the inference of causality and can only demonstrates an association between CVS and the identified factors. Social desirability bias and recall bias might possibly be introduced as well as interviewer bias might appear in the study during distance and illumination measurement. Individuals who are severely sick and absent from work might not include during the data collection.

8. CONCLUSIONS

In this study commercial bank workers had shown a high prevalence (74.6%) (95% confidence interval [CI] = 70.1, 79.5) of Computer Vision Syndrome. Majority of it (56%) were with severe cases. Sex, age, the habit of taking rest, monitor distance, presence of glare, window curtain were significantly associated with CVS.

9. RECOMMENDATIONS

From this study the following recommendations are forwarded to the management and employees of Commercial Bank of Ethiopia, Ministry of Labour and Social Affairs and future researchers.

Commercial Bank of Ethiopia:

- The organization have to create awareness and arrange safety and health training for helping a user avoid risks associated with computer vision syndrome.
- The organization have to arrange the workplace with comfortable and uniform illumination based on the standard illumination level (300Lux-500Lux).
- The organization have to install adequate fluorescent light perpendicular to the workers work station.
- The organization have to provide curtains/blinds/ to cover the windows and antiglare screen cover.
- The organization have to consider regular breaks for the employees i.e. 15minutes break every two hours work.

Employees of Commercial Bank of Ethiopian:

- They have to use the recommended viewing distance between the monitor and their face which is above 50cm.
- They have to take 20 seconds refreshment at a distance of 20feets every 20 min work.
- They have to exercise their viewing distance in relation to the standard.
- Workers have to reposition their workstation or the light sources when there is glare.
- Workers haven't expose themselves to electronic materials outside work.

Ministry of Labour and Social Affairs:

- Have to set guidelines for room illumination.
- Have to enforce for the CBE in order to recruit occupational health professionals.

Future researchers:

Have to do the study with larger sample size and eye examination of self-reported symptoms.

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11.ANNEXES:

Annex I: Structured questionnaire in English

ADDIS ABABA UNIVERSITY

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

Assessment of prevalence and associated factors of computer vision syndrome among commercial bank workers in Adds Ababa, Ethiopia.

Information sheet and Consent form for the study participants

Introduction: Hello, my name is _____.I came from Addis Ababa University, College of Health Science, and School of Public Health to collect data regarding computer vision syndrome which is conducted among all workers of CBE. The study has ethical approval from Addis Ababa University School of Public Health and learning and development center of CBE. In this study all workers of commercial bank of Ethiopia are requested for the willingness. You are requested to fill the questionnaire and to look this information sheet.

Title of the study: Assessment of computer vision syndrome among commercial bank of Ethiopia workers in Addis Ababa, Ethiopia.

Aim of the study: to assess the prevalence and associated factors of computer vision syndrome among commercial bank of Ethiopia workers in Addis Ababa, Ethiopia.

Benefits of the study: Though you may not be the direct beneficiaries of this research, the information generated from this research will help to reduce computer-related visual problems

Risks of the study: There is no any risk or discomfort that you will face by participating in this research except dedication of time for responding the questionnaires and illumination measurement.

Right to refuse or withdraw: You are requested to participate voluntarily in this study. It is your full right to refuse in responding any question or all of the questions.

Beneficences to participants: Study participants will not have any incentives or payments due to their participation. However, they will be informed their exposure level to workplace illumination and the result of their eye segment examination.

Confidentiality: All Personal identifiers & personal information will not be taken. All your responses and results obtained will be kept confidentially by using a coding system whereby no one has access to your responses. Information will not be accessed to others except the researcher.

Persons to contact: Please if you have any question regarding the study you may contact Haile Derbew (the principal investigator): Tel +251-946-89-44-65 or Mrs. Ansha Nega (Tel-0918151073) or Mr. Worku Tefera (Tel- 0913620514) (Advisors) Addis Ababa University, College of Health Sciences, School of Public Health.

Information consent form

Dear participants

Having the above information, I kindly ask you to take part in the study.
I the undersigned will like to approve that, as I give my consent to participate in this study after detailed objective of the study have been explained to me in the language I understand. I have also understood that I can withdraw my consent any time without loss of any personal benefits.

Would you willing to participate, please? Please mark thick (√) in front of your answer.

- ☐ Yes
- ☐ No

If your answer is" yes" please fill the following

Signature of the study participant: _____Date _____

Name of data collector _____ Signature: _____ Date: _____
Name of supervisor _____ Signature: _____ Date: _____

For any question regarding the study you can contact:
Principal investigator: **Haile Derbew,** Phone number: **+251-9-46-89-44-65**
E-mail: derbewhaile9@gmail.com

District ID NO	Branch ID NO	Participant ID NO

Part I: Socio-demographic data

1.1.Age _____

1.2.Sex

0 Female

1 Male

1.3.Job title

1. Clerical
2. Professional
3. Managerial

1.4.How long have you been working on the computer? Year's_____(work experience)

Part II: Symptoms of CVS

2.1.Are you aware of a condition called Computer Vision Syndrome? 0. No 1. Yes

2.2.If yes to the above question what are the symptoms of computer vision syndrome? List the symptoms you know.

_____

_____

2.3.What is the action to be taken to get relief from the syndrome? (Circle whichever applicable, you may select above one choice)

- Take a break but remain seated
- Take a break and move around
- Close my eyes
- Blink more frequently
- Wearing glasses while using the computer.
- 20-20-20 rule
- Others (specify)……

2.4.Whenever you use computer or after using computer have you experienced vision syndrome? 0. No 1. Yes

If yes for Q 2.4.Which of the following symptoms you experienced while using/after finishing the work on computer in the given time?(May have more than one answer)Mark X

S. no.	List of symptoms	Have you experienced in your life time since you start to use computer?	Have you experienced in the past 12 months?	Have you experienced In the past two week?
2.5.	Blurred vision			
2.6.	Eye strain			
2.7.	Eye fatigue			
2.8.	Headache			
2.9.	redness of eyes			
2.10.	watery eyes			
2.11.	dryness of eyes			
2.12.	double vision			
2.13.	eye irritation			
2.14.	Burning sensation			

2.15. If you experienced the symptoms (from Q 2.5-Q2.14) what kind of methods you use to relief?

_____

_____

Part III. Work-related factors

3.1.How many hours do you use the computer on average?(on your working area with working days including extra time)

- Per day _____hrs.
- Per week_____ hrs.

3.2. Do you use a computer or other electronic materials (smart mobile, tablet) in your home? 0. No 1. Yes

3.3.If your answer to question 3.2 is Yes How many hours do you use the computer on average in your home?

- Per day _____hrs.
- Per week_____ hrs.

3.4.Have you ever taken any training regarding problems of CVS and prevention methods?

0. No
1. Yes

3.5.If your answer for question 3.4 is 'yes' from where you take the training?

1. From your organization
2. From other organization
3. From internet (online)
4. If other_____

Part IV: Personal factors

4.1.Do you have a habit of taking break while using the computer?

0. No
1. Yes

4.2.If the answer to question no.4.1. If yes, by how many minutes after work?

_____

4.3.Which one of the following you use while you are using computer at work? (circle your choice, you can select more than one choice)

- Lubricating eye drops
- Computer glasses
- Contact lenses
- Bifocals
- Reading glasses
- Glass for short-sightedness
- I don't use
- If other _____

4.4.Have you ever consulted a doctor or eye specialist for an eye problem?

0. No 1.Yes

4.5.If yes, for question no. 4.4

- What was the diagnosis? _____
- What was the cause? _____

4.6. Do you have any hereditary eye disease?

0. No
1. Yes

4.7. Before you start working with computer do you have chronic eye diseases?

0. No
1. Yes

4.8. If your answer for question 4.8 is yes can you list some of the chronic eye diseases you exposed?_____

4.9. Do you have a habit of arranging brightness and contrast of computer when you use it?

0. No 1. Yes

Participant ID NO_____

Part VI. Information to be filled using measurement and observation

5.1.Result of Visual acuity

- Right eye _____
- Left eye _____

5.2.Viewing distance _____

5.3.Level of top of the computer screen

- Above the level of eyes
- At the level of eyes
- Below the level of eyes

5.4. Contrast of computer _____

5.5.Brightness of the computer _____

5.6.The measured amount of light failed at the task area and computer of the user.

Id No.	Measurement one (Top one)	Measurement (Top two)	Measurement (bottom one)	Measurement (bottom two)	Average measurement

5.7.Observational Checklists regarding workplace lighting

- Which light source is found at the work place?
  - Artificial light source____
  - Natural light source_____
  - Both
- Direction of the natural light source against the user?
  - Perpendicular to the user
  - In front of the user(direct glare)
  - Back of the user (indirect glare)
  - From side of the user
- Direction of the artificial light source against the user? Mark (√)
  - Perpendicular to the user

- In front of the user(direct glare)
- Back of the user (indirect glare)
- From side of the user

- Are the windows in work area covered with curtains/blinds? _____
- Is the computer covered by anti-glare screen?
    0. No
    1. Yes

Name and signature of data collector_____

Date of collection_____

Checked by supervisor_____

Name and signature_____

Consent Form in Amharic

አዲስ አበባ ዩኒቨርስቲ

ሕክምናና ጤና ሳይንስ ኮሌጅ

የሕብረተሰብ ጤና ትምህርት ቤት

በአዲስ አበባ ከተማ በሚገኙ የኢትዮጵያ ንግድ ባንክ ቅርንጫፎች ካሉት የኮምፒውተር ተጠቀሚ ሰራተኞች መካከል ኮምፒውተር መጠቀም የሚያስከትለው የእይታ ችግር መጠንና ተያያዥ የሆኑ ምክንያቶች የዳሰሳ ጥናት

መግቢያ፡ ጤና ይስጥልኝ ስሜ_____ይባላል፡፡ የመጣሁት ከአዲስ አበባ ዩኒቨርስቲ የጤና ሳይንስ ኮሌጅ የሕብረተሰብ ጤና ትምህርት ቤት ሲሆን የመጣሁበት ምክንያትም በአዲስ አበባ ከተማ በሚገኙ የኢትዮጵያ ንግድ ባንክ ቅርንጫፎች ካሉት የኮምፒውተር ተጠቀሚ ሰራተኞች መካከል ኮምፒውተር ከመጠቀም ጋር የተያያዙ የእይታ ችግሮች ላይ ለምናደርገው ጥናት የሚረዱ መረጃዎችን ለመሰብሰብ ነው፡፡ጥናቱ ከአዲስ አበባ ዩኒቨርስቲ ሕብረተሰብ ጤና ትምህርት ቤትና ከኢትዮጵያ ንግድ ባንክ የመማርና ዕድገት ማዕከል ፈቃድ የተሰጠው ነው ፡፡ በጥናቱ ላይ ሁሉም ኮምፒውተር ተጠቃሚ የባንኩ ሰራተኞች እንዲሳተፉ ተጠይቀዋል፡፡ እርስዎም ይህን መረጃ መስጫ ቅጽ እንዲመለከቱትና መጠይቁን እንዲሞሉት ብሎም ልኬቱን እንዲፈቅዱልን በትህተና እንጠይቃለን ፡፡

የጥናቱ ርዕስ፡ኮምፒውተር መጠቀም የሚያስከትለው የእይታ ችግር መጠንና ተያያዥ የሆኑ ምክንያቶች

የጥናቱ ዓላማ፡ኮምፒውተር መጠቀም የሚያስከትለውን የእይታ ችግር መጠንና ለበሽታዉ መከሰት ተያያዥ የሆኑ ምክንያቶችን ለመግለፅ ነው፡፡

የጥናቱ ጠቀሜታ፡ ጥናቱ ለተሳታፊዎች በቀጥታ ምንም ዓይነት ጥቅም አይሰጥም፡፡ ነገር ግን ከተሳታፊዎች የሚገኘውን መረጃ መነሻ በማድረግ ችግሩን ለመከላከል የሚረዱ አቅጣጫዎችን ለመቀይሰ ይረዳል፡፡

ጥናቱ የሚያስከትለው አደጋ፡ ጥናቱ በተሳታፊዎች ላይ መጠይቁን ለመሙላትና የኮምፒውተሩን የብርሃን መጠን ለመለካት የተወሰኑ ደቂቃዎችን ከመውሰዱ ውጭ ምንም ዓይነት አደጋ አያስከትልም፡፡

የተሳታፊዎች መብት: በዚህ ጥናት በፍቃደኝነት እንዲሳተፉ እንጋብዛለን፡፡ በማንኛውም ሰዓት መጠይቁን የማቋረጥ እንዲሁም በመጠይቁ ውስጥ መመለስ የማይፈልጉትን ጥያቄ የመዝለል መብት አለዎት፡፡

ለተሳታፊዎች የሚደረግ ጠቀሜታ፡ በጥናቱ ለመሳተፍ ምንም ዓይነት መደለያ ወይም ጥቅማ ጥቅሞች አይሰጡም፡፡ ነገር ግን ተሳታፊዎቹ የዓይናቸውን የዕይታ ሁኔታ እንዲያቁ ይደረጋል፡፡

የጥናቱ ተሳታፊዎችን ምስጢር ስለመጠበቅ፡ በተሳታፊዎች የተሞሉት መጠይቆች ከተመራማሪዎቹ አባላት ውጭ ለሌላ ለማንም ተላልፎ አይሰጥም፡፡እርስዎ የሰጡት መረጃ በምንም ዓይነት መልኩ ከግል ማንነትዎ ጋር አይያያዝም፡፡ የሰጡትም መረጃ በምስጢር ይያዛል፡፡

የበለጠ መረጃ ካስፈለግዎ፡ እባክዎ ጥናቱን በተመለከተ ማንኛውም ዓይነት ጥያቄ ካለዎት፡ አቶ ሃይሌ ደርበውን (ዋና የጥናቱ ተመራማሪ)፤ ስልክ ቁጥር 0946894465 ወይም ወ/ሮ አንሻ ነጋን (ስልክ ቁጥር-0918151073) (የጥናቱ ዋና አማካሪ)፤ አቶ ወርቁ ተፈራ (ስልክ ቁጥር-0913620514) (የጥናቱ አማካሪ) ደውለው ማነጋገር ይችላሉ

የፈቃደኝነት መጠየቂያ ቅጽ

የተከበሩ የጥናቱ ተሳታፊ፡

ከላይ የተጠቀሱትን ግምት ዉስጥ በማስገባት በጥናቱ ላይ እንዲሳተፉ በአክብሮት እጠይቃለሁ ::

ከላይ ባገኙት የመረጃ ግንዛቤ መነሻ በማድረግ በጥናቱ ላይ ለመሳተፍ ይስማማሉ? አዎ/አይደለም ብሎ ለመመለስ በተገቢው ሳጥን ውስጥ የ(√) ምልክት ያስቀምጡ

- አዎ
- አይደለም

መልስዎ አዎ ከሆነ እባክዎ የሚከተለውን አንብበው ይሙሉ::

እኔ ከዚህ በታች ፊርማዬ የተቀመጠው ተሳታፊ፤ የጥናቱ ዓላማ በሚገባ ሰለተረዳሁ በጥናቱ ለመሳተፍ የተስማማሁ መሆኔን (ማለትም መጠይቁን ለመሙላት፤ ለአካልና ኮምፒውተር ልኬቱ ስራ) በተለመደው ፊርማዬ አረጋግጣለሁ::በማንኛውም ጊዜ ጥናቱ አቋርጬ መውጣት እንደምችል እንዲሁም ምንም ዓይነት ጫና እንደማይደርስብኝም ተረድቻለሁ::

የተሳታፊ ፊርማ _____የተፈረመበት ቀን _____

የመረጃ ሰብሳቢው ስም _____ ፊርማ_____ ቀን_____

የመረጃ ተቆጣጣሪው ስም-_____ ፊርማ_____ቀን_____

ጥናቱን በተመለከተ ማንኛውም ዓይነት ጥያቄ ካለዎት ታች ባለው አድራሻ ዋና ተመራማሪውን መጠየቅ ይችላሉ

የዋና ተመራማሪው ስም፤ **ሃይሌ ደርበው**፤ ስልክ ቁጥር-0946894465፤

ኢሜይል- derbewhaile9@gmail.com

የዲስትሪክት መለያ ቁጥር	የቅርንጫፍ ባንኩ መለያ ቁጥር	የተሳታፊው መለያ ቁጥር

ክፍል አንድ፡- ማሕበራዊ መረጃዎች

እባክዎን የሚመርጡትን ምርጫ ያክብቡት፤ቁጥር ነክ የሆኑ ጥያቄዎችንም በትክክል ያስቀምጡ።

1.1. እድሜ _____ዓመት

1.2. ጾታ

0. ሴት
1. ወንድ

1.3. ከየትኛው የስራ መደብ ነዎት?

1. ክለሪካል
2. ፕሮፌሽናል
3. ማናጂራል

1.4. ኮምፒውተርን እየተጠቀሙ ስንት ዓመት ሰርተዋል? _____(ሌላ መስሪያ ቤት የሰሩት ካለ ያጠቃልላል)

ክፍል ሁለት፡- ኮምፒውተር በመጠቀም ምክንያት የሚታዩ የዐይን በሽታ ምልክቶች

2.1. ኮምፒውተርን በመጠቀም ስለሚመጡ የበሽታ ምልክቶች ግንዛቤ አለዎት?

0. የለኝም 1. አዎ

2.2. ለጥያቄ ቁጥር 2.1. መልስዎ አዎ ከሆነ የበሽታው ምልክቶች ምንድን ናቸው?የሚያቋቸውን ምልክቶች ያስቀምጡ_____

2.3. ኮምፒውተርን በመጠቀም ከሚመጡ የበሽታ ምልክቶች፤ ለመዳን ሊወሰድ የሚገባው መፍትሔ ምንድን ነው?(ከአንድ በላይ መልስ መምረጥ ይቻላል)

- ☐ እንደተቀመጡ ዕረፍት መውሰድ
- ☐ እየተንቀሳቀሱ ዕረፍት መውሰድ
- ☐ ዓይንን መጨፈን
- ☐ ዓይንን በተደጋጋሚ ማርገብገብ
- ☐ ኮምፒውተር ስትጠቀም መነፅር መጠቀም.
- ☐ በየ20 ደቂቃው ለ20 ሰከንድ ያክል ዓይንን የማሳረፍ ህግን መጠቀም
- ☐ ሌላ ካለ ይጠቀስ_____

2.4. ኮምፒውተር ሲጠቀሙ ወይም ከተጠቀሙ በኋላ ያጋጠመዎት የዓይን በሽታ ምልክት አለ?

0. የለም
1. አዎ

ለጥያቄ ቁጥር 2.4 መልስዎ አዎ ከሆነ ከሚከተሉት የዐይን በሽታ ምልክቶች ውስጥ ኮምፒውተር ሲጠቀሙ ወይም ከተጠቀሙ በኋላ ያጋጠመዎት የትኛው ነው?/ከአንድ በላይ መምረጥ ይቻላል/ የ "X" ምልክት ይጠቀሙ::

ተ.ቁ	የዐይን በሽታ ምልክቶች ዝርዝር	ኮምፒውተር መጠቀም ከጀመሩ ጊዜ አንስቶ አጋጥመዎት ነበር?	ባለፉት 12 ዉሩት አጋጥመዎት ነበር?	ባለፈው ሁለት ሳምንት አጋጥመዎት ነበር?
2.5	የእይታ መደብዘዝ			
2.6	የዓይን መወጠር			
2.7	የዓይን መድከም			
2.8	የራስ ህመም			
2.9	የዓይን መቅላት			
2.10	የእምባ መፍሰስ			
2.11	የዓይን ድርቀት			
2.12	አንድ ነገር ሁለት ሆኖ መታየት			
2.13	የዓይን መቆጥቆጥ			
2.14	የዓይን ማቃጠል			

2.15. ከላይ ከሰንጠረዡ ካሉት የዓይን በሽታ ምልክቶች (ከጥያቄ ቁጥር 2.5-2.14) አጋጥመዎት ከሆነ ለመዳን ምን ዓይነት መፍትሔ ወስደዋል?

_____

_____

ክፍል ሦስት፡- ከስራ ጋር ተያያዥነት ያላቸው መረጃዎች

3.1. በስራ ቦታዎ በአማካኝ ኮምፒውተርን ለስንት ሰዓት ይጠቀማሉ?(ከስራ ሰዓት ውጪ የሚሰሩትን ጨምሮ)

- በየቀኑ ለስንት ሰዓት ይጠቀማሉ? _____ሰዓት
- በየሳምንቱ ለስንት ሰዓት ይጠቀማሉ?_____ ሰዓት

3.2. በቤትዎ (ከስራ ውጭ በሆኑ ቦታዎች) ኮምፒውተር ወይም ሌላ የኤሌክትሮኒክስ ዕቃዎች ማለትም ስማርት ሞባይል፤ታብሌት ይጠቀማሉ? 1. አዎ 0.አልጠቀምም

3.3. ለጥያቄ ቁጥር 3.2 መልስዎ "አዎ" ከሆነ ቀጥለው ያሉትን ሁለት ጥያቄዎችን ይመልሱ።

- ✓ በየቀኑ ለስንት ሰዓት ይጠቀማሉ? _____ሰዓት
- ✓ በየሳምንቱ ለስንት ሰዓት ይጠቀማሉ? _____ሰዓት

3.4. በኮምፒውተር መጠቀም ምክንያት ሊመጣ ስለሚችል የበሽታ ምልክቶችና የመፍትሔ አቅጣጫዎች በተመለከተ ስልጠና ወስደው ያቃሉ?

0. አላውቅም
1. አዎ

3.5. ለጥያቄ ቁጥር 3.4 መልስዎ "አዎ" ከሆነ ስልጠናውን ከየት ነው የወሰዱት?

1. አሁን ከሚሰሩበት መስሪያ ቤት
2. ከሌላ መስሪያ ቤት
3. ከ ኢንተርኔት (በቀጥታ አንላይን ኮርስ)
4. ሌላ ካለ ይጠቀስ_____

ክፍል አራት፡

ከተሳታፊው ኮምፒውተር አጠቃቀም ጋር ተያያዥነት ያላቸው መረጃዎች

4.1. ኮምፒውተር ሲጠቀሙ ዐይንዎትን የማሳረፍ ልምድ አለዎት?

1. አዎ
0. የለኝም

4.2. ለጥያቄ ቁጥር 4.1. መልስዎ አዎ ከሆነ በየስንት ጊዜው ዓይንዎትን ያሳርፋሉ?

_____

4.3. በስራ ቦታ ላይ ኮምፒውተር ሲጠቀሙ ከሚከተሉት ውስጥ የትኞችን ይጠቀማሉ? (ከአንድ በላይ መልስ መምረጥ ይቻላል።)

- ☐ ዓይን የሚያለሰልስ ጠብታ
- ☐ የኮምፒውተር መነፅር
- ☐ እይታን የሚያስተካክል ሌንስ መነፅር
- ☐ ባለ ሁለት ሌንስ መነፅር
- ☐ የማንበብያ መነፅር
- ☐ ለአጭር እይታ የሚያገለግል መነፅር
- ☐ ምንም አልጠቀምም
- ☐ ሌላ ካለ ይጠቀስ_____

4.4. ለማንኛውም የዓይን በሽታ የዓይን ሃኪምን አማክረው ያቃሉ?

0.አላውቅም 1. አዎ

4.5. ለተ.ቁጥር 4.4. መልስዎ አዎ ከሆነ

- ✓ የምርመራው ውጤት ምን ነበር? _____
- ✓ የበሽታ ምልክቶቹ መንስኤ ምን ነበር?_____

4.6. ከቤተሰብ የተወረሰ የዓይን በሽታ አጋጥመዎት ያቃል? 1. አዎ 0. አላውቅም

4.7. ኮምፒውተርን በመጠቀም ስራ ከመጀመርዎ በፊት የቆየ የዓይን በሽታ አጋጥመዎት ነበር?

0. አይደለም 1. አዎ

4.8. ለጥያቄ ቁጥር 4.7. መልስዎ አዎ ከሆነ ያጋጠመዎት የዓይን በሽታ ዓይነቶችን ቢጠቅሱ_____

4.9. ኮምፒውተር ሲጠቀሙ የኮምፒውተሩን ብራይትነስና ኮንትራስት (የብርሃን መጠንና የብርሃን ልዩነት) የማስተካከል ልምድ አለዎት?

0. የለኝም 1. አዎ

የተሳታፊ መለያ ቁጥር_____

ክፍል ስድስት፡ በማየትና በመለካት የሚሞላ መረጃ

5.1. የዕይታ መለኪያ ውጤት

- ☐ ቀኝ ዓይን_____
- ☐ ግራ ዓይን_____

5.2. ኮምፒውተሩ ከተጠቃሚው ዓይን ያለው ርቀት_____

5.3. የኮምፒውተሩ የላይኛው ጠርዝ ከኮምፒውተር ተጠቃሚው የዐይን እይታ ያለበት ደረጃ

- ☐ ከዐይን ትይዩ በላይ
- ☐ በዐይን ትይዩ
- ☐ ከዐይን ትይዩ በታች

5.4. የኮምፒውተሩ ኮንትራስት_____

5.5. የኮምፒውተሩ ብራይትነስ_____

5.6. በሰራተኛው የስራ ቦታና ኮምፒውተር ላይ ያረፈው የብርሃን ልኬት ውጤት

መለዮ ቅጥር	ልኬት አንድ	ልኬት 2	ልኬት 3	ልኬት 4	አማካይ ልኬት

5.7. የስራ ቦታ ብርሃንን በተመለከተ በማየት የሚሞላ ቸክሊስት

☐ በስራ ቦታው ያለው የብርሃን ምንጭ ምንድን ነው?

- ሰው ሰራሽ ብርሃን ብቻ
- የተፈጥሮ ብርሃን ብቻ
- ሁለቱም የብርሃን ዓይነቶች አሉ።

☐ የተፈጥሮ ብርሃን ምንጭ ከተጠቃሚው አንፃር ያለው አቅጣጫ?

- ቀጥታ በአናት
- ከተጠቃሚው ፊት ለፊት
- ከተጠቃሚው በኋላ
- ከተጠቃሚው በጎን

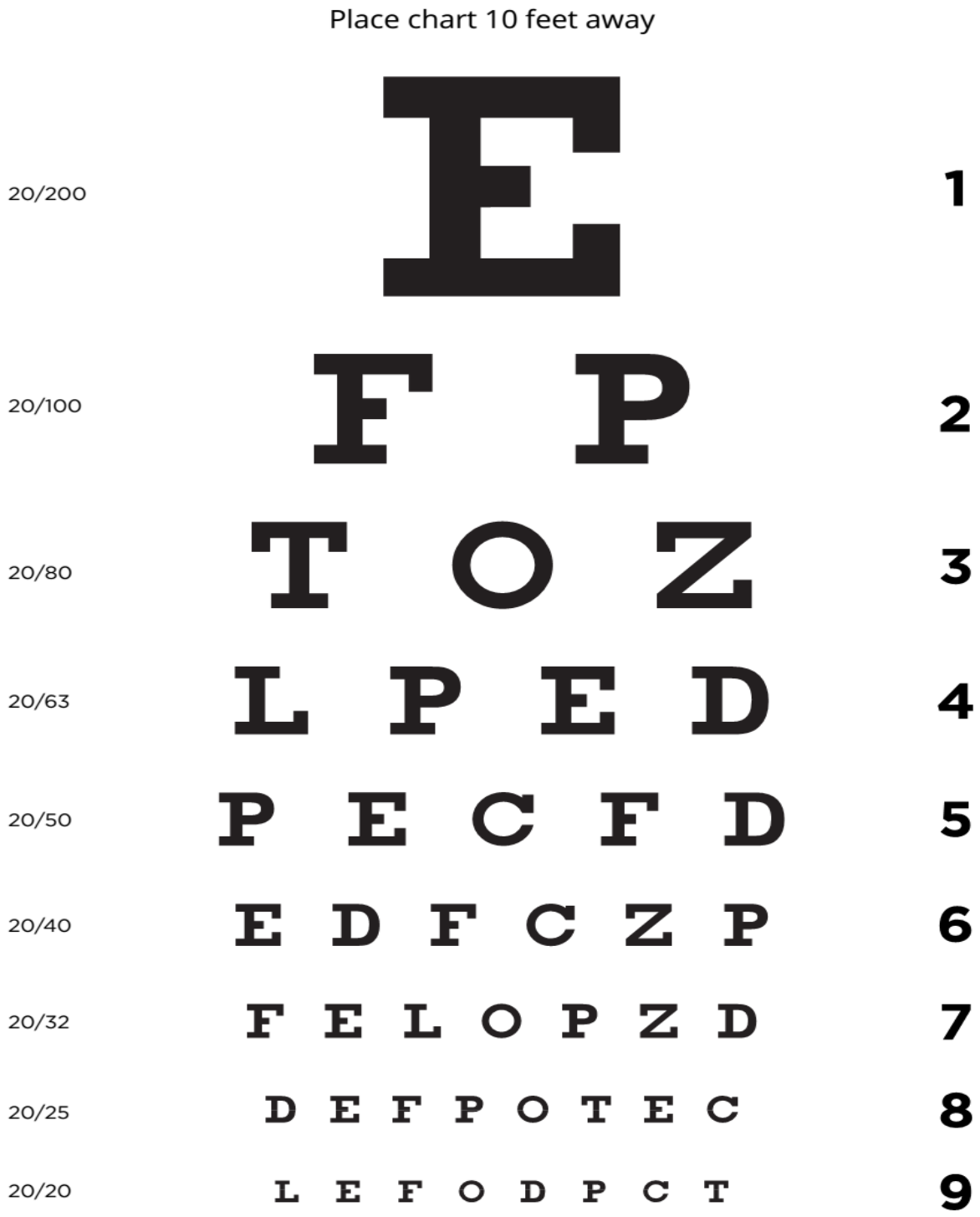
- የሰው ሰራሽ ብርሃን ምንጭ ከተጠቃሚው አንፃር ያለው አቅጣጫ?
    - ቀጥታ በአናት
    - ከተጠቃሚው ፊት ለፊት
    - ከተጠቃሚው በኋላ
    - ከተጠቃሚው በጎን
- በስራ ቦታ ያሉ መስኮቶች በመጋረጃ የተሸፈኑ ናቸው? _____
- ኮምፒውተሩ ነፀብራቅ መከላከያ መሸፈኛ አለው?
    - አዎ 0. የለውም

መረጃ የሰበሰበው ስምና ፊርማ_____

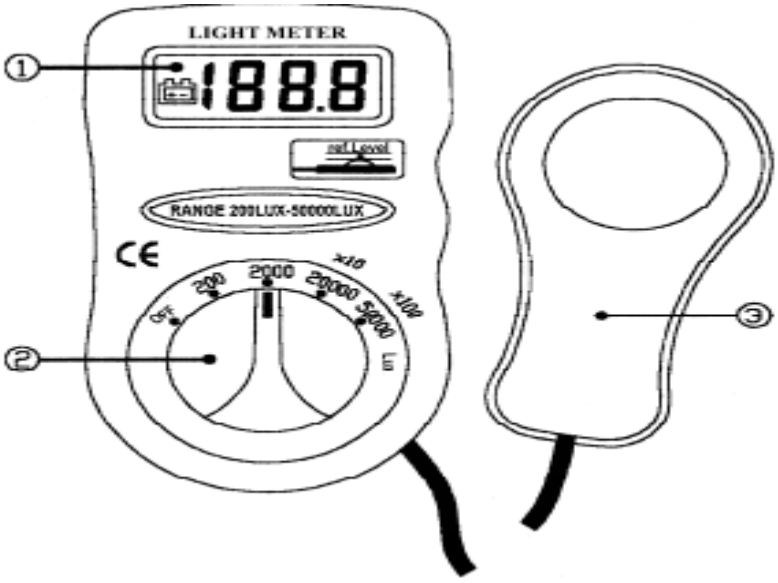
መጠይቁ የተደረገበት ቀን_____

መረጃውን ያረጋገጠው ስምና ፊርማ _____ ቀን_____

Snellen Eye Chart



Light meter Panel description and operating instruction



1. LCD display: 3 – 1/2digit LCD display with low battery “BAT” indication.

2. Power /function /range switch: Turn power ON or OFF and select measurement function and ranges.

3. Photo Detector- Photo Detector: Long life silicon photo diode inside

Measuring Light

1. Turn the power/function/range switch to select the range to desired (x1 lux, X10lux, x100lux) range.

2. Remove the photo detector to light source in a horizontal position.

3. Read the illuminance nominal from the LCD display.

4. Over-range: If the instrument only display one “1” in the M.S.D. the input signal is too strong, and a higher range should be selected.

5. When the measurement is completed. Replace the photo detector from the light source

DECLARATION

I, the undersigned, senior MPH in Environmental and Occupational Health student declare that this research thesis is my original work in partial fulfillment of the requirement for the degree of Master in Environmental and Occupational Health.

Name: Haile Derbew

Signature: _____

Place of submission: Department of Preventive Medicine, College of Health Sciences, Addis Ababa University.

Date of Submission: _____

This research thesis has been submitted after approved by my advisor.

Advisor: Name Signature

_____ _____