

# Prevalence and Predictors of Computer Vision Syndrome among Secretary Employees working in Jimma University, Southwest Ethiopia: A Cross Sectional Study at Jimma University

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## Research article

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# Abstract

Background Computer vision syndrome (CVS) is a group of ocular and extra-ocular symptoms experienced in relation to computer use. Nearly 60 million people suffer from CVS globally with a million of new cases occurring each year. The discomfort associated with this disorder result in increased error rate, reduced job satisfaction and work productivity. The problem has become a workplace concern among computer users especially in those occupationally exposed. The magnitude of CVS and its determinants are not well known in Ethiopia. Therefore, the aim of this study was to determine prevalence and predictors of computer vision syndrome among secretaries working in Jimma University, Ethiopia.

Methods An institution based cross-sectional study was conducted on a total of 217 secretary employees working in Jimma University. An interviewer administered pre-tested structured questionnaire was used to collect data. Collected data was analyzed using SPSS version 20.0. Multivariable logistic regression analysis was done to identify the independent predictors for CVS. Results A total of 217 secretaries were included in the study and all of them were females. The prevalence of CVS among study participants was 75.6%. Blurred vision 88(40.6%), extra-ocular symptoms 75(34.6%), eyestrain 66(30.4%) and headache 63(29.0%) were the most commonly reported symptoms of CVS. Factors significantly associated with CVS were duration of occupation (AOR=3.165; 95% CI=1.16, 8.57), average time spent on computer per day (AOR=3.163; 95% CI=1.52, 6.59), computer brightness adjustments (AOR=2.81; 95% CI=1.22, 6.47) and awareness on CVS and its prevention measures (AOR=5.385; 95% CI= 2.55, 11.35).

Conclusion This study revealed that CVS was highly prevalent among secretary employees working in Jimma University. Duration of occupation, average time spent on computer per day, awareness about CVS and its prevention measures and adjustments of computer brightness were the independent factors associated with computer vision syndrome. Secretaries should aware that CVS is a problem that can be prevented by proper use of computer at work place and therefore a means to increase their awareness should be considered.

## Background

Our world has moved from a manufacturing society to an information society. In this 21<sup>st</sup> century, where we are living in a highly sophisticated environment, computer is one of the most dispensable electronic device which is used presently almost by all age groups[1]. Globally, computers are one of the commonest office tools in various institutions such as government offices and academic institutions and its usage had become this century necessity[2].

The discovery of the computer has to a greater extent revolutionized most professions and their work performance. For instance, secretaries, accountants, bankers, academicians, journalists, engineers, flight controllers and graphic artists are professionals who cannot work without the help of computer[3]. These days, it is not uncommon to see secretary employees spending a significant part of their day glued to computer screens because of their occupation. However, working on it is not free from health hazards, especially, close and prolonged use of computer is known to cause medical problem termed "Computer Vision Syndrome" [4,5].

American Optometric Association (AOA) defined Computer Vision Syndrome (CVS) as a complex of eye and vision problems related to the activities which stress the near vision and which are experienced in relation to or during the use of computers[6]. CVS is becoming the number one occupational epidemic of the 21<sup>st</sup> century[7,8,9]. Globally, it is estimated that nearly 60 million people suffer from CVS with a million new cases occurring each year [10]. Several studies estimated that worldwide prevalence of CVS ranges from 25% to 93% among computer users[11].

Studies have reported that the prevalence of CVS was 54.6%, 67.4%, and 69.3% among operators of call center in Brazil[12], office workers in Sri Lanka[10], information technology professionals in Chennai [13] respectively. Bali *et al.*, reported that the most common CVS symptoms among study participants were eyestrain (97.8%), headache (82.1%), burning sensation (79.1%), watering (66.4%), and red eyes(61.2%)among Indian Ophthalmologists[14].

Study conducted in Chennai among university students have shown that the prevalence of CVS was 78.6% among medical students whereas 81.9% among engineering students[2]. Study conducted among computer engineering students of university situated in Lahore, India reported prevalence of CVS as 72.4%[15].

In Ethiopia, study conducted in Gondar found prevalence of CVS to be 73% among bankers [16]. Blurred vision (42.4%), headache (23.0%), red eyes (23.0%) were the most experienced symptoms among bankers. It is not debatable that the use of computers is generally encouraged to keep up with the fast-moving world of technology, research and science. The discomfort associated with prolonged and improper computer usage can significantly impairs workplace productivity, increases error rate, reduces job satisfaction and the quality of life by placing unusual strain on the human physical well-being [7].

The economic impact of the visual and musculoskeletal problems associated with improper and increased computer use is becoming high. Minimizing symptoms that reduce occupational efficiency will result in substantial financial benefit[17]. For instance, the cost of diagnosis and treatment of CVS in USA alone exceeds 2 billion annually which indicates a reflection of importance to think about this new emerging medical and visual problem[18]. CVS remains an underestimated and poorly understood condition at the workplace [19].

Several factors are associated with computer vision syndrome. Studies have shown that being female, longer duration of occupation, prolonged daily computer usage, improper sitting position and not adjusting computer brightness all were associated significantly with the presence of computer vision syndrome[12,20]. For instance, the Osaka study identified age above 30 years as a risk factor for computer use related dry eyes [4].

It is a well documented fact that CVS is a worldwide problem and this is true especially in developed countries, but in our country Ethiopia, there is dearth of information to prove the burden of the CVS and its determinants. Thus, the aim of this study was to determine the prevalence and predictors of computer vision syndrome among secretary employees working in Jimma University, 2018. The outcome of this

study may help the stakeholders to take measures to reduce this public health issue and policy makers to consider a methods to enhance proper computer use at work place.

## Methods

### *2.1. Study design, Area and Period*

Institution based cross-sectional study was study was conducted in Jimma University from 2 April to 2 May, 2018. Jimma University is found in Jimma town, which is located in Southwest part of Ethiopia in Oromia Regional State at a distance of 357 km from the capital city of Ethiopia, Addis Ababa. The establishment of Jimma University dates back to 1952 when Jimma college of Agriculture was founded. Currently, the University has four campuses (Main campus, Business and Economics campus, College of Agriculture and Veterinary Medicine campus and Jimma Institute of technology campus). It also has one teaching hospital which is found in main campus. The University had a total of about 224 secretary workers including those working in Jimma University Medical Center at the of data collection.

### *2.2. Population and eligibility criteria*

The source population of this study was all secretary employees working in the Jimma University and those who were available during the time of data collection. The inclusion criteria for this study were duration of occupation greater than or equal to one year and those willing to participate in the study. Secretaries who were not available during data collection time due to illness or maternal leave, had history of eye disease before employment, history of medical illness such as hypertension and diabetes mellitus, on medication that affect vision like anti-TB and those who had history of injury to neck, back and shoulder were excluded from study.

### *2.3. Sample Size determination*

Based on the assumption of 73% prevalence of CVS from previous study conducted among bank workers in Gondar town[16], applying single population proportion formula and correction formula, the calculated sample size was 131. However, because of manageability of sample size, and for the confidence of the research power, all available secretaries (total of 224) were considered to be included in the study.

### *2.4. Operational definitions*

**Presence of CVS:** Experiencing at least one of the following symptoms either intermittently or continuously for at least one week during the last twelve months in relation to computer use was considered as 'presence of CVS'. The symptoms are blurred vision, double vision, eye strain, eye burning sensation, itching eye, red eyes, watery eyes, dryness of eyes, pain in and around the eyes, increased sensitivity to light, changes in color perception and extra ocular symptoms[10].

**Extra ocular symptoms:** Symptoms including neck, back and shoulder pain.

**Viewing distance:** The distance from the eye to the computer screen in centimeter.

**Appropriate sitting position:** The face of the worker just in level to the computer screen.

**Mild symptom:** symptom that persist for few minutes to hours during computer use.

**Moderate symptom:** symptom that persists during computer use and subsides after rest.

**Severe symptom:** symptom that needs medical consultation [2].

## ***2.5. Data Collection instrument and Quality Control***

Data were collected by four ophthalmic nurses and overseen by 1 supervisor. Data collectors have measured the viewing distance to the nearest 0.1 centimeter. A pretested standardized questionnaire used in previous study conducted in Gondar[16] was used to collect information from participants. Data were collected through face-to face interview. The questionnaire was initially developed in English and translated into working language (Amharic) and then retranslated back to English to maintain its consistency. Before the actual data collection, the questionnaire was pre-tested on 11 secretaries working in Jimma town government officials in order to see the validity of the instrument to estimate the time needed to collect data, and the questionnaires were modified accordingly. Training was given for data collectors before data collection regarding purpose of the study, interview and ethical issues during data collection. Data collectors were instructed to completely fill the questionnaire. The data was checked for completeness and consistency throughout the data collection period.

## ***2.7. Data processing and Analysis***

Data were checked for completeness, coded, and entered in to EPI-data version 3.1 (Odense, Denmark) and then transferred to SPSS version 20.0 (IBM, Armonk, NY, USA) for analysis. Frequencies, means and percentage were used to give a clear picture of socio-demographic variables. Bivariate analysis was performed to select candidate variables at  $p\text{-value} \leq 0.25$ . The variables that have statistically significant associations with the outcome variable in the bivariate analysis were further considered as a candidate for backward stepwise multiple logistic regression model to control the effect of confounding variables. Multivariate analysis was carried out to declare variables that are independently associated with CVS and adjusted odds ratios (AOR) was used to indicate the strength of association between dependent and independent variables. The final model was assessed for goodness-of-fit using Hosmer–Lemeshow test. No evidence indicating lack of fit was found ( $p\text{-value} = 0.221$ ). Finally, those variables with  $p\text{ value} < 0.05$  in the final model were considered as statistically significant.

# **Results**

## ***3.1 Socio-demographic characteristics***

A total of 224 study subjects were initially determined to be included in this study. However, two secretaries were on maternal leave and not available during study period. Three secretaries reported to be diabetic while two were hypertensive and they were excluded. Finally, a total of 217 study subjects were the actual study participants from which data were collected and analyzed. All 217(100%) of the study participants were females. The age of study participants ranges from 21 to 48 years with the mean age of  $32.26 \pm 5.96$  years. Of these, a majority 135(62.2%) of the study participants belonged to the age category 26–35 years. Regarding the religion, 111(51.2%) study participants were Orthodox Christians followed by Muslim 40(18.4%), Protestant 39(18.0%) and others 27(12.4%). A majority 149(68.7%) of study participants belonged to Oromo ethnic group. Regarding educational status 116(53.5%) were diploma holders. Most 89(41.0%) of the study population had worked for about 5 to 9 years and more than half 140(64.5%) of the respondents spend  $\geq 6$  hours per-day working on the computer screen (**Table 1**).

### *5.2 Prevalence of computer vision syndrome*

The overall prevalence of CVS among study population was 75.6% (95% CI=70.0, 81.1). CVS is a disorder that covers wide variety of symptoms. In the present study, the most common reported symptom among study participants was blurred vision 88(40.6%), followed by extra-ocular symptoms 75(34.6%), eyestrain 66(30.4%) and headache 63(29.0%) whereas sensitivity to light 22(10.1%) and changes in color perception 21(9.7%) was the least complaint. The prevalence of each symptom of CVS is presented in **Figure-1**.

### *5.3 Severity of symptoms of computer vision syndrome*

Participants were asked to report whether they had experienced none, mild, moderate or severe problems during or after computer use. Accordingly, it was found that mild blurred vision, watery eye and headache was experienced by 38(17.5%), 37(17.1%), and 31(14.3%) of study participants respectively. Light sensitivity 12(5.5%) and dry eye 9(4.1%) were the least mild symptoms experienced.

Similarly, blurred vision 46(21.2%) and extra-ocular symptoms 45(20.7%) were the most commonly reported moderate symptoms while double vision 5(2.3%) and change in color perception 5(2.3%) were equally the least moderate symptoms reported by study participants. Extra-ocular symptoms 12(5.5%) were the main severe problem reported followed by eye strain 10(4.6%) and eye itching 8(3.7%). However, no study participant 0(0.0%) reported severe double vision (**Table-2**).

### *5.4 Factors associated with computer vision syndrome*

In bivariate analysis variables like age, duration of occupation, average time spent on computer per day, awareness about CVS and its prevention measures and use of eye glass were factors associated with CVS. The variables that showed statistically significant association in the bivariate analysis were transferred and further analyzed in multivariable logistic regression to adjust for potential confounders and to identify predictors of computer vision syndrome. By using a backward stepwise selection method,

all variables were entered into a multivariate analysis. In multivariate analysis, duration of occupation, average time spent on computer per day, awareness about CVS and its prevention measures and adjustments of computer screen brightness were variables independently associated with CVS. **(Table-3)**

Secretary employees worked for greater than or equal to 10 years were 3 times (Adjusted odds ratio [AOR]=3.165; 95% CI=1.16,8.57; p=0.024) higher to experience CVS as compared to those worked for less than 5 years. Study participants worked on computer for about greater than or equal to 6 hours per day was 3 times (AOR=3.163; 95% CI=1.52,6.59; p=0.002) more likely to suffer from CVS when compared to working on computer for less than 6 hours per day.

Another important predictor of CVS was adjustment of computer brightness in which secretary employees who did not adjust their computer brightness were 2.8 times (AOR=2.81; 95% CI=1.22, 6.47; p=0.015) more likely to develop from CVS as compared to employees those adjusted computer brightness. Most importantly, awareness about CVS and its prevention measures was strongly associated with CVS than other factors. Secretaries who were not aware of CVS and its prevention measures was 5.4 times (AOR=5.385; 95% CI= 2.55, 11.35; p=0.000) higher to experience CVS as compared to employees aware of the problem.

## Discussion

The present study showed that the prevalence of CVS was 75.6% (95% CI=70.0, 81.1). Studies found that the prevalence of CVS worldwide ranges from 25% to 93%[11]. The finding of present study is in line with study conducted in Gondar, Ethiopia among bankers[16] which reported prevalence of CVS to be 73%. The result of this study is also similar with several studies from other countries which found prevalence of CVS to be 74% among computer users in Abuja, Nigeria[8], 72% among university students in Ajman, United Arab Emirates[7] and 73.9% among operator of call center in São Paulo, Brazil[12].

However, our prevalence is lower than study conducted among university engineering students in Chennai[2] and Malaysia[20] which reported prevalence of CVS to be 81.9% and 89% respectively. The possible reason for higher prevalence in these studies may be university students use computers and other electronic devices for a longer time and even over night for the purpose of studying than secretary employees whom only spends their day work time on computer. On the other hand, in our study only the symptoms which lasted at least one week were considered as symptoms of CVS whereas they had no specification on duration of symptoms and therefore even transient symptoms might be included.

In contrast, the result of our study is higher than study conducted among office workers in Sri Lanka[12] and information technology professionals in Chennai[13] that found the prevalence of CVS 67.4%, and 69.3% respectively. The higher prevalence observed in our study may be due to involvement of neck, back and shoulder pain as a symptom of CVS which has been also considered as an extra-ocular symptom of CVS in many studies [8,12], whereas their definition of CVS consisted only of ocular/visual symptoms.

CVS is an umbrella term that covers a wide variety of visual/ocular and extra-ocular symptoms[6]. In the present study, blurred vision (40.6%), extra-ocular symptoms (34.6%) and eyestrain (30.4%) were the most commonly reported symptoms whereas a change in color perception (9.7%) was the least complaint. Similarly, study conducted in Gondar among bankers reported blurred vision (42.4%) and headache (23.0%) as the most frequent complaint by participants[16]. Moreover, eyestrain, blurred vision and headache in descending order were the most common reported symptoms among computer users in Benin, Nigeria[21].

However, study conducted in Pakistan among university students reported irritation of eyes (48%), headache (38%) and burning sensation (33%) as the most frequent complaint[20] whereas among Sri Lankan computer workers headache was complained by 45.7% while changes in color perception was reported by 9.3% study participants[10]. Al Rashidi *et al.*, reported that majority (62.14%) of participants presented with eye strain while the second symptom was burning sensation in eyes complained by 7.57% of the participants[22]. This difference could be attributed to differences in study participants' occupation and pain threshold, sampling technique and sample size.

CVS is a problem that is caused by several factors. The present study found average time spent on computer per day as a predictor of CVS. Mowatt *et al.*, found result consistent with current study where 75% of people who spend >6 hours a day on the computer have more visual problems than those who do not[23]. Several studies have shown that an increase in the number of hours spent on computer increases the risk of developing CVS significantly[12,24].

In contrast to present study, study conducted in Gondar among bankers found no significant association between working hours per day and CVS[16]. The reason may be due to the study participants in this area being bank workers most often taking frequent breaks to give services for customers resulting lesser average time spent on computer per day than secretaries that use computers for a longer time without eye break. Likewise, study done in Italy also didn't find any association between duration of the computer use and CVS[25].

Duration of occupation was another factor significantly associated with CVS in the present study. Study by Ranasinghe *et al.*, among computer office workers in Sri Lanka also reported that duration of occupation was significantly associated with CVS[10]. Gupta *et al.*, also found similar result, in which significant association was observed between the symptoms and years of computer usage[5]. However, study conducted by Arumugam *et al.*, did not found significant association[13].

The present study also found that adjustment of computer screen brightness was factor significantly associated with CVS. Study conducted in Uttar Pradesh, India among computer operators working in different offices and banks found that eyestrain, headache and watery eyes were significantly reported by more number of subjects who work with computers without adjusting the brightness of the screen[26].

However, in study among computer office workers in Sri Lanka adjusting the brightness of screen was not significantly associated with CVS[10].

Brightness is one of the key features of a computer screen, which should be adjusted to provide balance with room lighting and maximum visibility. Brightness causes images and words on screen to become blurry especially at its edge. Blurred images are known to cause stimulation of accommodation which leads to ciliary muscle to tire easily and develop symptoms of CVS like blurred vision and eyestrain. Adjustment of the brightness level according to the workplace significantly reduces CVS symptoms like eyestrain and watering[26,27].

Moreover, awareness about CVS and its prevention measures was strongly associated with CVS in the current study. Studies show that most problems associated with computer use are caused by insufficient knowledge about safe computer usage. Sufficient knowledge about CVS and its preventive measures would minimize or prevent the occurrence of CVS[8,11].

This study has certain limitations. First, the obtained data on symptoms of computer vision syndrome were based on subjective report by study participants and this may lead to over or under estimation of the prevalence of computer vision syndrome. Secondly, ophthalmic examination was not done as a result some of the symptoms of CVS like blurred vision and eye strain that might be caused by uncorrected refractive error might potentially overestimate the prevalence.

## **Conclusions**

According to the present study, computer vision syndrome was highly prevalent among secretary employees working in Jimma University, where about three-fourth of the study participants suffered from CVS. The most common reported symptoms of CVS were blurred vision, extra-ocular symptoms and eyestrain whereas a change in color perception was the least complaint. Duration of occupation, average time spent on computer per day, awareness about CVS and its prevention measures and adjustments of computer screen brightness were found to be factors independently associated with computer vision syndrome. Therefore, Jimma University and other concerned bodies should consider methods to improve safe use of computers at workplace to reduce the prevalence of computer vision syndrome among secretary employees.

## **Abbreviations**

CVS- Computer Vision Syndrome, COR-Crude Odds Ratio, AOR-Adjusted Odds Ratio, CI- Confidence Interval, SD-Standard Deviation, AOA- American Optometry Association

## **Declarations**

### ***Ethics approval and consent to participate***

Ethical clearance was obtained from the Institutional Review Board of institute of health, Jimma University, with reference number IHRPGD/268/2018. Written consent was obtained from each study participants.

### ***Consent for publication***

Not applicable

### ***Availability of data and materials***

The original data for this study are available from the corresponding author on reasonable request.

### ***Competing interests***

The authors declare that there is no competing interest regarding the publication of this paper.

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### ***Authors' Contributions***

**MTL** conceived research idea, designed the study, collected data, analyzed it, interpreted the result, and prepared the manuscript for publication. **MIS** conceived the study, supervised the data collection, and reviewed the draft of the manuscript. **YM** participated in designing the study, supervision of the research project, and reviewing of the draft of the manuscript. **LTA** participated in designing the study, analyzed the result, and prepared the manuscript for publication.

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## Tables

Table 1 Socio-demographic characteristics of secretary employees working in Jimma University, 2018, (n=217)

Characteristics	Response	Frequency	Percentage
Age	<=25 years	21	9.7
	26-35 years	135	62.2
	>=36 years	61	28.1
	<b>Mean±SD</b>	<b>32.26±5.96</b>	
Religion	Orthodox	111	51.2
	Muslim	40	18.4
	Protestant	39	18.0
	Others*	27	12.4
Ethnicity	Oromo	149	68.7
	Amhara	27	12.4
	Others <sup>†</sup>	41	18.9
Marital status	Married	136	62.7
	Single	61	28.1
	Others <sup>#</sup>	20	9.2
Educational level	Certificate	4	1.8
	Diploma	116	53.5
	Degree	97	44.7
Duration of occupation as secretary	<5 years	57	26.3
	5-9 years	89	41.0
	>=10 years	71	32.7
	<b>Mean±SD</b>	<b>8.36±5.24</b>	
Average working hours on computer per day	<6 hours	77	35.5
	>=6 hours	140	64.5
	<b>Mean±SD</b>	<b>6.06±1.48</b>	

\*Catholic & Jehovah witness <sup>#</sup>divorced, separated and widowed <sup>†</sup>Tigre, Gurage, Kambata, Hadiya

Table 2 Frequency and severity of CVS symptoms among secretary employees working in Jimma University, 2018, n=217

<b>Symptoms of CVS</b>	<b>None n (%)</b>	<b>Mild n(%)</b>	<b>Moderate n(%)</b>	<b>Severe n(%)</b>
Blurred vision	129(59.4)	38(17.5)	46(21.2)	4(1.8)
Eye strain	151(69.6)	23(10.6)	33(15.2)	10(4.6)
Red eyes	168(77.4)	25(11.5)	23(10.6)	1(0.5)
Watery eye	166(76.5)	37(17.1)	13(6.0)	1(0.5)
Dry eye	190(87.6)	9(4.1)	16(7.4)	2(0.9)
Double vision	187(86.2)	25(11.5)	5(2.3)	0(0.00)
Eye itching	160(73.7)	26(12.0)	23(10.6)	8(3.7)
Eye burning/irritation	157(72.4)	21(9.7)	32(14.7)	7(3.2)
Pain in and around eyes	173(79.7)	20(9.2)	16(7.4)	8(3.7)
Sensitivity to light	195(89.9)	12(5.5)	7(3.2)	3(1.4)
Change in color perception	196(90.3)	15(6.9)	5(2.3)	1(0.5)
Headache	154(71.0)	31(14.3)	28(12.9)	4(1.8)
Extra ocular symptoms	75(34.6)	18(8.3)	45(20.7)	12(5.5)

Table 3 Bivariate and multivariate logistic regression analysis of factors associated with CVS among secretary employees in Jimma University, 2018, (n=217)

Variables		CVS		COR (95%CI)	AOR (95%CI)
		Yes	No		
Age	<=25 years	12(57.1)	9(42.9)	1.00	
	26-35 years	101(74.8)	34(25.2)	<b>3.82[1.27,11.47]*</b>	
	>=36 years	51(83.6)	10(16.4)	<b>1.72[1.08,3.75]*</b>	
Duration of occupation	<5 years	39(68.4)	18(31.6)	1.00	2.207[0.67,7.18]
	5-9 years	63(70.8)	26(29.2)	3.179[1.29,7.78]	<b>3.165[1.16,8.57]**</b>
	>=10 years	62(87.3)	9(12.7)	<b>2.843[1.23,6.55]*</b>	
Average time spent on computer	<6 hours	48(62.3)	29(37.7)	1.00	<b>3.163[1.52,6.59]**</b>
	>=6 hours	116(82.9)	24(17.1)	<b>2.92[1.55,5.52]*</b>	
Sitting position	Appropriate	137(74.5)	47(25.5)	1.00	
	Inappropriate	27(81.8)	6(18.2)	1.54[0.60,3.97]	
Viewing distance	< 50cm	52(80.0)	13(20.0)	1.42[0.70, 2.89]	
	>= 50cm	112(73.7)	40(26.3)	1.00	
Awareness on CVS and its prevention methods	Yes	60(61.2)	38(38.8)	1.00	<b>5.385[2.55,11.35]**</b>
	No	104(87.4)	15(12.6)	<b>4.39[2.23,8.64]*</b>	
Habit of eye blinking	Yes	16(72.7)	6(27.3)	1.00	
	No	148(75.9)	47(24.1)	1.18[0.43, 3.19]	
Habit of taking break	Yes	126(76.8)	38(23.2)	1.00	
	No	38(71.7)	15(28.3)	0.76[0.38, 1.53]	
Eye glass	Use eye glass	39(86.7)	6(13.3)	<b>2.44[1.97, 6.15]*</b>	
	Not use eye glass	125(72.7)	47(27.3)	1.00	
Use of antiglare	Yes	11(84.6)	2(15.4)	1.00	
	No	153(75.0)	51(25.0)	0.55[0.12,2.54]	
Position of computer screen to eye level	Below eye level	7(58.3)	5(41.7)	1.00	
	At eye level	133(77.3)	39(22.7)	2.14[0.52,8.68]	
	Above eye level	24(72.7)	9(27.3)	0.90[0.37,2.16]	
Adjust computer brightness	Yes	95(69.3)	42(30.7)	1.00	<b>2.811[1.22,6.47]**</b>
	No	69(86.2)	11(13.8)	<b>2.77[0.23,2.09]*</b>	
Adjustability of the chair	Yes	142(75.5)	46(24.5)	1.00	
	No	22(75.9)	7(24.1)	1.02[0.41,2.54]	
Alternate use of document holder	Yes	27(75.0)	9(25.0)	1.00	
	No	83(77.6)	24(22.4)	1.15[0.29,2.52]	
Position of window to computer screen	Window at front	28(80.0)	7(20.0)	1.35[0.55,3.30]	
	Window at back	136(74.7)	46(25.3)	1.00	
Watching television	Yes	139(74.7)	47(25.3)	0.71[0.27,1.84]	

	No	25(80.6)	6(19.4)	1.00	
Using smart phone	Yes	107(77.5)	31(22.5)	1.33[0.71,2.51]	
	No	57(72.2)	22(27.8)	1.00	

\* Significant at p-value  $\leq 0.25$ , \*\* Significant at p-value  $< 0.05$ , COR- Crude Odds Ratio, AOR- Adjusted Odds Ratio

## Figures

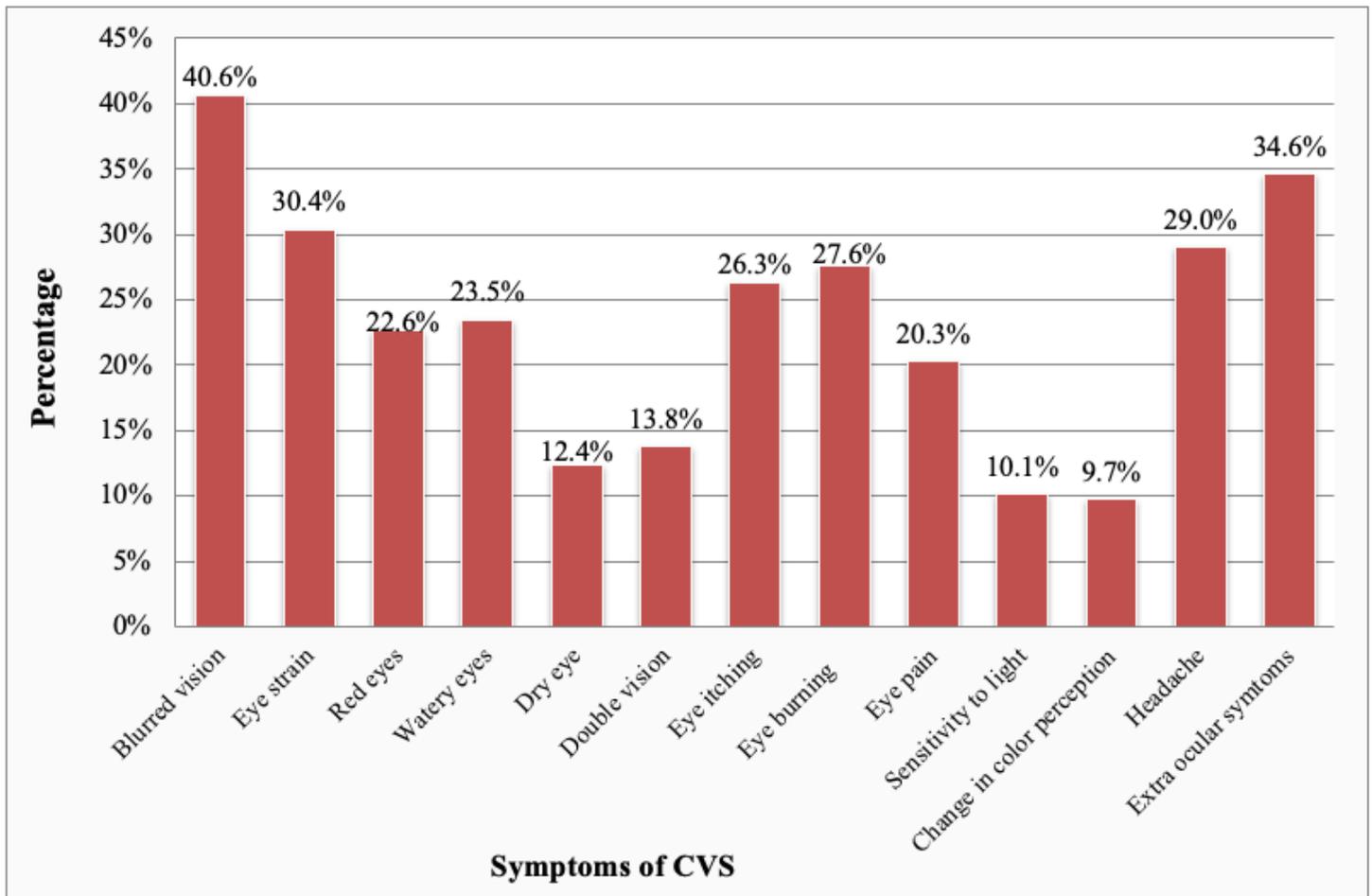


Figure 1

Prevalence of symptoms of CVS among secretary employees in Jimma University, 2018.