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Research Article

A PROSPECTIVE STUDY OF MULTINATIONAL COMPANY WORKERS' INTRAOCULAR PRESSURE

SYED IMRAN ALI[1], SUMERA TASLEEM[2], SANAM MARIA QUDSIYA[3]

[1]Department of Physiology, Government Medical College, Nagarkurnool, Telangana, India. [2]Department of Physiology, Malla Reddy Institute of Medical Sciences, Hyderabad, Telangana, India. [3]Labcorp Drug Development, Qubix Bussiness Park Private Limited, (SEZ) Blue Ridge, Pune, Maharashtra, India. Email: qudsiya786@yahoo.com

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ABSTRACT

Objectives: The objective of this study were to find out differences in intraocular pressure (IOP) before and after computer usage and to find out differences in IOP in males and females. Computers have become such a vital part of our daily lives that it is often difficult for us to eliminate our use. The present age is regarded as the computer age. Most of our time goes looking at screens of different forms in laptops, desktop computers, tablets, and mobile phones. Computers use has become a necessity of the present-day world in various professions and it may sometimes require prolonged sessions which can produce strain on the eyes, liable to affect IOP.

Methods: The present study includes 100 subjects between 20 and 40 years of age who works continuously for at least 4 h a day on computer screens and individuals without ophthalmological disorders. Schiotz tonometer was used to measure IOP by an ophthalmologist.

Results: Our study sample contains 80% males and 20% females, with a manage of 29.29 and 27.55 years, respectively. The increase in IOP value of the left eye after exposure is comparatively more significant in the 6–10 years exposure group (p=0.0000). This finding is similar to the one obtained for the right eye. There is a significant increase in mean IOP values after computer exposure in both males and females. However, the increase is comparatively more significant in males compared to females.

Conclusion: There will be a significant increase in IOP after Computer exposure in both genders with a comparatively greater rise of IOP in males than those in females.

Keywords: Intraocular pressure, Computer vision syndrome, Ocular hypertension

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INTRODUCTION

Intraocular pressure (IOP) is the trans corneal pressure difference. Normal IOP ranges between 10 mmHg and 20 mmHg. The average value of IOP is 15.5 mmHg with fluctuations of about 2.75 mmHg.

Ocular hypertension (OHT) is defined as IOP higher than normal, in the absence of visual field loss or optic nerve damage [1,2].

Aim

The present study aims to find the relationship between computer usage and an increase in IOP before and after the work shift in young multinational company (MNC) workers.

There are very few studies in this direction; therefore, the present study was undertaken to find out the effect of computer work on IOP.

Current smokers had slightly higher mean IOPs [3]. Transient decrease in IOP is found in alcoholics. The relatives of patients with the primary open-angle glaucoma have higher IOPs than that of the general population [4]. Computer usage causes strain on the eye which is due to constant working distance, reduced blinking, the quality of light emitted from the screens, and improper lighting [5]. Humans blink on an average about 15 times per minute, studies show the rate of blinking reduces while using desktop computer screens and other digital screen devices [6]. Blinking helps to lubricate the eyes once that we are exposed to a screen the blinking rate reduces by 60%, resulting in dry eyes which are one of the causes of Compute Vision syndrome [7]. Computer vision syndrome (CVS) results from constant eye exposure to computer screens for a long duration of time and is characterized by symptoms such as headaches, neck pain, eye strain, blurred vision, and double vision. These symptoms worsen due to wrong posture and improper lighting during computer usage [8]. About 90% of the people who work on a computer for three or more hours a day get affected by CVS reported by the National Institute of Occupational Safety and Health [9]. Cornea adapts slowly to the changing IOP, but the rise in IOP causes slow progressive damage to the optic nerve, scotomas start appearing with increasing damage to the optic nerve, and death of all the optic nerve cells results in blindness [10]. About 82% of myopic, are most likely to develop glaucoma along with CVS [7]. Glaucoma, the most common cause of blindness, is a disease of the eye, where the intraocular pressure becomes pathologically high, sometimes rising acutely to 60–70 mm Hg. Pressures above 25–30 mm Hg can cause loss of vision when maintained for long periods [11].

METHODS

The present study includes 100 subjects between 20 and 40 years of age who works continuously for at least 4 h a day on computer screens and the individuals without ophthalmological disorders were included in the study from the period of January 2016 to January 2017. The study was conducted after taking clearance from the ethical committee (Institutional Review Board number # 2014/6/009) in a MNC after taking consent from the subjects and prior permission was taken from the company manager. Schiotz tonometer was used to measure IOP by Ophthalmologist from Owaisi Hospital and Research center. IOP is measured thrice and the average served as the mean control for each subject. IOP was measured, both before and after 4 h of computer session, involving reading or studying English printed material.

Statistical analysis

Statistical analysis was performed by SPSS 20.0 software. Deriving mean and standard deviation (SD) and comparison are done by applying the student's t-test.

RESULTS

- Our sample contains 80% males and 20% females, with a mean age of 29.29 and 27.55 years, respectively.
- Graph 1 shows several cases showing increased, decreased, or no change in IOP after computer exposure in the right and left eyes separately.
- An increase in IOP after computer work was found in76% cases for the left eye and 75% cases for the right eye.
- IOP decreased in 12% cases on the left and 8%casesinthe right eye.
- There was no change in IOP after computer exposure in 12% and 17% of cases in the left and right eye, respectively.
- The above results show that in all the three groups, that is, 0–5 years, 6–10 years, and 11–15 years of exposure, IOP values for the right eye are increasing significantly after computer exposure with p values of 0.0003, 0.0001, and 0.0005, respectively.
- However, the increase in IOP value of the right eye after exposure is comparatively more significant in the 6–10 years exposure group (p=0.0001).
- The above results show that in all the three groups, that is, 0–5 years, 6–10 years, and 11–15 years of exposure, IOP values for the left eye are increasing significantly after computer exposure with p values of 0.0004, 0.0000, and 0.0001, respectively.
- However, again the increase in IOP value of the left eye after exposure is comparatively more significant in the 6–10 years exposure group (p=0.0000). This finding is similar to the one obtained for the right eye.
- As the years of exposure are increasing, the mean IOP difference of the left eye is also increasing. This indicates that there is an increased risk of OHT with increasing duration of exposure.
- The results for the right eye are surprising, as there is a reduced mean IOP difference in the 6–10 years exposure group. There as on for this decrease can be investigated by further studies.
- The mean IOP difference in all cases is higher in the left eye compared to the right eye indicating that the left eye is affected more than the right.
- The above results show a significant increase in mean IOP values after computer exposure in both males and females.
- However, the increase is comparatively more significant in males compared to females as indicated by p-values in the above table.
- When we compare the left eye mean IOP pressures of males and females before exposure, there is an in significant gender difference as indicated by p value of 0.1
- However, statistically significant (p=0.036) gender difference has been observed in the left eye mean IOP values after exposure with the mean IOP value in females (18.29mmHg) significantly lesser than that in males (20.06 mmHg).
- Significant gender difference has been observed for the right eye mean IOP values before and after exposure, with female shaving lesser pre and post-exposure values compared to males. The reason for this difference is not clear. Further studies are suggested in this direction.

DISCUSSION

One hundred individuals were included in our study with a mean age of 28.94 years, whose work involved spending at least 4 h a day looking at computer screens. Out of 100 individuals, there were 80 males (mean age=29.3 years) and 20 females (mean age=27.55 years) (Table 1). All cases belong to south India mainly Hyderabad; therefore, the results cannot be generalized to other populations as there are ethnic, geographical, and regional differences in IOP as shown by Hashemi *et al.* [12].

Based on the duration of computer exposure, we have divided the subjects into three groups, that is, from 0 to 5 years, 6 to 10 years, and 11 to 15 years of exposure, and our findings are as follows. The majority of cases belong to the group of 6–10 years of exposure, that is, 49 cases. The long exposure group of 11–15 years exposure is having the least number of cases, that is, 18. For the left eye, the values of mean IOP difference were increased (Table 2) progressively as the years of exposure

Table 1: Mean age of participants according to gender

Participants	N	Mean Age (years)	SD
Total	100	28.94	4.95
Males	80	29.29	4.78
Females	20	27.55	5.48

Table 2: Duration of exposure versus IOP for LEFT EYE

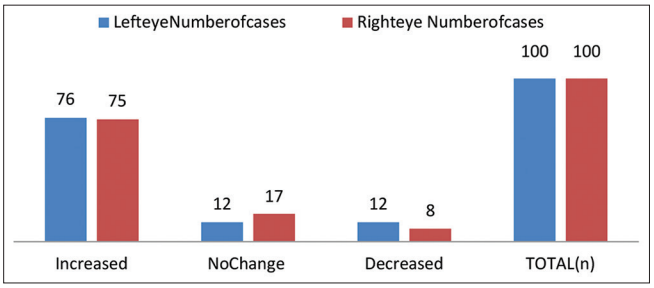
Years of exposure	IOP Pre-exposure	IOP Post-exposure	p-value
0–5	16.79	18.88	0.0004
6–10	17.44	19.62	0.0000
11–15	18.38	21.46	0.0001

IOP: Intraocular pressure

Table 3: Duration of exposure versus IOP for the right eye

Years of exposure	IOP pre-exposure	IOP post-exposure	p-value
0–5	16.08	18.21	0.0003
6–10	16.86	18.85	0.0001
11–15	17.19	19.77	0.0005

IOP: Intraocular pressure



Graph 1: IOP difference before and after computer exposure

increased, but in the right eye, the increase in the IOP was less in the 6–10 years group compared to 0–5 and 11–15 years group (Table 3). This indicates that the left eye (Table 4) is more vulnerable to OHT than the right eye. In the right eye, the results are different and surprising, as the difference in mean IOP is less than left eye in the 6–10 years and 11–15 years exposure group (Table 5). The reason for this difference can be investigated by further studies. The mean IOP difference in all groups (based on years of exposure) was found to be comparatively more in the left eye than the right indicating that the left eye is affected more than the right eye irrespective of the number of exposure years.

When we compared the pre and post-exposure IOP values concerning gender, we found that variation of IOP is significant in both genders after computer exposure, with post-exposure values found to be higher than basal values. Findings of our study is in line with Pas-Wyroślak *et al.* [13].

The mean IOP values in our study were found to be higher in males both before and after exposure (Table 6). The results obtained in various studies regarding gender differences in IOP are controversial with few studies showing significant differences while others are not. For example, in one study conducted by Pointing JS, the IOP values of males were shown to be lower than females which are contradictory to our results [14].

While in another study conducted by Yassin *et al.*, there was no significant difference observed in the IOP values of males and females [15]. Further, studies are required for the conclusion regarding this finding. Results in our study indicate that there is a statistically significant difference in the right eye mean IOP values of males and females before exposure with

Table 4: Eye wise comparison of pre- and post-exposure IOP values in males and females

Side	Exposure	Gender	Mean	p-value
Left eye	Before	Male	17.66	0.107
		Female	16.32	
	After	Male	20.06	0.036
		Female	18.29	
Right eye	Before	Male	16.94	0.036
		Female	15.56	
	After	Male	19.24	0.000
		Female	17.07	

Table 5: IOP difference (between pre- and post-exposure mean values) versus duration of exposure in the right and left eye

Years of exposure	N	Left eye IOP difference (mmHg)	Right eye IOP difference (mmHg)
0–5	33	2.09±3.05	2.12±2.48
6–10	49	2.18±2.93	1.99±2.63
11–15	18	3.07±2.71	2.57±2.47
Total	100	2.31±2.93	2.14±2.54

IOP: Intraocular pressure

Table 6: Gender differences in IOP values in the right and left eye before and after exposure

Gender	Side	Exposure	Mean	p-value
Male	Left	Before	17.66	0.0000
		After	20.06	
	Right	Before	16.94	0.0000
		After	19.24	
Female	Left	Before	16.32	0.001
		After	18.29	
	Right	Before	15.56	0.005
		After	17.07	

IOP: Intraocular pressure

basal IOP value of males found to be comparatively higher. In the left eye, the basal mean IOP value was found to be comparatively higher in males, but the difference is statistically not significant. This is surprising that our results are showing significant gender differences in basal mean IOP values of the right eye but not in the left eye. The reason for this difference is not understood. It might be due to sampling error or because of gender-related differences in the underlying physiological mechanism.

CONCLUSION

The present study concludes that there is a significant increase in IOP after computer exposure in both genders with a comparatively greater rise of IOP in males than those in females.

SUGGESTIONS

Further, studies on larger samples with an equal proportion of males and females are suggested.

AUTHORS CONTRIBUTIONS

SIA and ST contributed to the study conception and design, writing the original draft and data interpretation. SMQ contributed to data collection and interpretation. All authors read and approved the final manuscript.

CONFLICTS OF INTEREST

Authors declare that there is no conflicts of interest.

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