Effect Of Computer Display Terminal On The Eye

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Abstract

A survey of 308 computer users and 153-control group working in commercial computer centers "business centers" within Ilorin metropolis of Kwara-State was done. The aim was to determine the effect of computer visual display terminals (computer monitors) on the eye. The main ocular effect found in computer users was Asthenopia. Prevalence of Asthenopia as the only symptom among the study group ranges between 13.9% and 46.3% while in the control group it was between 3.3% and 16.3%. 63.0% of the study group and 18.7% of the control group had significant Asthenopia with P = 0.05. Eye examination including lens, funduscopy, tonometry and refractive statuses were essentially comparable in the two groups examined. There was no demonstrable organic eye lesion attributable to computer visual display terminal.

Keywords: Asthenopia, Computer Monitor.

Introduction

A computer is an electronic device, which accepts and processes data by following a set of instructions (programme) to produce an accurate and efficient result (information) [1]. Computer usage is increasingly becoming universal. It is currently a common tool in offices and homes for storage, analysis and retrieval of information. The value of computer lies on its high speed, ability to store large amount of data, accuracy and precision, making it supreme over manual computation. Various workers had argued on the possible effect of computer usage on the eye[2, 3, 4]. A number of computer users had variously complained of eye discomfort, which according to them is attributable to their work on the computer monitor. The question then arises: Is the computer monitor of any inimical effect to the eye? If yes, to what extent? Majorities of researchers believe that symptoms of eyestrain are more prevalent among the groups working with the visual display unit [3, 4, 5]. The visual display unit (monitor) serves as an output device. The computer operator gazes on it for a variable period of time with persistent accommodation. In the normal eye, it is difficult to fatigue accommodation. If however, visual tasks are continued at a range close to near point (punctum proximum) for any length of time, fatigue appears even in the emmetropic or orthophoric individuals [4]. There is exposure to ionising radiation like X-rays, Beta-irradiation and solid particles from the cathode ray tubes used in visual display unit. Continuous exposure to such rays experimentally is known to have led to cataract, conjunctivitis and retinopathy[3]. Furthermore, there is exposure to variable amount of illumination, glare and contrast. All of these have been propounded as the cause of ocular complaints. Poor working environment, wrong positioning of computer users, uncorrected refractive errors are also believed to account for the symptoms by some other workers[6]. Asthenopia refers to visual and ocular symptoms resulting from effort by internal or external ocular musculature in maintaining clear vision[4]. Luberto[7] and Rechichi[8] in Italy found 62.5% and 68% Asthenopia respectively using the criteria of the presence of two symptoms in the computer operator. Gur[9], working in Israel, found prolonged work with visual display unit leading to Asthenopia. Majorities of evaluation of Asthenopia are subjective. They are dependent on individual ratings and personality. Till date, acceptable tests for measuring physiological correlation of eye discomfort are lacking. Gobba[6] and Luberto[7] using an autorefractometer, found end of work shift temporary myopia (myopization) and a significant correlation between Asthenopia and myopization. The workers concluded that end of shift myopization may be used as a reliable objective measurement of visual fatigue. However, large-scale study will be required to evaluate the sensitivity and specificity of this end of shift myopization.

The purpose of this study is to evaluate the possible effect of Visual Display Unit on the eye of computer operator in our local environment

Materials and Methods

This study was carried out in Ilorin metropolis of Kwara-State. All commercial computer centers "business centers" within the Ilorin metropolis including all centers situated within the premises of all the higher institutions in Ilorin were included in the study. The list of the commercial centers was obtained from the State's Ministry of Commerce and Industry and from contact groups. All commercial computer users who have worked for at least 3 months in the "business centers" were included in the study group, while the control

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group consisted of unexposed administrative workers, hard copy workers, secretaries and photocopying machine operators working in the same "business centers". A total of 308 computer users and 156 controls were included in the study. 7 people declined to participate in the study and were excluded. Informed consent was taken from all the participants with guaranteed confidentiality. A questionnaire was administered on all the participants. Items in the questionnaire included age, sex, educational status, presence of headache, eye-ache, photophobia, lacrimation, foreign body sensation, redness, double vision, difficulty in changing focus. History of any known refractive error and whether corrected or not was also obtained. Visual acuity assessment for distant and near vision using a portable Snellen chart and near vision chart respectively was done. Visual acuity of each eye was done separately, unaided and with spectacles where applicable. Ocular examination included examination of the lids, conjunctiva, cornea, pupillary light reaction, and anterior chamber depth. This was done with the aid of pen-touch and a portable slit-lamp biomicroscope. Funduscopy was done with the direct ophthalmoscope and retinoscopy was carried out where necessary. All the cases and control had corneal staining with flourescein dye to rule out keratitis that may account for some of the symptoms. Patients with cup/disc ratio > 0.4 were referred to the eye clinic for tonometry and visual field analysis. All workers with previously diagnosed organic eye lesions like cataract, glaucoma or corneal lesions before the commencement of their present jobs were excluded from the study. The data collected was analysed using statistical analysis software package Epi info version 6.02 developed by the Center for Disease Control (CDC) and World Health Organisation (WHO).

Results

Analysis of a total of 308 computer users and 153-control group was reviewed. 87.6% of the study group were between 20 and 39 years of age. The mean age was 26.8years. In the control group, 88.8% were between 20 and 39 years of age. The mean age was 25.4years. In the study group, males accounted for 39.3% and females 60.7%, M: F ratio 1:1.5. In the control group, the males accounted for 52.9% and the females 47.1%, M: F ratio 1:0.9. Majority of the operators has secondary school and vocational secondary education. University education accounted for 33.3% in the control as compared to 18.2% in the study group. In the study group, photophobia was responsible for 46.7%, followed closely by eyeache-40.5%. The frequency of redness, lacrimation and itching were similar-Table 2. 80(26%) of the study group compared to 45(30%) of the control were found to have refractive error Table 3. The pattern of the error is as shown in figure 1. Conjunctiva findings were normal in 99.3% of the study group and control while 0.7% had

Table 1: Educational status of Respondents

	Cases	**Control**
Educational Level	Frequency(%)	Frequency(%)
Primary	2(0.60)	2(1.31)
Secondary	154(50.0)	51(33.33)
Technical	96(31.20)	49(32.03)
University	56(18.20)	51(33.33)
Total	308(100)	153(100)

Table 2: Prevalence of single asthenopic symptoms

	Cases	**Control**
Photophobia	144(46.7)	23(15.0)
Eye ache	125(40.5)	25(16.3)
Lacrimation	90(29.2)	14(9.2)
Redness	89(28.9)	9(5.9)
Itching	88(28.5)	19(12.4)
Headache	87(28.1)	14(9.2)
Blurred vision	63(20.4)	6(3.9)
Difficulty in changing focus	47(15.2)	5(3.3)
Double vision	43(13.9)	5(3.3)

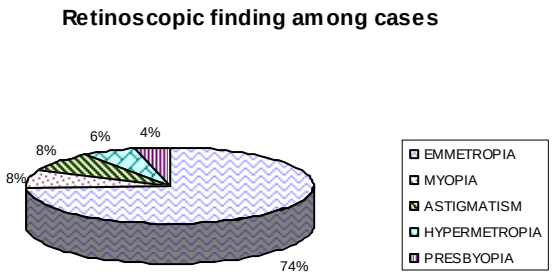
Table 3: Prevalence of Refractive errors among Respondents

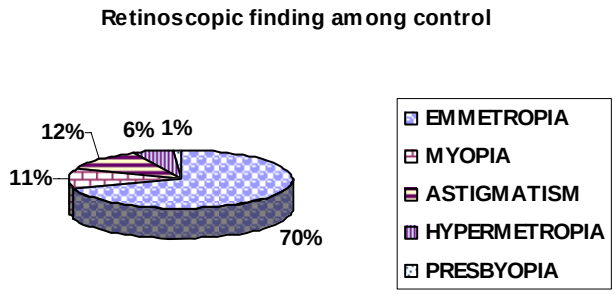
	Cases	**Control**
Presence of refractive error	Frequency(%)	Frequency(%)
Yes	80(26.0)	45(30.0)
No	228(74.0)	108(70.0)
Total	308(100)	153(100)

Table 4: Cup/Disc ratio in Respondents

	Cases(%)		**Control(%)**	
Cup/Disc ratio	Right eye	Left eye	Right eye	Left eye
0.2-04	303(98.4)	304(99)	153(100)	151(98.7)
0.5-0.7	5(1.6)	1(4)	Nil	2(1..3)
0.8-1.0	Nil	Nil	Nil	Nil

brownish discoloration attributable to vernal conjunctivitis. Corneal clarity, anterior chamber depth, pupillary light reactions in both eyes in the control and study group was normal. No case of lens opacity was found in both control and study group. The RE fundi examination were normal in 99.3% of the study group while 0.7% had macular scar probably from Toxoplasmosis. The LE fundi were normal in the study group. No lesion was found in the eyes of the control group. Cup / disc ratio of respondent is shown in table 4.





Discussion

Computer vision syndrome (CVS) is a term that is used to describe eye-related problems and other symptoms caused by prolonged computer use. As our dependence on computer use continues to increase, a lot of computer users are seeking medical attention for eye irritation in addition to backache, neck pain and wrist / joint ache. Those who work with computers often experience many frustrating symptoms such as blurred near vision, difficulty in focusing from close to far and back again; dry, red, irritating eyes; headaches that disappear after a period of rest; soreness and pain in the neck, shoulder, back and wrist. These problems are more noticeable with computer work than other forms of near work. This could be attributed to the fact that letters on the computer monitor are formed by tiny dots called pixels, rather than a solid image. This causes the eye to work a bit harder to keep the images in focus. In this study, majority of the respondents are between 20 and 39 years. In the study group, there were fewer males (39.3%) than females (60.7%) whereas in the control group there were a higher percentage of males (52.9%) than females (47.1%). The higher percentage of males in the control group might be as a result of inclusion of administrative workers and managers most of who are males. The prevalence of a single asthenopic symptom in this study (Table 2) is generally lower than that reported by Daum et al [10] and Neugebauer et al [11] in Germany. However, specifically, double vision as a single asthenopic symptom in this study is closely related to that found by these two authors in their study. The lower prevalence of a single asthenopic symptom in this study might not be unconnected with the fact that computer appreciation on a wide scale is
a recent development in Nigeria. This is compounded by irregular electricity supply, which prevents a continuous prolonged work at the computer. A significant asthenopia in this study was taken as the presence of at least 2 symptoms. With this criterion, a prevalence of 63% was found in the study group and 18.7% in the control group showing a significant difference with a P value of 0.03. Using a criterion of 1 sign and 1 symptom in a given workday, Sanchez-Roman et al [12] found a prevalence of 68.5% in computer users and 47.7% in unexposed administrative workers with a P value of 0.05. In this study as in other studies [13, 14, 15] no organic eye lesion was found with the use of computer display terminals. Refractive error which could be another cause of eyestrain occurs in almost the same proportion in the two groups as shown in table 3. The external eye signs, intraocular pressure, cup/disc ratio and other ocular findings were essentially the same. The cup/disc ratio finding is as shown in table 4. This is also consistent with similar studies [13, 14, 15] on the visual effect of the Television screen which also use a cathode ray as employed in the computer monitor.

Conclusion

A notable eye-related problem with computer usage is Asthenopia. So far there is no scientific evidence that the computer display terminal (monitor) have any deleterious organic effect on the eye. However, those who work with computers often experience some varying degree of frustrating symptoms as found in this and other studies. As our dependence on computer grows, complaints associated with its use, especially ocular, are bound to increase. Prolonged multicentric, prospective study is however necessary to evaluate possible late effect.

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