PREVALENCE OF ASTHENOPIA AMONG COMPUTER USERS IN ENUGU, SOUTH EAST NIGERIA

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SUMMARY

Objective:
A cross-sectional survey of 560 computer users in Enugu urban, Enugu State was conducted between August and December 2002.The prevalence of asthenopic symptoms and risk factors to the occurrence of asthenopia were determined.

Method:
Interview was done using structured, pre-tested, interviewer- administered questionnaire. Subjects were examined with Snellen's chart to measure distance visual acuity, jaegers reading chart for near acuity, pen torch for anterior segment examination, direct ophthalmoscope for fundoscopy, streak retinoscope for refraction and metre tape for distance between the screen and the subject

Result:
Out of 560 subjects interviewed and examined 401 (71.6%) had asthenopic symptoms. Headache was the most common symptom occurring in 35% of the subjects. Tearing was seen in 27.1%, ocular discomfort or pains accounted for 26.6%. Some subjects had more than one symptom. Presence of ametropia was found to be significantly related to the occurrence of asthenopia (P=0.0), as also the female gender compared to the males, P=0.0000007. Distance of operators to their monitors, age of operators and the use of screen filters did not seem to significantly influence occurrence of asthenopia (P= 0.71, P=0.55 and P=0.39 respectively). Majority of the subjects (96%) had good vision (VA of 6/6- 6/18).

Conclusion:
Presence of ametropia is related to occurrence of asthenopia. Correction of existing ametropia would contribute to visual comfort of computer (vdt) users. Pre- employment and regular ocular examination should be made accessible to those who make regular and long use of computers.

Keywords: *Asthenopia, Computer users, Nigeria.*

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INTRODUCTION

The world is currently experiencing a digital revolution in information technology. There is increase in both acquisition and use of computers (video display terminal (vdt)) in the work places. The world health organization has observed that computer technology is proliferating very rapidly, not only in the industrialized countries but also in the developing countries[1]. In the work places, people sit in front of and work long hours on computers with its potentially harmful effects on the health of its users particularly eye health. There has been a lot of concern about these potential harmful effects on human eyes since the introduction of computers in the early 1980s[2]. Asthenopia among computer users has been implicated as an important source of concern to the ocular health of computer users.

Asthenopia refers to the subjective visual and ocular symptoms resulting from effort by internal and external ocular musculature in maintaining clear vision[3]. Asthenopic symptoms commonly complained of by those who use computers include; eyestrain, blurred vision, headache, fatigue, tearing, pains in and around the eyes, inability to maintain near focus, refractive changes, dry eyes and changes in colour perception.[4,5] Studies have shown that majority of computer (vdt) users experience some vision or ocular symptoms which affect their efficiency and comfort at work[5,6,7]. The unique characteristics and high visual demands of video display terminal work make many individuals susceptible to the development of eye and vision related symptoms. Uncorrected vision conditions, poor visual display terminal design, poor work place ergonomics and a highly demanding visual task can all contribute to the development of visual symptoms and complaints[8].

Vision problems experienced by computer users are generally temporary and will generally decline after stopping computer work at the end of the day[9]. However, some workers may experience continued impaired or reduced visual abilities such as blurred distance vision, even after work[10] for several hours. These complaints worsen if nothing is done to address the cause of the problems. They will continue to recur and perhaps worsen with future computer use.

In Enugu state, some patients that consult at the eye clinic of the University of Nigeria teaching hospital, Enugu also complain of symptoms of asthenopia such as headache, eye discomforts, blurring of vision and tearing which they attribute to computer use. Adepoju[11] did a study on effects of computer video display terminals on the eye in Kwara state of Nigeria. Apart from this work, no other study has been done on vision and ocular problems associated with computer use in the country, to the best knowledge of the authors.

The objective of the present study was therefore to determine the prevalence of asthenopia in computer users and determine the role of some risk factors such as refractive errors, sex, age, distance of operators to monitor screen and screen filter on the occurrence of asthenopia. It is hoped that the study would enable us proffer solutions to the asthenopic problems associated with computer use particularly as the digital revolution spreads in Nigeria.

MATERIALS AND METHODS

A cross-sectional survey of computer users in Enugu urban was conducted between August and December 2002.We randomly selected 560 computer users in different parts of Enugu. These subjects were working regularly with computers in their offices for at least four months and a minimum of four hours daily. A graduate assistant was recruited and trained to help with interviews and administration of questionnaires. The protocol for the study was approved by the research and ethics committee

of the University of Nigeria Teaching Hospital, Enugu.

Data collected include, ocular symptoms probably due to computer use, distance between the subject and the computer screen and ocular examinations were provided for. The distance between the operator and the screen was measured using a metre tape. Visual acuity for distance and near were tested with Snellen's chart and jaegers type reading chart respectively, either inside the room with adequate illumination or outdoors. Refraction was done with the streak retinoscope while fundoscopy was done with Keeler vista 20 standard direct ophthalmoscope. Data collected were entered into the computer and analysed with Epi info version 6 statistical package. The chi square test was used for significance testing and P- values of < 0.05 were considered statistically significant.

RESULTS

Among the 560 computer users asthenopic symptoms were present in 401(71.6%) subjects and absent in 159(28.4%) subjects. The frequency of occurrence of particular asthenopic symptoms among the study subjects is given in table 1.

Table 1: Frequency of any Single Asthenopic Symptoms

Symptoms	Frequency	%
Headache	196	35.0
Tearing	152	27.7
Discomfort or pains	149	26.6
Blurring of vision	144	25.7
Itching	89	15.9
Redness	53	9.5
Double vision	39	7.0
Difficulty changing fixation	18	3.2

Headache was the most common asthenopic symptoms occurring in 35% of the subjects. Some subjects had more than one symptom.

Table 2 shows that the prevalence of asthenopia varied with age, being most prevalent in the age group 45-49 years. However, this did not reach statistical significance.

TABLE 2: Age Specific Prevalence of Asthenopia

Age groups(yrs)	Subjects	Asthenopia	%
<20	49	38	77.6
20-24	227	168	74.0
25-29	143	96	67.1
30-34	60	36	60.1
35-39	41	34	83.0
40-44	27	20	74.1
45-49	9	8	88.9
50 and above	4	1	25.0
Total	560	401	

$X^2 = 0.44$, $P = 0.55$, $df = 7$

Of the 354 female subjects of this study, 279 (78.8%) had asthenopia. On the other hand 122 (59.2%) of the 206 male subjects also had asthenopia. The female subjects therefore seemed to be more prone to asthenopia ($X^2=24.6$, $P=0.0000007$) than their male counterparts.

Table 3 gives the relationship between the occurrence of asthenopia in the population studied and the retinoscopy results. The results suggest that the occurrence of asthenopia is related to presence of ametropia hence 88.8% of ametropes have asthenopia as against 65% emmetropes, ($X^2 = 24.9$, $P = 0.0$).

Table 3: Frequency Of Asthenopia in Relation to Retinoscopy

	Asthenopia		
Retinoscopy result	**Yes**	**No**	**Total**
Emmetropia	266	143	409
Myopia	71	10	81
Astigmatism	23	2	25
Hypermetropia	9	1	10
Presbyopia	32	3	35
Total	401	159	560

In table 4 it is seen that different operators kept their monitors at different distances as each preferred. Distance does not seem to have any effect on occurrence asthenopia $X^2 = 0.69$, $P=0.71$, $df=2$.

Table 4: Distance Of Operators To Monitor Screen In Relation To Asthenopia

	ASTHENOPIA		
DISTANCE	YES	NO	TOTAL
< 50 cm	91	34	125
50- 70 cm	235	99	334
> 70cm	75	26	101
TOTAL	401	159	560

The use or non use of screen filter was found not to have any effect on occurrence of asthenopia (X^2 =0.75, P =0.39), table 5.

Table 5: Occurrence Of Asthenopia In Relation to Use of Screen Filter

	Asthenopia		
Use of screen filter	**YES**	**NO**	**Total**
Yes	86	29	115
No	315	130	445
Total	401	159	560

Discussion

The female to male ratio of this study population is 1.7:1.0. Adepoju[11] also reported more females than males in her work. The greater number of females could be because there are numerically more females than males in the state, according to population census report[12]. Also, females are generally more involved than males in secretarial and typing duties in our environment.

Majority of the study population were under 34 years. This is not surprising considering the fact that computer assisted work is relatively new in our environment and its application is attracting mostly unemployed young individuals with some form of computer training, for employment in such establishments as business centres, banks and so on. Most of them had good vision which was necessary in computer work.

The prevalence of asthenopia in this study was 7 1.6%. Adepoju[11] reported a lower prevalence. The difference could be traced to different methods of analysis, sample sizes and types of symptoms studied. Thomson[13] in England had noted that the estimates of prevalence of eye symptoms associated with the use of computers vary enormously depending on the sample, test and methods used. It is therefore not surprising that the various prevalence of single asthenopic symptoms obtained in this study were generally lower than those reported by Daum[14] in the United States and Neugebauer[15] in Germany. Although Adepoju[11] reported slightly different prevalence from the present study in some instances, both studies recorded lower prevalence than those done in America and Europe. Possible reasons for the differences could be due to the likelihood of a relatively shorter duration of exposure to monitors in our environment. Computer assisted work is new in our environment and many people have not been exposed long enough to start experiencing symptoms unlike in Europe and America where computers were introduced in the mid 70s and 80s[16,17]. Also, in many work places in our environment, obvious lack of diligent application to duties during the larger part of the working day is glaring. This situation appears different in the western societies hence a report from Europe observed that operators using computer (vdts) for a large part of the working day frequently report that their eyesight is quite badly affected at work and for some time afterwards and that it is during those periods when the eyes are working seriously that the eyes are at real risk of vdt symptoms[18]. Furthermore, irregular power supply affects continuous use of computers daily with the exception of a few centres that have standby generators.

Although asthenopia was not significantly related to age in this study and those of other workers[13,14,19]; Adepoju[11] found a significant relationship between Asthenopia and age. While the present study is a cross sectional study, Adepoju's was a case control study. Although not specifically related to age, Asthenopia was most commonly encountered in the age group 45-49 years as other workers[11,19]. This could be explained by the fact that many people in this age bracket may

have started experiencing some degree of presbyopia[3] which places additional demand on them while working with computer monitors. Again, those of these subjects who are hypermetropic may have started converting from facultative to absolute hypermetropia which could further predispose them to symptoms of asthenopia when using computer monitors. Work with computers could dispose users to early onset of asthenopic symptoms. The age group 35-39 years was the next with the highest asthenopic symptoms in the study. This is not surprising as presbyopia is encountered in blacks at an earlier age[20].

There was a significant relationship between sex and occurrence of asthenopia. Females seem to be more prone to asthenopic symptoms than their male counterparts. This is similar to previous reports[21,22,23].

Although other workers have not found similar relationship[11,13], it does appear that females respond to stress quicker than their male counterparts. As asthenopia is a sign of fatigue of visual apparatus, females may show sign of fatigue when working with computer monitors earlier than males. Again, differences in methodology and case definitions may account for the differences between the results of these two groups of workers.

Ametropia was found to significantly increase the risk of asthenopia. This study showed that 88% of ametropic subjects had asthenopia compared to only 65% of their emmetropic counterparts. This is comparable to the work done in Nigeria[11] but differs from the work done in Italy which reported 51.9%. Uncorrected and poorly corrected errors of refraction in the Nigerian subjects may account for the difference. Uncorrected or poorly corrected farsightedness, astigmatism, presbyopia and binocular vision (eye coordination and eye focusing) problems are known to be major contributing factors to computer (vdt) related eye stress[5,14].

The minimum distance between the operator and the monitor found in this study was 32cm while the maximum distance was 95cm with a mean of 58.6cm±11.5. It was found that operators kept their monitors at different distances as each preferred. The distances did not seem to influence the occurrence of Asthenopia. This is similar to a previous report[11]. However, more than half of the operators in the study preferred viewing distances in the range of 50-70 cm from the screen. In another study, it was reported that most operators sat between 50-60cm from the screen and developed eye strain when the distance was reduced[5]. Eye to screen distance of 50-70 cm has been advocated because with this distance, the user achieves physiological resting (tonus) states of accommodation and vergence[24]. Monitor shield (filter) did not reduce the risk of occurrence of asthenopia in this study. Previous studies[11,25] reported similar findings. One of the earlier researchers noted that protective filter alone does not reduce the occurrence of asthenopia due to the presence of other factors such as refractive error and time spent on monitor[25]. Filters are designed to reduce glare and reflections from the screen. Most subjects who used filter in this study however stated that it made their eyes comfortable.

Conclusion:

Asthenopia among computer users is a potential threat to visual and ocular comfort and productivity among those that make regular and long use of computers daily.

It is recommended that computer users who make regular and long use of monitors should be provided with pre employment and regular ocular examinations to correct any visual deficits, ergonomic education to include programmed breaks and rest built into the computers as well as health education.

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