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The Determinant Factors Affecting the Event of Computer Vision Syndrome (CVS) on Helpdesk Employees at PT. Telkom Access Papua in 2020

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Abstract

Background: Computer Vision Syndrome (CVS) occurs due to prolonged use of computers. Many individuals with CVS experience discomfort when using a computer for a long time. If workers are affected by CVS, it will affect the company because the productivity of workers decreases so that the company's income will also decrease.

Research Objectives: To identify the determinant factors associated with the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua in 2020.

Research method: The research method used in this study was observational analytic with a cross-sectional study approach. A sample of 50 employees was taken using total sampling. The study was conducted in March 2020. Statistical tests used in this study were univariate, bivariate, and multivariate analysis. Data obtained by using questionnaires and interviews.

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Results: Bivariate analysis showed several determinant factors affecting the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua, they are: using contact lenses ($p = 0.037$; $RP = 1.779$; $95\% \text{ CI} = 1.107-2.858$), working hours ($p = 0.049$; $RP = 1.917$; $95\% \text{ CI} = 1.031-3.563$), break eyes ($p = 0.020$; $RP = 2.588$; $95\% \text{ CI} = 1.069-6.267$), and room lighting ($p = 0.011$; $RP = 2.574$; $95\% \text{ CI} = 1.168-5.676$); while sex ($p = 0.162$; $RP = 1.607$; $95\% \text{ CI} = 0.982-2.631$), age ($p = 0.589$; $RP = 1.636$; $95\% \text{ CI} = 0.511-5.237$), using eye glasses ($p = 0.186$; $RP = 0.642$; $95\% \text{ CI} = 0.388-1.060$), length of working ($p = 0.087$; $RP = 1.976$; $95\% \text{ CI} = 0.912-4.283$), viewpoint ($p = 0.087$; $RP = 1.976$; $95\% \text{ CI} = 0.912-4.283$), distance between eyes and monitor ($p = 0.087$; $RP = 1.976$; $95\% \text{ CI} = 0.912-4.283$), and room temperature ($p = 0.894$; $RP = 0.828$; $95\% \text{ CI} = 0.378-1.814$) were not affecting the event of computer vision syndrome (CVS). Multivariate logistic regression analysis showed two dominant determinant factors that affecting the event of computer vision syndrome (CVS); they are: break eyes and room lighting.

Keywords: Computer Vision Syndrome (CVS); employees; cross-sectional.

1. Introduction

Excessive use of a computer is at risk of developing eye health problems such as eye fatigue with an incidence ranging from 40% to 90%. The American Optometric Association states that eye fatigue, vision problems and eye health worsen when working long hours and are dependent on the computer. Several studies indicate that 35% to 48% of office workers suffer from these health problems [1]. Computer Vision Syndrome (CVS) originates from prolonged use of computers. Many individuals complain of discomfort when using a computer for a long time [1]. CVS is a visual disorder which is the number one occupational hazard in the 21st century and this exposure to the use of computer technology in humans will be difficult to overcome [2]. The prevalence of CVS reaches 64-90% in computer users with the number of sufferers worldwide estimated at 60 million people and every year there will continue to emerge 1 million new cases [3]. In general, CVS complaints consist of eye strain, headache, blurred vision, dry and irritated eyes, pain in the neck and back, sensitivity to light and double vision [1]. In Indonesia, the prevalence of severe low vision 1.49% and the prevalence of blindness 0.5%. The prevalence of severe low vision and blindness increased rapidly in the population of the age group of > 45 years old with an average increase of about two to three times every 10 years [4]. Most computers were used basically aim to improve working effectiveness; however, they are also have some negative impact to their users. The increased use of computers in the work environment can have an impact on CVS events. All office employees in any workplace will be vulnerable to experiencing CVS. One workplace that utilizes the use of computers is PT Telekomunikasi Indonesia as a leading telecommunications company in Indonesia which has a subsidiary, PT Telkom Access Papua, which operates in the field of providing construction services and managing network infrastructure. PT. Telkom Access Papua has 50 employees in the helpdesk department whose job is to oversee the entire operational process of the company every day which starts from 8:00AM to 20:00PM. They have to monitor everything through a computer monitor. Based on observations and interviews with 25 helpdesk employees at PT. Telkom Access Papua, many of them experienced fatigue in working, especially complaints on the eyes, namely: blurred vision, dry eyes, and headaches. It is especially appears to some employees who worked using computers with eye distance and monitors are very close. This situation can affect the productivity of the employees and then affect the company's income. The results of this study can be

useful for company management in determining policies related to increase the productivity of the employees by eliminating some factors that can affect the event of CVS on employees. Based on this background, the authors are interested in researching about "The determinant factors affecting the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua in 2020."

2. Materials and Methods

2.1. Type of Research

The type of research used in this study was observational analytic with a cross-sectional design which is widely used, often in epidemiology. The samples in this study were employees who work at the Helpdesk of PT. Telkom Access Papua. The samples of 50 employees were taken as total sampling. All the selected samples were included in this study.

2.2. Ethical Research and Data Collection

Each respondent was asked to sign an informed consent. Primary data was collected by conducting interviews directly to the sample using the interview guidelines (questionnaire). Data processing was performed using a computer with the help of SPSS program packages. Data were analyzed using chi-square and multiple logistic regression.

3. Result and Discussion

3.1. Univariate Analysis

Univariate analysis was used to describe each variable of the study. This analysis only displays the frequency and percentage of each variable. The results of the analysis can be seen in table 1:

Table 1 shows that out of 50 respondents, male sex as many as 36 people (72%), age ≤ 40 years old as many as 44 people (88%), no use of eye glasses as many as 34 people (68%), no use of contact lenses as many as 37 people (74%), length of working ≥ 4 years as many as 34 people (68%), working hours < 4 hours per day as many as 27 people (54%), break eyes < 20 minutes as many as 34 people (68%), viewpoint $< 15^{\circ}$ as many as 34 people (68%), distance between eyes and monitor < 50 cm as many as 34 people (68%), glare room lighting as many as 31 people (62%), room temperature $\geq 24^{\circ}\text{C}$ as many as 41 people (82%), and has computer vision syndrome (CVS) as many as 26 people (52%).

Table 1: Distribution of respondents according to Sex, Age, Use of eye glasses, Use of contact lenses, Length of working, Working hours, Break eyes, Viewpoint, Distance between eyes and monitor, Room lighting, Room temperature, and Computer Syndrome Vision (CVS).

No	Variable	Frequency (n)	Percentage (%)
1	Sex		
	Female	14	28
	Male	36	72
2	Age		
	> 40 years old	6	12
	≤ 40 years old	44	88
3	Use of eyeglasses		
	No	34	68
	Yes	16	32
4	Use of contact lenses		
	Yes	13	26
	No	37	74
5	Length of working		
	≥ 4 years	34	68
	< 4 years	16	32
6	Working hours		
	< 4 hours per day	27	54
	≥ 4 hours per day	23	46
7	Break eyes		
	< 20 minutes	34	68
	≥ 20 minutes	16	32
8	Viewpoint		
	< 15°	34	68
	≥ 15°	16	32
9	Distance between eyes and monitor		
	< 50 cm	34	68
	≥ 50 cm	16	32
10	Room lighting		
	Glare	31	62
	No glare	19	38
11	Room temperature		
	< 24°C	9	18
	≥ 24°C	41	82
12	Computer Syndrome Vision (CVS)		
	Yes	26	52
	No	24	48
Total		105	100

Source: Primary Data, 2020

3.2. Bivariate Analysis

Bivariate analysis was carried out to determine the relationship between independent and dependent variables, namely sex, age, using eye glasses, using contact lenses, length of working, working hours, break eyes, viewpoint, distance between eyes and monitor, room lighting, and room temperature with the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua. To find out the relationship between the determinant factors and the event of computer vision syndrome (CVS), the chi-square test was used with a significance level of 5%. The results of the bivariate analysis are presented in the following tables:

a. Relationship between sex and the event of computer vision syndrome (CVS)

Table 2 shows that out of 14 female employees, 10 employees (71.4%) were CVS and only 4 (28.6%) were non-CVS. While from 36 male employees, 16 (44.4%) were CVS and 20 employees (55.6%) were Non-CVS. The statistical test results obtained by Ratio Prevalence (RP) of 1.607 and 95% CI (0.982–2.631) showed that sex was not a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.

Table 2: Distribution of sex and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Sex	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
Female	10	71.4	4	28.6	14	100
Male	16	44.4	20	55.6	36	100
Total	26	52.0	24	48.0	50	100

p=0.162; RP=1.607; 95%CI (0.982–2.631)

Source: Primary Data, 2020

b. Relationship between age and the event of computer vision syndrome (CVS)

Table 3 shows that out of 44 employees with age > 40 years old, 24 (54.5%) were CVS and 20 (45.5%) were non-CVS. While from 6 employees with age ≤ 40 years old, 2 (33.3%) were CVS and 4 (66.7%) were Non-CVS.

Table 3: Distribution of age and the event of computer vision syndrome (CVS) of helpdesk employees at PT. Telkom Access Papua

Age	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
> 40 years old	24	54.5	20	45.5	44	100
≤ 40 years old	2	33.3	4	66.7	6	100
Total	26	52.0	24	48.0	50	100

p=0.589; RP=1.636; 95%CI (0.511–5.237)

Source: Primary Data, 2020

The statistical test results obtained by Ratio Prevalence (RP) of 1.636 and 95% CI (0.511–5.237) showed that age was not a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.

c. Relationship between using eye glasses and the event of computer vision syndrome (CVS)

Table 4 shows that out of 34 employees who were not using eye glasses, 15 (44.1%) were CVS and 19 (55.9%) were non-CVS. While from 16 employees who were using eye glasses, 11 (68.8%) were CVS and 5 (31.2%) were Non-CVS. The statistical test results obtained by Ratio Prevalence (RP) of 0.642 and 95% CI (0.388–1.060) showed that using eye glasses was not a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.

Table 4: Distribution of using eye glasses and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Using eye glasses	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
No	15	44.1	19	55.9	34	100
Yes	11	68.8	5	31.2	16	100
Total	26	52.0	24	48.0	50	100

p=0.186; RP=0.642; 95%CI (0.388–1.060)

Source: Primary Data, 2020

d. Relationship between using contact lenses and the event of computer vision syndrome (CVS)

Table 5 shows that out of 13 employees who were using contact lenses, 10 (76.9%) were CVS and only 3 (23.1%) were non-CVS. While from 37 employees who were not using contact lenses, 16 (43.2%) were CVS and 21 (56.8%) were Non-CVS.

Table 5: Distribution of using contact lenses and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Useing contact lenses	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
Yes	10	76.9	3	23.1	13	100
No	16	43.2	21	56.8	37	100
Total	26	52.0	24	48.0	50	100

p=0.037; RP=1.779; 95%CI (1.107–2.858)

Source: Primary Data, 2020

The statistical test results obtained by Ratio Prevalence (RP) of 1.779 and 95% CI (1.107–2.858) showed that using contact lenses was a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua. Employees who were using contact lenses tend to have the event of computer vision syndrome (CVS) 1.779 times greater than employees who were not using contact lenses.

e. Relationship between length of working and the event of computer vision syndrome (CVS)

Table 6 shows that out of 34 employees who has ≥ 4 years length of working, 21 (61.8%) were CVS and only 13 (38.2%) were non-CVS. While from 16 employees who has < 4 years length of working, 5 (31.2%) were CVS and 11 (68.8%) were Non-CVS.

Table 6: Distribution of length of working and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Length of working	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
≥ 4 years	21	61.8	13	38.2	34	100
< 4 years	5	31.2	11	68.8	16	100
Total	26	52.0	24	48.0	50	100

p=0.087; RP=1.976; 95%CI (0.912–4.283)

Source: Primary Data, 2020

The statistical test results obtained by Ratio Prevalence (RP) of 1.976 and 95% CI (0.912–4.283) showed that length of working was not a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.

f. Relationship between working hours and the event of computer vision syndrome (CVS)

Table 7 shows that out of 27 employees who has working hours < 4 hours per day, 18 (66.7%) were CVS and only 9 (33.3%) were non-CVS. While from 23 employees who has working hours ≥ 4 hours per day, 8 (34.8%) were CVS and 15 (65.2%) were Non-CVS.

Table 7: Distribution of working hours and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Working hours	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
< 4 hours per day	18	66.7	9	33.3	27	100
≥ 4 hours per day	8	34.8	15	65.2	23	100
Total	26	52.0	24	48.0	50	100

p=0.049; RP=1.917; 95%CI (1.031–3.563)

Source: Primary Data, 2020

The statistical test results obtained by Ratio Prevalence (RP) of 1.917 and 95% CI (1.031–3.563) showed that working hours was a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua. Employees who has working hours < 4 hours per day tend to have the event of computer vision syndrome (CVS) 1.917 times greater than employees who has working hours ≥ 4 hours per day.

g. Relationship between break eyes and the event of computer vision syndrome (CVS)

Table 8 shows that out of 34 employees who has break eyes < 20 minutes, 22 (64.7%) were CVS and only 12 (35.3%) were non-CVS. While from 16 employees who has break eyes ≥ 20 minutes, only 4 (25.0%) were CVS and 24 (75.0%) were Non-CVS.

Table 8: Distribution of break eyes and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Break eyes	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
< 20 minutes	22	64.7	12	35.3	34	100
≥ 20 minutes	4	25.0	12	75.0	16	100
Total	26	52.0	24	48.0	50	100

p=0.020; RP=2.588; 95%CI (1.069–6.267)

Source: Primary Data, 2020

The statistical test results obtained by Ratio Prevalence (RP) of 2.588 and 95% CI (1.069–6.267) showed that break eyes was a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk

employees at PT. Telkom Access Papua. Employees who has break eyes < 20 minutes tend to have computer vision syndrome (CVS) 2.588 times greater than employees who has break eyes ≥ 20 minutes.

h. Relationship between viewpoint and the event of computer vision syndrome (CVS)

Table 9 shows that out of 34 employees who has < 15° of viewpoint, 21 (61.8%) were CVS and only 13 (38.2%) were non-CVS. While from 16 employees who has ≥ 15° of viewpoint, only 5 (31.2%) were CVS and 11 (68.8%) were Non-CVS.

Table 9: Distribution of viewpoint and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Viewpoint	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS			
	n	%	n	%	n	%
< 15°	21	61.8	13	38.2	34	100
≥ 15°	5	31.2	11	68.8	16	100
Total	26	52.0	24	48.0	50	100

p=0.087; RP=1.976; 95%CI (0.912–4.283)

Source: Primary Data, 2020

The statistical test results obtained by Ratio Prevalence (RP) of 1.976 and 95% CI (0.912–4.283) showed that viewpoint was not a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.

i. Relationship between distance between eyes and monitor and the event of computer vision syndrome (CVS)

Table 10: Distribution of distance between eyes and monitor and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Distance between eyes and monitor	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS			
	n	%	n	%	n	%
< 50 cm	21	61.8	13	38.2	34	100
≥ 50 cm	5	31.2	11	68.8	16	100
Total	26	52.0	24	48.0	50	100

p=0.087; RP=1.976; 95%CI (0.912–4.283)

Source: Primary Data, 2020

Table 10 shows that out of 34 employees who has distance between eyes and monitor < 50 cm, 21 (61.8%) were CVS and only 13 (38.2%) were non-CVS. While from 16 employees who has distance between eyes and monitor ≥ 50 cm, only 5 (31.2%) were CVS and 11 (68.8%) were Non-CVS.

The statistical test results obtained by Ratio Prevalence (RP) of 1.976 and 95% CI (0.912–4.283) showed that distance between eyes and monitor was not a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.

j. Relationship between room lighting and the event of computer vision syndrome (CVS)

Table 11 shows that out of 31 employees who has glare room lighting, 21 (67.7%) were CVS and only 10 (32.3%) were non-CVS. While from 19 employees who has no glare room lighting, only 5 (26.3%) were CVS and 14 (73.7%) were Non-CVS.

Table 11: Distribution of room lighting and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Room lighting	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
Glare	21	67.7	10	32.3	31	100
No glare	5	26.3	14	73.7	19	100
Total	26	52.0	24	48.0	50	100

p=0.011; RP=2.574; 95%CI (1.168–5.676)

Source: Primary Data, 2020

The statistical test results obtained by Ratio Prevalence (RP) of 2.574 and 95% CI (1.168–5.676) showed that room lighting was a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua. Employees who had glare room lighting tend to have computer vision syndrome (CVS) 2.574 times greater than employees who had no glare room lighting.

k. Relationship between room temperature and the event of computer vision syndrome (CVS)

Table 12 shows that out of 9 employees who has < 24°C of room temperature, 4 (44.4%) were CVS and 5 (55.6%) were non-CVS. While from 41 employees who has ≥ 24°C of room temperature, 22 (53.7%) were CVS and 19 (46.3%) were Non-CVS.

Table 12: Distribution of room temperature and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Room temperature	The event of computer vision syndrome (CVS)				Total	
	CVS		Non-CVS		n	%
	n	%	n	%		
< 24 ^o C	4	44.4	5	55.6	9	100
≥ 24 ^o C	22	53.7	19	46.3	41	100
Total	26	52.0	24	48.0	50	100

p=0.89; RP=0.828; 95%CI (0.378–1.814)

Source: Primary Data, 2020

The statistical test results obtained by Ratio Prevalence (RP) of 0.828 and 95% CI (0.378–1.814) showed that room temperature was not a significant determinant factor for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.

3.3. Multivariate Analysis

Multivariate analysis used in this study is multiple logistic regressions. This analysis is a mathematical model used to study the relationship between two or several independent variables and one dichotomous dependent variable [5]. This analysis is intended to determine the most dominant determinant factors for the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua. The results of multivariate analysis can be seen in table 13.

Table 13: The results of Multiple Logistic Regression Analysis with Stepwise Forward LR Method between Independent Variables on the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua

Covariate	B	Wald	P	OR	95%CI	
Break eyes	2.045	5.468	0.019	7.729	1.329	42.905
Room lighting	1.472	4.321	0.038	4.356	1.088	17.445
Constant	-2.582	7.192	0.07	0.076		

Source: Primary Data, 2020

Based on the results of multiple logistic regression analysis, the dominant determinant factors that affecting the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua were break eyes and room lighting.

4. Discussion

4.1. Sex Determinant Factor for the event of computer vision syndrome (CVS)

Gender is one of the factors supporting the occurrence of CVS. Many studies mention that the incidence of CVS in women is more than in men, although not significantly different. Physiologically, the anatomy of a woman's eyes in the tear film layer will thin out more quickly with increasing age, and will cause the eyes to feel dry, which is also a sign of CVS symptoms. Based on the results of the chi-square statistical test with $p=0.086$, it is known that there is no significant relationship between gender and exposure to computer vision syndrome (CVS) on the helpdesk employees at PT Telkom Access Papua. Supported by the results of Paramita's research [6], it shows that out of 50 respondents there were 29 male respondents and 26 of them have CVS complaints. This can occur because the majority of helpdesk employees at PT Telkom Access Papua are 36 men and the division of tasks and working hours for men is higher than for women. The majority of male respondents said that after office hours were finished at home they still continued to monitor the escort with a technician. So that male respondents use computers more frequently and longer compared to women.

4.2. Age Determinant Factor for the event of computer vision syndrome (CVS)

As the age increases, it will be followed by the degeneration of organs so that the ability of organs will decrease. One of them is the ability of the five senses like the eye. The degeneration process occurs at the age of 40 years and above, there is an accommodation problem that occurs in the elderly, or people who are in old age [7]. This can occur due to degeneration of the eye organs in old age resulting in presbyopia refractive disorders, where it can reduced the ability of eye accommodation in accordance with the increasing age. The more age increases, the lens of the eye will experience a decline in the ability to process accommodation, so that it will be a disorder of presbyopia refraction. In this study, it was known from 50 employees, there were 6 employees aged > 40 years and 2 employees experiencing Computer Vision Syndrome (CVS). Based on the results of the analysis, it was found that there was no significant relationship between age and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua. The results of this study is in line with the results of Paramita's research [6], which showed that there was no significant relationship between age factor and CVS complaints on employees of computer users at PT. Anugerah Pharmindo Lestari Semarang Branch.

4.3. Using eye glasses Determinant Factor for the event of computer vision syndrome (CVS)

Based on the results of the chi-square statistical test with $p=0.104$, it is concluded that there is no significant relationship between using eye glasses with exposure of computer vision syndrome (CVS) on helpdesk employees at PT Telkom Access Papua. This study examines the use of glasses against the appearance of vision complaints while working in a computer. The glasses that they used are single lens minus glasses for myopia, positive for hypermetropia, and only a few respondents use glasses with photocromic lenses. Some respondents expressed that the glasses they used were purchased without first checking for refractive abnormalities. This means that some respondents use glasses not in accordance with the problem of eye refraction suffered, so this does not improve lens correction but confuses the focal point of vision that can increase the risk of Computer

Vision Syndrome (CVS). The results of the analysis was found that there was no significant relationship between using eye glasses and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.. In contrast to the statement of Reddy [8] that eye glasses users showed significant complaints in research in Malaysia. The results reported by Reddy who examined the relationship between the use of glasses with the incidence of complaints in CVS sufferers were significant compared to respondents who did not wear glasses. The explanation that can be delivered about the significant results is the number of respondents between the case groups and the control group whose difference is not much, so the comparison is not too far. Some respondents expressed that they started using glasses since working in front of the computer.

4.4. Using contact lenses Determinant Factor for the event of computer vision syndrome (CVS)

The use of contact lenses causes an increase in the evaporation of the tear layer which is followed by a compensation in the form of increased osmolarity of the tear layer which eventually causes injury to the surface of the eye. Based on the results of the chi-square statistical test, it is known that there is a significant relationship between using eye contact lenses with exposure to computer vision syndrome (CVS) on the helpdesk employees of PT Telkom Access Papua. The prevalence ratio test results obtained by $RP = 1.779$ shows that employees who are using contact lenses, have the opportunity to experience computer vision syndrome (CVS) of 1.779 times greater than employees who are using contact lenses. In previous studies, found that complaints of computer vision syndrome were more severe in individuals who used contact lenses compared with those who did not. Studies examining the effects of contact lens use on Computer Vision Syndrome show that contact lens wearers are more likely to suffer from CVS than non-lens wearers, with a prevalence of 65% vs 50%. Workers who wear contact lenses and are exposed to computers for more than 6 hours a day are more likely to suffer from CVS than non-lens users who work on computers for the same amount of time [9]. By using contact lenses and working using a computer in an AC room, if it is not regular in resting the eyes and giving eye drops to contact lenses, the eyes will be dry, tense and at high risk of experiencing Computer Vision Syndrome (CVS).

4.5. Length of working Determinant Factor for the event of computer vision syndrome (CVS)

Although statistically there is no relationship between length of working and the event of CVS on helpdesk employees at PT Telkom Access Papua, it can be seen that employees who are at risk and experiencing CVS are 21 employees (61.8%). This shows that the length of work of employees will affect complaints of computer vision syndrome (CVS) on workers who use computers. Several other studies report significant relationship between length of working and the event of CVS. Alisah's study found that length of working was related to the occurrence of computer vision syndrome (CVS) on employees of PT Pertamina RU VI Balongan [10]. In addition, Anggriani's [11] study found there was of Bank Kalbar employees received harmonious results, which was a statistically significant relationship between tenure and CVS complaints on employees at Bank Kalbar ($p = 0.049$).

4.6. Working hours Determinant Factor for the event of computer vision syndrome (CVS)

An individual who works at a computer for more than 4 hours continuously is at risk of suffering from CVS

compared to working at a computer for less than 4 hours continuously. The results of this study are in accordance with previous studies. Increasing working hours in front of a computer without interspersed with other activities can reduce the ability of accommodation so that it will aggravate the symptoms of CVS on computer user workers. Permana and his colleagues [12] who conducted research on computer rental workers in the UNNES region, showed that there was a relationship between the length of work and complaints of computer vision syndrome (CVS) on computer rental workers in the UNNES campus area ($p < 0.05$). Previous studies conducted by Azkadina [13] found similar results that there was a significant relationship between work time using a computer > 4 hours a day with CVS with a value of $p = 0.020$. Thus the use of computers may not be more than 4 (four) hours a day. If more than this time, the eyes tend to experience eye health problems, such as eye fatigue, dry eyes, eye strain, and refractive abnormalities can occur. If the usage for a period of more than 4 (four hours) cannot be removed from, then the frequency, duration, and quality of rest must be better. This can make the eye muscles become relaxed and not tense or stiff, so the eyes will feel fresh and work will feel comfortable.

4.7. Break eyes Determinant Factor for the event of computer vision syndrome (CVS)

In this study, there was a significant relationship between eye rest with the occurrence of Computer Vision Syndrome (CVS). This is consistent with the theory and previous research by Azkadina [13] which states that rest periods of less than 10 minutes after computer use are twenty-fold risk of suffering from CVS compared to breaks for more than or equal to 10 minutes after computer use. Frequency of regular rest is useful for a moment to rest the muscles of the eye accommodation, so that it will reduce the occurrence of Computer Vision Syndrome (CVS). If you do not rest your eyes, the eyes will continue to accommodate so that the ciliary muscles will stiffen and it will cause eye refraction abnormalities or tired eyes due to not doing eye rest that serves to relax the tension that occurs in the eye muscles.

4.8. Viewpoint Determinant Factor for the event of computer vision syndrome (CVS)

The angle of vision is the most important factor for CVS because the large angle of vision can affect the appearance of CVS symptoms. Computer use should be below the horizontal line of the eye towards the computer screen. Optimally, the computer screen should be at an angle of $15-20^\circ$ to the eye level [1]. According to Logaraj in his research, computer users who see a computer at an angle of $< 15^\circ$ have a higher risk of experiencing complaints in the form of headaches and eye irritation [14]. In this study, although statistically there is no significant relationship between the perspective of the eye and monitor with the event of computer vision syndrome (CVS) on helpdesk employees at PT Telkom Access Papua, it can be seen that employees who are at risk and experiencing CVS are 21 employees (61.8%). Research conducted by Nopriadi on bank employees getting the results of a significant relationship between the monitor's point of view and CVS [15].

4.9. Distance between eyes and monitor Determinant Factor for the event of computer vision syndrome (CVS)

Based on the results of the chi-square statistical test, it is known that there is not significant relationship between

eye distance and computer monitor with exposure to computer vision syndrome (CVS) on helpdesk employees at PT Telkom Access Papua. The prevalence ratio test results obtained by $RP = 1.976$, this shows that employees who are at risk, have the opportunity to experience computer vision syndrome (CVS) of 1.976 times greater than employees who are not at risk. Research by Chiemeke and his colleagues reported that complaints of visual impairment were more common in workers with visibility less than 10 inches (25.4 cm) [16]. Employees who work with eye distance and monitors < 50 cm more experience CVS complaints. This can occur because the eyes that continue to do close-range vision < 50 cm will continue to accommodate so that the eyes will get tired more quickly and if done continuously for a long period of time, it will result in other refractive abnormalities.

4.10. Room lighting Determinant Factor for the event of computer vision syndrome (CVS)

Based on the results of the chi-square statistical test, it is known that there is a significant relationship between room lighting and exposure to computer vision syndrome (CVS) on helpdesk employees PT Telkom Access Papua. The prevalence ratio test results obtained by $RP = 2.576$ shows that employees who are at risk, have the opportunity to experience computer vision syndrome (CVS) of 2.576 times greater than employees who are not at risk. Research conducted by Arianti [17] found that workers who worked with lighting levels that were not standard or at risk were mostly experiencing eye fatigue complaints, as many as 142 workers (95.3%). Based on the results of a multivariate analysis, in this study, the lighting level variable was the most dominant suspected factor influencing complaints of eye fatigue in computer user workers at the Call Center of PT. AM in 2016.

4.11. Room temperature Determinant Factor for the event of computer vision syndrome (CVS)

Based on the results of the chi-square statistical test, it is known that there is no significant relationship between Room Temperature and exposure to computer vision syndrome (CVS) on helpdesk employees at PT Telkom Access Papua. Working room temperature conditions are grouped into two categories, namely rooms that have a temperature at risk $< 24^{\circ}\text{C}$ and rooms that have a normal or no risk temperature $> 24^{\circ}\text{C}$. Most CVS complaints were experienced by the group of respondents who worked in a room with normal temperature, which amounted to 53.7%. This study found that there was no statistically significant relationship between workspace temperature conditions and CVS ($p = 0.89$). These results occur because the results of this study obtained a minimum temperature of $< 22^{\circ}\text{C}$ and a minimum humidity of 60%, so that humidity is still within normal limits, so it has no effect on tear removal. This is in line with Anggraini's [11] study of the PT Bank Kalbar computer operator where there is no statistically significant relationship between workroom temperature conditions and the occurrence of CVS.

4.12. Dominant Determinant Factor for the event of computer vision syndrome (CVS)

Based on the results of multiple logistic regression analysis with the Stepwise Forward LR method, the dominant factors are break eyes and room lighting. Thus, the most dominant factor influencing the incidence of computer vision syndrome (CVS) on helpdesk employees at PT Telkom Access Papua in 2020 is eye rest and lighting. The results of this study are known to be related to Computer Vision Syndrome (CVS) in the helpdesk

employees at PT Telkom Access Papua in 2020, namely using contact lenses, working hours, break eyes, and room. However, the dominant risk factors for Computer Vision Syndrome (CVS) are break eyes and room lighting. This can occur because the workload of employees who are never separated from the computer and after the use of a computer or a break from the computer the employee is still staring at the Visual Display Terminal (VDT) screen such as a cell phone or tablet so that even in the resting eyes the eyes remain accommodated. In line with the results of Arianti's [17] research, it is stated that the level of lighting is the most dominant variable affecting the complaints of eye fatigue in computer user workers at the Call Center of PT. AM. The OR value at the lighting level indicates that the work table with non standard lighting levels has a 8,488-time chance of causing eye strain complaints to computer user workers at the Call Center of PT. AM.

5. Conclusion

Based on the results of data analysis and hypothesis testing, it can be concluded as follows:

1. There is no relationship between sex and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
2. There is no relationship between age and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
3. There is no relationship between the use of eyeglasses and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
4. There is a significant relationship between the use of contact lenses and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
5. There is no relationship between the length of working and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
6. There is a significant relationship between working hours and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
7. There is a significant relationship between break eyes and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
8. There is no relationship between viewpoint and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
9. There is no relationship between distance between eyes and monitor and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
10. There is a significant relationship between room lighting and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
11. There is no relationship between room temperature and the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua.
12. The dominant determinant factors that influence the event of computer vision syndrome (CVS) on helpdesk employees at PT. Telkom Access Papua were break eyes and room lighting.

6. Suggestion

1. PT. Telkom Access Papua should provide the guidance about health and safety for helpdesk employees. Improve lighting levels that are still below the standard so that employees do not experience complaints of eye fatigue.
2. For employees, do not work with monitor distance <50 cm and viewpoint <15⁰. Take enough rest and consume vitamin for eyes health.

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