



# Factors associated with eyestrain complaints in corporate customer care center computer users

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## ABSTRACT

Eye tiredness, according to medical science, is a symptom induced by excessive efforts of the visual system, which is not in perfect condition, to attain visual clarity. Pain or throbbing around the eyes, blurred vision, double vision, difficulty focusing, sore eyes, red eyes, watery eyes, headaches, and dizziness accompanied by nausea are all symptoms of eyestrain. According to a study conducted by the Japanese Ministry of Health (2004), 91.6% of computer operators complained of eye fatigue. This study is quantitative and employs a cross-sectional research approach. According to the findings, the majority of computer users complain of eye fatigue. Furthermore, there is a relationship between age and lighting level with complaints of eye fatigue among computer users at PT. Telekomunikasi Indonesia, Tbk's Corporate Customer Care Center (C4) in 2009 with a Pvalue of 0.023 and the lighting level variable has an OR value of 30.00, indicating that the lighting level has a risk of 30 times the incidence of complaints of eye fatigue in computer user workers at C4 PT. Telekomunikasi Indonesia, Tbk. The variables refractive error, eye rest, and monitor distance have no correlation with complaints of eye tiredness. To alleviate worker complaints of eye fatigue, The company's advice is to offer lighting in accordance with the required standards for computer workplaces, namely 300 Lux, and to conduct periodic eye checks for employees. When working with a computer, workers should avoid wearing contact lenses because eye fatigue will be felt more rapidly. Meanwhile, future researchers are likely to use a reaction timer to objectively assess eye fatigue and a case-control study design to evaluate other characteristics connected to eye fatigue.

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## 1. INTRODUCTION

According to medical science, eye fatigue is a symptom caused by excessive efforts of the visual system which is in a less than perfect condition to obtain visual acuity. Meanwhile, according to Trevino Pakasi (1999) eye fatigue is a subjective condition caused by excessive use of eye muscles. Tired, tense or sore eyes are a disorder experienced by the eyes because the muscles are forced to work hard, especially when they have to look at close objects for a long time. The eye muscles themselves consist of three external muscle cells which regulate the movement of the eyeball, the ciliary muscles which function to focus the lens of the eye and the iris muscles which regulate the light entering the eye. All activities associated with forcing these muscles to work hard can make the eyes tired. Symptoms of sore eyes

will usually appear after a few hours of work. When the eye muscles become tired, the eyes will become uncomfortable or sore. Meanwhile, according to Suma'mur (1991) in Henny (2001) eyestrain arises as intensive stress on eye functions such as on the muscles of accommodation at work that need careful observation or on the retina as a result of inaccurate contrast.

Symptoms of eye fatigue are divided into three, namely visual symptoms such as double vision, ocular symptoms such as pain in both eyes, and referral symptoms such as nausea and headaches (Trevino Pakasi, 1999). Eyestrain can cause physical problems such as headaches, double vision, glare at night light, red eyes, inflammation of the lining of the eyes, reduced visual acuity, and various other vision problems. Another impact of eye fatigue in the world of work is loss of productivity, increased accident rates, and the occurrence of vision complaints (Taylor & Francis, 1997). According to the Department of Health eye fatigue can cause irritation such as watery eyes and red eyelids, double vision, headaches, decreased eye sharpness,

Eye fatigue often occurs in workers who use computers in carrying out their daily work activities. Impaired vision caused by computer use, by The American Optometric Association is called Computer Vision Syndrome (CVS), which is a symptom that can cause various complaints including tired and dry eyes, headaches, blurry vision, and sensitivity to light (Fauzi, 2006). Meanwhile, according to Pheasant (1990) the symptoms of a person experiencing eye fatigue include pain or throbbing around the eyes, blurred vision, double vision, difficulty in focusing vision, sore eyes, red eyes, watery eyes, headaches, and dizziness accompanied by nausea. Factors that can affect eye fatigue according to the Occupational Health and Safety Unit of the University of Queensland are work equipment factors (size of objects on the screen and screen display), work environment (monitor light, room lighting, air temperature), work design (document characteristics, work duration). and individual characteristics (history of disease). Eye fatigue according to Trevino Pakasi (1999) is influenced by internal factors and external factors. Internal factors can be classified into ocular and systemic factors.

Meanwhile, external factors are influenced by the level of lighting and the distribution of light in the work area. Visual symptoms according to OSHA can also result from inappropriate lighting, glare from the monitor, object sizes on the monitor screen that are difficult to read, and eye rest patterns (OSHA, 1997). Age of workers according to Guyton (1991) also affects eye fatigue. North (1993) states that factors that affect visual performance include the individual's own ability, visibility to objects, lighting, duration, object size, glare, and contrast. The use of computers around the world has increased from time to time. With a computer, work can be done easily and quickly. But computer use also has an effect on health. Computer use can be stressful, as NIOSH (The National Institute of Occupational Safety and Health) found. NIOSH found that computer operators have a higher level of stress compared to other jobs (Djunaedi, 2003).

In various studies conducted in the United States, it was found that Computer Vision Syndrome (CVS) or eye fatigue was found to be associated with continuous use of a monitor or Video Display Terminal (VDT). Data according to EyeCare Technology (1995) in Endit (2003) found that there are 60 million people who suffer from visual impairment due to using a Video Display Terminal (VDT) for 3 hours or more a day. Meanwhile, according to NIOSH, it was reported that 88% of people who interact with computers for more than 3 hours per day will experience eye fatigue disorders.

The Manager of Professional Services from the Optometric Association of Australia states that eye fatigue, vision problems and eye health worsen as we continue to work long hours and rely on computers. The office worker group is part of the highest risk category for eyestrain, several studies indicate that 35-48% of office workers suffer from this problem (Robinson, 2003 in Hana 2008). Research conducted by the Japanese Ministry of Health (2004) also found that the proportion of eye fatigue complaints felt by computer operators was 91.6%.

In Indonesia eye fatigue is a symptom that is often found due to continuous eye interaction with computer use. The results of research conducted at the "X" Hospital in 2004 found that the prevalence rate of eye fatigue in computer workers was 95.8% (Fauziah, 2004). Using a computer for a long time will make your eyes tired and dry because your eyes are constantly used to see the monitor

screen. To prevent this we need to pay attention to visual ergonomics in using a computer such as the distance between the eye and the monitor screen, room lighting and the position of the monitor to the eye so that workers get visual comfort when doing their work.

PT. Telekomunikasi Indonesia, Tbk is a State-Owned Enterprise (BUMN), an industry engaged in the field of domestic communication services. One of its sub-divisions is the Corporate Customer Care Center (C<sub>4</sub>), which is a company engaged in the telecommunications sector to handle and coordinate disruptions to Corporate customers who use Telkom products. In dealing with disturbances that occur in Telkom services, workers are very dependent on computers with a long and continuous use of time so that it can cause negative consequences for the health of the body, especially eye health. Based on information from the management, until now there has never been a research activity conducted on the health of workers related to the occurrence of eye health problems, especially eye fatigue in computer users. For this reason, researchers are interested in conducting research on factors related to complaints of eye fatigue in computer user workers at the Corporate Customer Care Center (C<sub>4</sub>) of PT. Telekomunikasi Indonesia, Tbk.

## 2. RESEARCH METHOD

### Research design

This research is a quantitative research using descriptive analytic method with a cross sectional approach because in this study the independent and dependent variables will be observed at the same time (period).

### Place and time of research

The research will be conducted from December 2009 to January 2010 at the Corporate Customer Care Center (C<sub>4</sub>) of PT. Telekomunikasi Indonesia, Tbk.

### Population and Research Sample

The population of this research is all workers who work at the Corporate Customer Care Center (C<sub>4</sub>) of PT. Telekomunikasi Indonesia, Tbk in 2009 that is 80 workers. While the sample criteria taken are all computer user workers in the customer service section. Based on the results of calculations using the formula for the number of samples to test the hypothesis of two proportions, with the assumption from previous research, namely that: the proportion in the population that has eyestrain with a lighting level < 300 lux (P<sub>1</sub>) is 88.9% and the proportion that has a proportion that has fatigue eyes with lighting level ≥ 300 lux (P<sub>2</sub>) is 42.9% (Prayitno, 2008). In this study, the researcher wanted a 95% confidence level using a 5% degree of significance with a test power of 90%. The formula for a large sample hypothesis test of two proportions:

$$\text{Samples (n)} = \left[ \frac{Z_{1-\alpha/2} \sqrt{2P(1-P)} + Z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)}}{(P_1 - P_2)} \right]^2$$

### (P<sub>1</sub>-P<sub>2</sub>)<sup>2</sup>

Information:

N :Minimum sample size required in research

$Z_{21-\alpha/2}$  :The degree of significance of  $\alpha$  in the 2-tailed test (two tails),  $\alpha = 5\%$

$Z_{1-\beta}$  :90% test strength

P :The average proportion in the population

P<sub>1</sub> :Proportion in population with eyestrain by exposure level  
< 300 lux (P<sub>1</sub>) is 0.889

P<sub>2</sub> :proportions that have proportions that have eyestrain with with  
lighting level ≥ 300 lux (P<sub>2</sub>) is 0.429

## 3. RESULTS AND DISCUSSIONS

### Univariate analysis

Univariate analysis of the incidence of complaints of eye fatigue in computer user workers at C4 PT. Telekomunikasi Indonesia, Tbk in 2009 can be seen in the table.

Table 1. Overview of Complaints of Eyestrain in Computer User Workers at the Corporate Customer Care Center (C4) of PT. Telekomunikasi Indonesia, Tbk The year 2009

Description of Complaints of Eyestrain	Amount	Percentage
Sigh	46	90,2
Not complaining	5	9,8
Total	51	100

Based on table 5.1, it is known that most workers experience complaints of eye fatigue, namely as much as 90.2%. While workers who do not Based on table 5.1, it is known that the majority of workers experience complaints of eye fatigue as much as 90.2%. While workers who do not.

### Description of the Types of Eyestrain Complaints

Distribution of types of eye fatigue complaints complained of by computer user workers at C4 PT. Telekomunikasi Indonesia, Tbk can be seen in the chart:

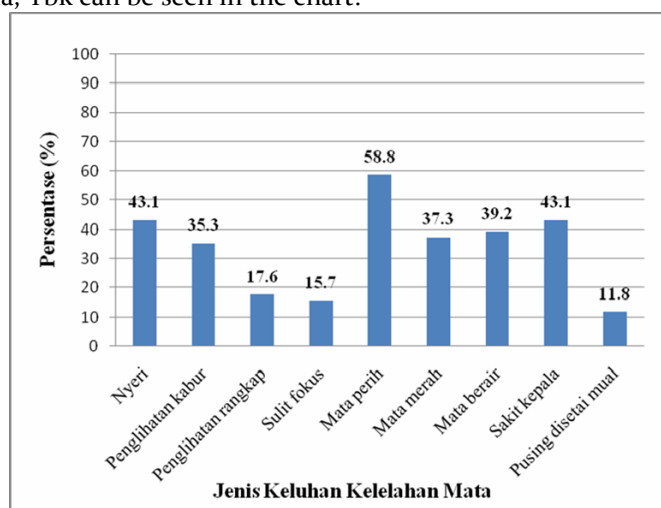


Figure 1. Distribution of Types of Eyestrain Complaints to Computer User Workers at the Corporate Customer Care Center (C4) of PT. Telekomunikasi Indonesia, Tbk in 2009

Based on graph 5.1, it is known that the types of eye fatigue complaints that many workers complain about are sore eyes, namely as many as 58.8% of workers. Meanwhile, the type of eye fatigue that workers complained of the least was dizziness accompanied by nausea, namely 11.8% of workers. From this graph it can also be seen that the top three complaints that are most experienced by all computer user workers at C4 PT. Telekomunikasi Indonesia, Tbk namely sore eyes (58.8%), pain around the eyes (43.1%), and headaches (43.1%). Based on the results of the study, there were 23% of workers who experienced the three major eye fatigue complaints, and most of these workers worked with lighting levels below 300 lux.

### Overview of Factors Associated with Complaints of Eyestrain

Univariate analysis of the description of the frequency distribution based on the variable factors associated with complaints of eye fatigue in workers who use computers at C4 PT. Telekomunikasi Indonesia, Tbk in 2009 can be seen in table 2:

Table 1. Description of Frequency Distribution Based on Variable Factors Associated with Complaints of Eyestrain in Computer User Workers in Corporate Customer Care Center (C4). PT. Indonesian Telecommunications,

No.	Variable	Category	Amount	Percentage(%)
1.	Age	≥ 45 years	3	5,9
		< 45 years	48	94,1
		<b>Total</b>	<b>51</b>	<b>100</b>
2.	Abnormalities Refraction	There are Abnormalities	28	54,9
		No Abnormalities	23	45,1
		<b>Total</b>	<b>51</b>	<b>100</b>
3.	Rest Eye	Not	10	19,6
		Yes	41	80,4
		<b>Total</b>	<b>51</b>	<b>100</b>
4.	Monitor Distance	< 50 cm	11	21,6
		≥ 50cm	40	78,4
		<b>Total</b>	<b>51</b>	<b>100</b>
5.	Level Lighting	< 300 lux	48	94,1
		≥ 300 lux	3	5,9
		<b>Total</b>	<b>51</b>	<b>100</b>

- a. Age  
Based on the results of the research in table 5.2, it is known that most workers are aged <45 years, namely 94.1% of workers. Meanwhile, only 5.9% of workers aged ≥ 45 years.
- b. Refractive Abnormalities  
Based on the research results in table 5.2, it is known that 54.9% of workers have refractive errors. While workers who do not have refractive errors are 45.1% of workers.
- c. Eye Rest  
Based on the research results in table 5.2, it is known that 19.6% of workers do not take eye breaks. While workers who do eye rest as much as 80.4% of workers.
- d. Monitor Distance  
Based on the research results in table 5.2, it is known that workers who work with a monitor distance of <50 cm are 21.6% of workers. Meanwhile, workers who work with a monitor distance of ≥ 50 cm are 78.4% of workers.
- e. Lighting Level  
Based on the results of the research in table 5.2 it is known that the lighting level at the worker's desk is < 300 lux as many as 94.1% of workers. Meanwhile, only 5.9% of workers have lighting levels for workers' desks that are ≥ 300 lux.

### Bivariate Analysis

This bivariate analysis was carried out to obtain an overview of the relationship between the variables of worker characteristics, work equipment, and work environment with the incidence of eye fatigue complaints in computer user workers at the Corporate Customer Care Center (C4) PT. Telekomunikasi Indonesia, Tbk in 2009. To find out the relationship between these variables and complaints of eye fatigue, a Chi-Square statistical test was carried out using a significance degree of 5%. The following will present the results of the bivariate analysis of each variable.

Table 2. Analysis of the Relationship between Age and Complaints of Eyestrain in Computer User Workers at the Corporate Customer Care Center (C4)

Age	Complaints of Eyestrain				Total	P Value	OR 95% CI
	Sigh		Not Complaining				
	n	%	n	%			
≥ 45 years	1	33,3	2	66,7	3	100	0.02
< 45 years	45	93,8	3	6,3	48	100	3
Amount	46	90,2	5	9,8	51	100	0.481

Based on table 5.3, it can be seen that of the workers aged ≥45 years, only 1 worker complained of eye fatigue. In contrast, the majority of workers aged <45 years (93.8%) also experienced complaints

of eye fatigue. Based on the results of the chi square statistical test at a significance degree of 5%, Pvalue = 0.023 was obtained so that it can be seen that age has a significant relationship with complaints of eye fatigue. Based on the calculation of risk estimate, OR = 0.033 (95% CI 0.002-0.481), meaning that workers aged  $\geq 45$  years have a risk of 0.033 times to experience eye fatigue complaints compared to workers aged  $<45$  years.

### Relationship between Refractive Disorders and Complaints of Eyestrain

Table 2. Analysis of the Relationship between Refractive Disorders and Eyestrain Complaints in Computer User Workers at the Corporate Customer Care Center (C4) of PT. Telekomunikasi Indonesia, Tbk in 2009

Refractive Abnormalities	Complaints of Eyestrain						P Value	OR 95% CI
	Sigh		Not Complaining		Total			
	n	%	n	%	n	%		
There are Abnormalities	24	85.7	4	14.7	28	100	0.273	
No Abnormalities	22	95.7	1	4.3	23	100	0.362	
Amount	46	90.2	5	9.8	51	100	0.028 - 2.630	

Based on table 5, it can be seen that both workers who have refractive errors and those who do not have refractive errors are experiencing eye fatigue. Workers who have refractive errors and complain are 85.7%, while workers who do not have refractive errors and complain are 95.5%. Based on the results of the chi square statistical test, it is known that refractive errors do not have a significant relationship ( $\alpha > 0.05$ ) with complaints of eye fatigue, Pvalue = 0.362.

### Relationship between Eye Rest and Complaints of Eyestrain

Table 2. Analysis of the Relationship between Eye Rest and Complaints of Eyestrain Computer User Workers at Corporate Customer Care Center (C4) PT. Indonesian Telecommunications

Rest Eye	Complaints of Eyestrain						P Value	OR 95% CI
	Sigh		Not Complaining		Total			
	n	%	n	%	n	%		
Not	10	100	0	0	10	100	1.139	
Yes	36	87.8	5	12.2	41	100	0.569	
Amount	46	90.2	5	9.8	51	100	1.016 - 1.277	

Based on table 5.5, it can be seen that workers who do not take mat breaks all complain of eye fatigue. On the other hand, most workers who take eye breaks also complain of eye fatigue. Based on the results of the chi square statistical test, it is known that eye rest does not have a significant relationship ( $\alpha > 0.05$ ) with complaints of eye fatigue, Pvalue = 0.569.

### Relationship between Lighting Level and Complaints of Eyestrain

Table 2. Analysis of the Relationship between Lighting Levels and Complaints of Eyestrain in Computer Users at the Corporate Customer Care Center (C4) PT. Indonesian Telecommunications

Lighting level	Complaints of Eyestrain						P Value	OR 95% CI
	Sigh		Not Complaining		Total			
	n	%	n	%	n	%		
< 300 lux	45	93.8	3	6.3	48	100	30.00	
$\geq 300$ lux	1	33.3	2	66.7	3	100	0.032	
Amount	46	90.2	5	9.8	51	100	2,078 - 433,129	

Based on the table, it can be seen that most workers work with lighting levels  $<300$  lux and most of these workers also complain of eye fatigue. Conversely, workers who work with lighting levels

$\geq 300$  lux also have workers who complain of eye fatigue, namely only 1 worker. Based on the results of the chi square statistical test at a significance degree of 5%,  $P$ value = 0.023 was obtained so that it can be seen that the level of lighting has a significant relationship with complaints of eye fatigue. Based on the estimated risk calculation, OR = 30.00 (95% CI 2.078 – 433, 129), meaning that workers who work with lighting levels  $<300$  lux have 30 times the risk of experiencing eyestrain compared to workers who work with lighting levels  $\geq 300$  lux .

#### 4. CONCLUSION

Description of complaints of eye fatigue in workers who use computers at the Corporate Customer Care Center (C<sub>4</sub>) of PT. Telekomunikasi Indonesia, Tbk in 2009, 90.2% of workers complained of eye fatigue and 9.8% of workers did not experience eye fatigue. There is a significant relationship between age and complaints of eye fatigue in computer user workers at the Corporate Customer Care Center (C<sub>4</sub>) of PT. Telekomunikasi Indonesia, Tbk. There is no significant relationship between refractive errors and complaints of eye fatigue among computer users at the Corporate Customer Care Center (C<sub>4</sub>) PT. Telekomunikasi Indonesia, Tbk. There is no significant relationship between eye rest and complaints of eye fatigue in computer user workers at the Corporate Customer Care Center (C<sub>4</sub>) PT. Telekomunikasi Indonesia, Tbk. There is no significant relationship between monitor distance and complaints of eye fatigue in computer user workers at the Corporate Customer Care Center (C<sub>4</sub>) PT. Telekomunikasi Indonesia, Tbk. There is a significant relationship between lighting levels and complaints of eye fatigue among computer users at the Corporate Customer Care Center (C<sub>4</sub>) of PT. Telekomunikasi Indonesia, Tbk.

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