



(RESEARCH ARTICLE)



## Prevalence of visual symptoms among visual display unit users in Owerri Imo State

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### Abstract

The increasing number of cases of ocular and non-ocular symptoms generally termed, the "Computer Vision Syndrome" (CVS) as a result of the ubiquitous use of computers and mobile computing devices. Computer-related asthenopia might take an epidemic form if it is not put on check. This study was undertaken to find out the prevalence of the visual complaints among computer and related users in Owerri, Imo State aimed at determining if the symptoms are prevalent in equal proportion among VDU and Non-VDU users. A total of 332 selected persons (male and female) between the ages of 16 - 45yrs from schools, banks, offices and other establishments who use VDUs  $\geq$  and  $<$  1hr/day within Owerri Municipal Area were administered with structured questionnaire. Study revealed VDU users presentation with Headache (17.72%), Ocular Pain (16, 52%), Eyestrain (15.40), Lacrimation (14, 60%), Double Vision (11.75%), Burning & Irritation (10.09%), Itching (7.83%), Dryness (3.58%) and Redness (2.52%). All the Symptoms (dryness, eyestrain, headache, itching, lacrimation, ocular pain and redness) except double vision are statistically significant ( $P < 0.05$ ). Furthermore, these symptoms are neither age nor gender related. Also, individuals as well as work-related factors were found to be predictive of these visual complaints. Headache, ocular pain, eyestrain, lacrimation, double vision, burning & irritation, itching, dryness and redness of the eye are the prevalent symptoms among VDU users in Owerri. The use of antiglare screen, filters or "radiation absorbing devices" to reduce and control light and reflections as well as adjustment shades, curtains or blinds in order to effectively control light levels throughout the day are however recommended.

**Keywords:** Computer Vision Syndrome (Cvs); Computer- Related Asthenopia (Cra); Prevalence; Visual Complaints (Vc); Owerri

### 1. Introduction

In the past decade, computers have turned to an integral part of modern life. It is estimated that, since 2000, about 75% of daily activities of all jobs involve computer use [1]. In today's society, the use of computer as a tool at workplaces, academic institutions, recreation facilities and homes has become very common [2]. Users of computer devices spend time on them with little or no caution in its use. Despite the great advantages of the machines, the effect on the professionals and other users Vis a Vis visual discomfort and related symptoms has become a thing of concern. Computer

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Vision Syndrome (CVS), also referred to as Digital Eye Strain (DES), describes a group of eye and vision-related problems that result from prolonged computer, tablet, e-reader and cell phone use. Many individuals experience eye discomfort and vision problems when viewing digital screens for extended periods. The level of discomfort appears to increase with the amount of digital screen use [3]. Visual discomfort and related symptoms occurring in computer workers must be recognized as a growing health problem [4]. The visual conditions for computer work are complex and include several factors that need to be well controlled [5]. Computer users vision-related problems are the most frequently reported health-related problems occurring in over 70% of computer users [6], [7]. The most common symptoms associated with Computer Vision Syndrome CVS or (DES) are eyestrain, headaches, blurred vision, dry eyes, neck and shoulder pain, while the symptoms may be caused by poor lighting, glare on a digital screen, improper viewing distances, poor sitting posture and uncorrected vision problems [3]. Three major mechanisms that lead to computer vision syndrome are extra ocular mechanism, accommodative mechanism and ocular surface mechanism. The visual effects of the computer such as brightness, resolution, glare and quality all are known factors that contribute to computer vision syndrome [8]. Prevention is the most important strategy in managing computer vision syndrome. Modification in the ergonomics of the working environment, patient education and proper eye care are crucial in managing computer vision syndrome [9]. Dry eyes/diplopia in CVS is common among users of computers irrespective of gender and age. Nonetheless, users of contact lenses, students and various factors including environmental variations, disease conditions and office workers who use computers have been studied in relation to CVS with amazing outcomes ranging from low, moderate and high prevalence over the years [10, 11, 12-15].

The use of computer devices is becoming increasingly high in Nigeria and other Industrially Developing Countries (IDCs) as rapid implementation of Computer Based Tests (CBTs), Computer Based Teaching and Learning Systems (CBTALS) at all levels of education especially in the private institutions and day to day use of gadgets becomes a vogue. Caution must be exercised to avoid overuse of computer programs as a learning and educational tool [16]. Our study however sort to evaluate the prevalence of symptoms of CVS in relation to gender, age, duration of exposure, use of anti-glare screen, habit of taking breaks from VDUs as well as adjustment of the computer screen among computer users in Owerri-Imo State, Nigeria.

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## **2. Material and methods**

Well-structured questionnaires were administered to 332 respondents in order to obtain information from frequent and seldom users of computers. It considered the bio-data of respondents, pattern, mode and degree of VDU usage and the assessment of some visual symptoms due to computer use considering visual symptoms index as mild, moderate and severe.

### **2.1. Pre-sampling**

Ocular and systemic history was obtained using a well-structured questionnaire to ascertain the vision and other health conditions which formed the inclusion and exclusion criteria. Study population was recruited from Banks, civil service office, photographers, cyber cafes, business centers, traders, secondary schools, universities and hotels located in Owerri municipal, Imo State.

### **2.2. Inclusion Criteria**

This was made up of those within ages 16 - 45years, who have used computers at least for 1 year and without systemic diseases as well as those not on topical or systemic medications, medicated spectacles or contact lenses.

Those that fell under this category were sub-divided into 2 groups that work under same environmental condition:

### **2.3. Group A (Experimental)**

Included those exposed to VDT and computer more than 3 hours daily i.e. those whose jobs demand the use of computers and their likes.

### **2.4. Group B (Control)**

Included those that sparingly use the computers or whose daily duties do not demand the use of computers.

### **2.5. Exclusion Criteria**

This included >45 years old individuals and those that had systemic diseases. Others were those using topical or systemic drugs and those using medicated spectacle or contact lenses.

## 2.6. Statistical Analysis

Data was analyzed with SPSS version 19.0 and Statgraphics Centurion statistical packages. Significance between the groups was analyzed using two-way analysis of variance (ANOVA) while  $P < 0.05$  was considered statistically significant.

## 3. Results and discussion

A total of 332 respondents, comprising of 285 persons (85.84%) with 168 females (58.95% and 117 males (41.05%) that use VDU>1hr/day and 47 (14.16%) with 25 females (53.19%) and 22 males (46.81%) that use VDU< 1hr/day were studied.

The study revealed 197 (69.12%) commercial users, 30 (10.53%) students and 58(20.35%) of them were bankers. These formed the greater population of the VDT users; who work with the computers for a relatively long period of time usually not < 1 hr/day. This finding reveals that the highest percentage of VDT users (46.32%) was aged between 36 - 45 years as indicated in Table 3, with 45.26%, 42.46%, 41.75% and 39.65% complaining of headaches, ocular pain, eyestrain and lacrimation respectively. Among the 285 subjects studied, major ocular complaint reported in descending order were; Headache (93.68%), Ocular pain (87.37%), Eyestrain (81.40%) and lacrimation (77.19%) in subjects using computers for more than 1 hr/day, distance from computer screen with respect to eyes, use of antiglare screen, taking frequent breaks, use of LCD monitor and adjustment of contrast and brightness of monitor screen bear a significant association with the ocular complaints in computer users, in Owerri, Imo State.

The prevalence ocular complaints among the VDU operators are as follows in descending order; Headache 17.72%, Ocular pain 16.52%, Eyestrain 15.40%, Lacrimation 14.60%, Double vision 11.75%, burning & Irritation 10.0%, Itching 7.83%, Dryness 3.58% and Redness 2.52%.

The most common of these symptoms are; Headache17.72%, Ocular pain16.52 %, eyestrain 15.40 % and lacrimation14.60 %

**Table 1** Test of Between-Subjects Effects

<b>Dependent Variable: Number of Responses</b>					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	27946.111a	8	3493.264	6.883	.005
Intercept	126169.389	1	126169.389	248.610	.000
Visual_symptom	27946.111	8	3493.264	6.883	.005
Error	4567.500	9	507.500		
Total	158683.000	18			
Corrected Total	32513.611	17			
a. R Squared = .860 (Adjusted R Squared = .735)					

Since the P-value of the F-test is less than 0.05, there is a statistically significant difference between the mean number of response from one level of Visual symptom to another at the 95.0% confidence level.

**Table 2** VDU-Related Visual Symptoms According to Gender

	<b>Male (%)</b>	<b>Female (%)</b>	<b>Row Total (%)</b>
Yes	640 (25.2)	867 (34.1)	1507 (59.2)
No	413 (16.2)	624 (24.5)	1037 (40.8)
Column Total	1053 (41.4)	1491 (58.6)	2544 (100)

Findings revealed that the male and female folks were equally affected (i.e. there was no gender difference) hence, statistically not significant ( $P > 0.05$ ) with females dominating in such tasks probably due to the fact that men are engaged more in physically - challenging occupation while women are left with less - challenging tasks such as VDT operations. This concurs with the report from other computer - health related studies [17]. This study contradicts the study by [18], which reported that asthenopia was gender related. From our study, visual complaints due to VDT use is not related to gender but we have more women 68.95% than men 41.05% reporting of asthenopia prior to VDU use - *Table 2*

**Table 3** Visual Symptoms According to Age

Age	Yes (%)	No (%)	Row Total (%)
16-25	201 (7.8)	267 (10.4)	468 (18.3)
26-35	497 (19.4)	412 (16.1)	909 (35.4)
36-45	809 (31.5)	379 (14.8)	1188 (46.3)
Column Total	1507 (58.8)	1058 (41.3)	2565 (100.00)

The age group 36 - 45 years was more dominant among the age group studied just as they are in the wider labor market. Within this age, commercial users (69.12%) and bankers (20.35%) are the major computer users in Owerri municipal due to the fact that it has been a civil service area with a litany of education institutions, generate a high volume of paper work and so requires business centers to service them. Similarly, in the banking sector, ICT is a precursor in this regard; owing to the transit from manual to VDT Operations within the last 2 decades.

Findings revealed that, 46.32% of the respondents who work with the VDTs were aged between 26 - 35 years with the least response occurring at ages 16 -25; and this shows that visual complaints are more pronounced in people between the age brackets 36-45 years - *Table 3*. This may be due to the age-related changes in accommodation which sometimes is misinterpreted to be due to VDU-use. This contradicts the studies by [19], which visual symptoms are age -related. The study had the visual symptoms increasing with age from 18.25%, and 35.44% to 46.32% in those aging: 16 - 25, 26 -35 and 36 - 45 years respectively - *Table 3*

**Table 4** Evaluation of the Visual Complaints Based on VDU Monitor Type in Use

	CRT (%)	LCD (%)	Row Total (%)
Ocular pain	186 (12.3)	63 (4.2)	249 (16.5)
Double vision	150 (10.0)	27 (1.8)	177 (11.8)
Dryness	54 (3.6)	0 (0.0)	54 (3.6)
Redness	36 (2.4)	2 (0.1)	38 (2.5)
Lacrimation	171 (11.4)	49 (3.3)	220 (14.7)
Itching	108 (7.2)	10 (0.7)	118 (7.9)
Eyestrain	184 (12.2)	48 (3.2)	232 (15.4)
Burning and Irritation	133 (8.8)	19 (1.3)	152 (10.1)
Headache	187 (12.4)	80 (5.3)	267 (17.7)
Column Total	1209 (80.2)	298 (19.8)	1507 (100.00)

The result emanating from this study reveals that the visual problems due to VDU usage in descending order are headaches 17.71%, ocular pain 16.62%, eyestrain 15.40%, lacrimation 14.40%, double vision 11.75%, burning & irritation 10.01%, itching 7.8%, dryness 3.58% and redness 2.52%. This study agreed that there was a relationship between VDT use and subjective symptoms as reported in the studies by [20, [21] - *Table 4*

**Table 5** Evaluation of the Visual Complaints Based on Hours of Daily Contact with the VDU

Ocular Symptoms	Number of respondents based on hours of daily contact with the computer									
	<1 hr 018(6.32%)		1 - 3 hrs 030(10.53%)		4-6 hrs 056(19.65%)		7 -10 hrs 072 (25.26%)		11 hrs-above 109 (38.25%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Ocular pain	07	11	018	12	044	12	071	01	109	00
Double vision	03	015	07	023	028	028	038	034	101	08
Dryness	02	016	04	026	08	048	012	060	028	081
Redness	01	017	03	027	04	052	010	062	20	089
Lacrimation	03	015	05	025	033	023	071	01	108	01
Itching	01	017	06	024	09	047	030	042	072	037
Eyestrain	04	014	08	022	042	014	070	02	108	01
Burning and Irritation	02	016	-	030	011	045	046	026	093	016
Headache	05	013	027	03	055	01	071	01	109	00

The rate of visual complaints in those who spend above 11 hours / day working with the computers is higher followed by those that spend about 7-10 hours, 4-6 hours, 1-3 hours and < 1hour/day (table 5).

The data in table 5 shows that visual symptoms increase with an increase in the length of exposure on the computer with headaches, ocular pain, eyestrain and lacrimation occurring at greater proportions than double vision, burning and irritation, itching, dryness and redness respectively. This concurs with the studies by [22]. Furthermore, in terms of the break observed while working with the computers, 47.72% took break once also with highest occurrence of visual symptoms, followed by those who took break once or twice (32.28%) and least in thrice (20%) break observers. The distance of VDU to the eyes, frequency of breaks, and type of VDU monitor, Anti-glare screen, brightness and contrast levels, duration of exposures were considered the most predictive factors which caused ocular complaints among VDU users. This concurs with the study by [23].

All the Symptoms (dryness, eyestrain, headache, itching, lacrimation, ocular pain and redness) except double vision are statistically significant ( $P < 0.05$ ).

#### 4. Conclusion

Headache, ocular pain, eyestrain, lacrimation, double vision, burning & irritation, itching, dryness and redness of the eye are the prevalent symptoms among VDU users in Owerri. The use of antiglare screen, filters or "radiation absorbing devices" to reduce and control light and reflections as well as adjustment shades, curtains or blinds in order to effectively control light levels throughout the day are however recommended.

#### Compliance with ethical standards

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##### *Disclosure of conflict of interest*

The authors have declared that no competing interests exist.

### Statement of ethical approval

Ethical approval - Reference OWMC/AD/609/74 was obtained from the Owerri Municipal Council, Imo state.

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