



UNIVERSITI PUTRA MALAYSIA

***THE PROLONGED USE OF COMPUTING DEVICE ON THE RISK
DEVELOPING COMPUTER VISION SYNDROME (CVS) AMONG
LECTURERS DURING COVID-19 PANDEMIC IN MALAYSIA***

LUQMAN HAKIM MOHD JELANI

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LECTURERS DURING COVID-19 PANDEMIC IN MALAYSIA**

BY

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**Thesis submitted in fulfilment of the requirement for the degree of Bachelor
Science (Environmental and Occupational Health) from the Faculty of Medicine
and Health Sciences, Universiti Putra Malaysia**

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ABSTRACT

Objective: To determine the factor for developing computer vision syndrome (CVS) among lecturer during COVID-19 pandemic in Malaysia on prolonged used of computing device. **Method:** A self-administered, validated and pretested questionnaire was used to collect data on sociodemographic, working characteristic, and working condition in the university campus of Universiti Putra Malaysia (UPM) and Universiti Teknologi MARA (UITM) from March to May 2021 among lecturer (N=165). The questionnaire is collected to assess the risk of developing computer vision syndrome among lecturer during the pandemic. **Result and Discussion:** Among 174 respondent the study shows that the respondent working hour increase from 1-4 hour a day with computing device before Covid-19 pandemic and 5-8 hours a day during Covid-19 pandemic. Most of the respondent does not use any protective measure and personal protective equipment during working with computing device, such as eye lubricant, the use of computer glasses, and antiglare or blue light protection. The prevalent of the computer vision syndrome of 77.6% which the highest symptom are Eye fatigue (52.3%), Headaches (44.3%), and Eyes Strain (43.1%). From the study, it shows that the working place have the significant with computer vision syndrome, as the different administrative can influence the chance of getting computer vision syndrome. The study also shows a the longer working hour can increase the

chance of computer vision syndrome. It is also highlighted that the use of computer glasses, frequently doing eye examination, use of Eye Lubrication can reduce computer vision syndrome, while seating to close with computing device can increase the possibility of getting computer vision syndrome. **Conclusion:** The finding of this study suggested that, socio-demographic, working characteristic and working condition have the association with computer vision syndrome.

Keyword: *Computer Vision Syndrome, Computing Device, Covid-19 Pandemic*

**PENGUNAAN PERANTI PERKOMPUTERAN YANG BERPANJANGAN
PADA RISIKO PENINGKATAN SYNDROME PENGLIHATAN
KOMPUTER (CVS) PADA PENSYARAH SELAMA PANDEMIK COVID-19
DI MALAYSIA**

LUQMAN HAKIM BIN MOHD JELANI

ABSTRAK

Objektif: Untuk menentukan faktor untuk mengembangkan sindrom penglihatan komputer (CVS) di kalangan pensyarah semasa pandemik COVID-19 di Malaysia pada penggunaan komputer yang berpanjangan. **Kaedah:** Soal selidik yang dikendalikan sendiri, disahkan dan diuji digunakan untuk mengumpulkan data mengenai sosiodemografi, ciri kerja, dan keadaan kerja di kampus universiti Universiti Putra Malaysia (UPM) dan Universiti Teknologi MARA (UITM) dari bulan Mac hingga Mei 2021 di kalangan pensyarah (N = 165). Soal selidik dikumpulkan untuk menilai risiko mengembangkan sindrom penglihatan komputer di kalangan pensyarah semasa wabak. **Hasil dan Perbincangan:** Di antara 174 responden kajian menunjukkan bahawa jam kerja responden meningkat dari 1-4 jam sehari dengan alat penyusun sebelum pandemi Covid-19 dan 5-8 jam sehari semasa pandemik Covid-19. Sebilangan besar responden tidak menggunakan langkah perlindungan dan peralatan pelindung diri semasa bekerja dengan alat pengkomputeran, seperti penitis mata, penggunaan cermin mata komputer, dan perlindungan antiglare atau cahaya biru. Kelaziman sin-drom penglihatan komputer sebanyak 77.6% yang merupakan gejala tertinggi adalah keletihan mata (52.3%), sakit kepala (44.3%), dan ketegangan mata (43.1%). Dari kajian itu, menunjukkan bahawa tempat kerja mempunyai signifikan dengan sindrom penglihatan komputer, kerana pentadbiran yang berbeza dapat

mempengaruhi kemungkinan mendapat sindrom penglihatan komputer. Kajian ini juga menunjukkan bahawa waktu bekerja yang lebih lama dapat meningkatkan kemungkinan sindrom penglihatan komputer. Juga ditekankan bahawa penggunaan kacamata komputer, sering melakukan pemeriksaan mata, penggunaan penitis mata dapat mengurangi sindrom penglihatan komputer, sementara tempat duduk untuk ditutup dengan alat komputer dapat meningkatkan kemungkinan mendapat sindrom penglihatan komputer. **Kesimpulan:** Dapatan kajian ini menunjukkan bahawa, sosio-demografi, ciri kerja dan keadaan kerja mempunyai kaitan dengan sindrom penglihatan komputer.

Kata kunci: *Sindrom Penglihatan Komputer, Peranti Komputer, Pandemik Covid-19*

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ABBREVIATIONS

CVS	Computer Vision Syndrome
CPU	Computer Processing Unit
UITM	Universiti Teknologi Mara
UPM	Universiti Putra Malaysia
IAQ	Indoor Air Quality



CHAPTER 1: INTRODUCTION

1.1 BACKGROUND OF STUDY

Visual fatigue is an eye disorder that is studied because of its high prevalence and its increase in some activities including lecturers who work with computer. The occurrence of visual fatigue in professionals who use computers was first described by Elias and Cail (1982) whom considered it as a functional disorder, by excessive and prolonged contractions of the ciliary muscles of the eye, to obtain a fine focus object. Visual fatigue associated with computer work is defined as Computer Vision Syndrome (CVS) that can be characterized by the presence of one or more eye symptoms (visual fatigue, eye fatigue, burning sensation, eye irritation, "redness", "blurred vision" and "dry eyes")(Belhm et al., 2005).

Computer Vision Syndrome (CVS) is defined as a group of eye and vision-related problems related from the activities that create stress on the eyes such as prolong use of computer, tablet, e-reader and cell phone use based on American Optometric Association. People started experiencing eye discomfort and vision problems when viewing computing device for extended period and increase with amount of the computing device use. The symptoms related to extended viewing time for computing device is classified into four categories which are asthenopia, ocular surface related symptoms, visual and extra ocular symptoms. (Blehm et al., 2005).

Today's personal modern lifestyle has also promoted comfort and convenience. Sedentary habits, which can have risk factors for eye health. A gradual cause for inactivity was the wide availability of computers, tablets, and smartphones to support everyday activities and decision-making, and thus a contributing factor to the prevalence of asthenopia in the workplace (Blehm et al., 2005). Han et al (2013)

highlighted the importance of maintaining a healthy lifestyle and a strong sense of social identity in another study, as they were protective factors for declining eye health and CVS development.

In addition, long working hours under insufficient lighting can cause eye fatigue, resulting in frequent need for breaks, work performance degradation, and overall protection (Wolkoff et al, 2008). In the long run, if this problem has not been adequately addressed, cumulative damaging effects on eye health will potentially be identified (Wagel et al., 2015).

A pandemic is an outbreak that happens on a scale that reaches international borders, typically affecting individuals on a global scale. Coronavirus disease 2019 (COVID-19) is characterized as a disease caused by a new coronavirus now known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; previously known as 2019-nCoV), which was first identified in Wuhan City, Hubei Province, China, in the midst of an outbreak of respiratory disease cases. On December 31, 2019, it was initially reported to the WHO. The WHO declared the COVID-19 outbreak a global health emergency on January 30, 2020. The WHO announced COVID-19 to be a global pandemic on March 11, 2020, its first such designation since it declared H1N1 influenza to be a pandemic in 2009. (Cennimo, 2021)

Lecturer at the Universiti Putra Malaysia and Universiti Teknologi MARA most often have extended 8 a.m. to 5 p.m. work hours. The pandemic has forced the lecturer to work at home and use computing device for educational purposes, as the result, challenge working from home such as inconsistency of working time and unhealthy working balance happen (Lusinski, 2019). Studies have shown that long working hours with computing device settings can contribute to eye discomfort symptoms therefore computer vision syndrome (Akinbinu et al, 2014). The longer

period of pandemic was notable and worrying towards deterioration of ocular health. Therefore, to determine the risk factors of computer vision syndrome (CVS) among lecturers during COVID-19 pandemic in Malaysia on prolonged used of computing device.

1.2 PROBLEM STATEMENT

The use of computing device is rising every year because of the growing of technology and the need of the computing device in our daily life. During the pandemic period the use of computing device is more demanding due to work from home initiative program that some organisations implement in the working environment. Base on the article by Slack (2020), the survey in United State of America showed that in March 2020 the magnitude of shifting to working from home was 27%, but in August the number of magnitudes working from home had jump to 44%.

In Malaysia, in August 2018 the average Malaysian spent online using internet between 1 to 4-hour daily based on the survey by Statista Research Department. (Malaysia Daily Spend Online, 2020). Based on Department of Statistic Malaysia, the percentage of household's access to Internet increase 90.1%, pay TV channel increase 75.8% and radio increase 97.2%. (DOSM, April 2020). This show that the use of computing device in Malaysia is high. For worker, based on a study at two call centres in São Paulo, Brazil have confirmed a high prevalence of computer vision syndrome among call centres' operators. The presence of CVS has been linked to, with being female, lack of acknowledgement at work, and high demand at work. (Sa et al., 2012).

To connect with the student, lecturers need to spend more time with computing device during the pandemic. The article by New York Times, show that, the increasing trend in learning and working on the internet is increasing, the video chat application

usage increase for communication and entertaining site online increase during pandemic (Koeze & Popper, 2020). The Zoom meeting platform have reported a grows over 200 million meeting participants daily during the Covid-19 pandemic, most of the user come from education sector. (Yuan, 2020)

From the explanation of the study above, in 2020 due to pandemic the use of computing device is higher especially for working in the education sector. The higher usage of computing device the higher the risk to get computer vision syndrome. Based on a study, 3 hours/day can lead to the risk of developing computer vision syndrome (CVS), low-back pain, tension headaches and psychosocial stress has contributed to a health risk (Assefa et al., 2017). The computer vision syndrome does not happen overnight but of a cumulative ocular health deterioration and will become harmful in the future generation (Iribarren et al., 2001). In Malaysia, there is limited evidence to prove the magnitude and risk of the problem. Therefore, there must be a solution to reduce the effect of the computer vision syndrome by analysing the risk factor.

1.3 JUSTIFICATION OF STUDY

This research is conducted for awareness toward society on the effect of computing device on one's eyes. In this modern era the computing device is become a daily equipment but, people do not aware the health effect of the computing device. This research will justify the effect of the computer vision syndrome (CVS) toward target population, economic and nation.

The effect of the computer vision syndrome (CVS) on the target population is it cause the reduction in work accuracy, but it is not proven causing permanent damage. (Assefa et al., 2015). The working accuracy is important for the educational sector as it can benefit the student and the institute itself for a higher educational quality.

Lecturer can improve work productivity in their working environment and improve healthy eyes. For university the performance of the lecturer mean that the quality of the education, increasing the performance of the lecturer can increase the work productivity.

For the economic effect, Malaysia government can reduce the budget for medication significant in the future if the computer vision syndrome can be prevented. The budget for Ministry of Health in 2020, is RM30.6 billion. (Ravindran, 2020). If the computer vision syndrome (CVS) is reduced in the future, the cost for the visual disorder will be benefit on other medications used or other department in the future.

For the benefit of the nation, in the future the prevalence of the computer vision syndrome can be reduce or eliminated. It is important to prepare the country for industrial revolution 4.0 where the country depends highly on the digital economic.

1.4 RESEARCH QUESTIONS

The present study has several research questions that wants to be answered namely:

1. How many hours does the study population spend on computing device?
2. What is the prevalence of CVSs among study population during pandemic?
3. What is the working condition of the study population?
4. What is the risk factor of CVSs among study population during pandemic?
5. Is there any association between socio-demographic with the risk of developing of CVS?
6. Is there any association between working condition on risk of developing CVS?
7. Is there any association between working characteristic on risk of developing CVS?

1.5 OBJECTIVES

1.5.1 GENERAL OBJECTIVE

To determine the risk factors of computer vision syndrome (CVS) among lecturers during COVID-19 pandemic in Malaysia on prolonged used of computing device.

1.5.2 SPECIFIC OBJECTIVES

- a) To determine the socio-demographic, working characteristics, and working condition of respondents.
- b) To determine the prevalence of CVS among respondents.
- c) To measure the association between socio-demographic, working characteristics, working condition with CVS.

1.6 HYPOTHESIS

The is a significant association between socio-demo with CVS.

There is significant association between working characteristic with CVS.

There is significant association between working condition with CVS.

1.7 CONCEPTUAL DEFINITION

1.7.1 LECTURER

Someone who works at a university or college is a lecturer. For the purpose of this study, professionals whose primary role is education, research, or public service were included in the lecturer. This included staff with titles such as professor, associate professor, assistant professor, teacher, lecturer, or the equivalent to any of these academic ranks, occupying an academic position.

1.7.2 COMPUTER VISION SYNDROME (CVS)

CVS is repetitive motion injuries that cause from extended, uninterrupted period of time, the eyes are fixed on a screen or other display system of computing device. The muscle of the eye cannot recover from intense stress needed to maintain concentration on a close image. (Seltman R., 2017)

1.7.3 COMPUTING DEVICE

Any CPU-controlled electronic devices, including desktop and laptop computers, smartphones, and tablets. In comparison to a dedicated equipment unit such as a network switch, it typically refers to a general-purpose system that can accept software for many purposes. (Definition of Computing Device, n.d)

1.7.4 PANDEMIC

A pandemic is an occurrence of illness that spreads across countries or continents. It affects more people than an epidemic and takes more lives. When it became apparent that the disease was serious and that it was spreading rapidly over a wide area, the World Health Organization (WHO) need declared to declared a disease as pandemic. For example Covid-19. (Seltman R., 2020)

1.7.5 SOCIODEMOGRAPHIC

Sociodemographic is related or involving a combination of social and demographic factors. A social factor is defined as the thing that effect someone life. A demographic factor is defined as characteristics that define a particular group within a population (What is sociodemographic factor, n.d).

1.7.6 WORKING CONDITION

Working conditions apply to the environment component and aspects of the terms and conditions of employee. (Oxford Research, 2011)

1.7.7 WORKING CHARACTERISTIC

Job classification and components of responsibility, such as working duration, given hours of rest and indoor working hours, which influenced the probability of having signs of computer vision syndrome. (Iribarren et al., 2001)

1.8 OPERATIONAL DEFINITION

1.8.1 LECTURER

The lecturer at Universiti Putra Malaysia (UPM) and Universiti Teknologi MARA (UITM) having a job scope of is education, research, or public service.

1.8.2 COMPUTER VISION SYNDROME (CVS)

The computer vision syndrome is defined when the person has a symptom of eyestrain, headaches, blurred vision, dry eyes, neck, and shoulder pain due to spending long period of time on computing device.

1.8.3 COMPUTING DEVICE

The device that is use by the lecturer for education, research, or public service that use that using CPU-controlled electronic devices, including desktop and laptop computers, smartphones, and tablets.

1.8.4 PANDEMIC

The pandemic in this study refer to Covid-19 as it is happening during the duration of the study.

1.8.5 SOCIODEMOGRAPHIC

The sociodemographic in this study refer to the age, sex, gender, race, and previous vision impairment among lecturers.

1.8.6 WORKING CONDITION

The working condition is referring to the environmental components of the workplace such as temperature, indoor air quality (IAQ), relative humidity, ventilation and movement of air, and adequacy of lighting affected the probability of developing symptoms of Computer Vision Syndrome among lecturers.

1.8.7 WORKING CHARACTERISTIC

The working characteristic such as, working hour using computing device (before pandemic), working hour using computing device (during pandemic) and total years working with computing device among lecturer.

1.9 CONCEPTUAL FRAMEWORK

Figure 1 shows all variables that can be included in this study. The population that will be studied is University Lecturer in Universiti Putra Malaysia and Universiti Teknologi MARA. The dependable variable in this study is the effect of prolong use of computing device, which is one of the most prevalence and significant occupational health issues that is concern especially during pandemic, where people are suggested on working from home. The independent variable risk factor of computer vision syndrome.

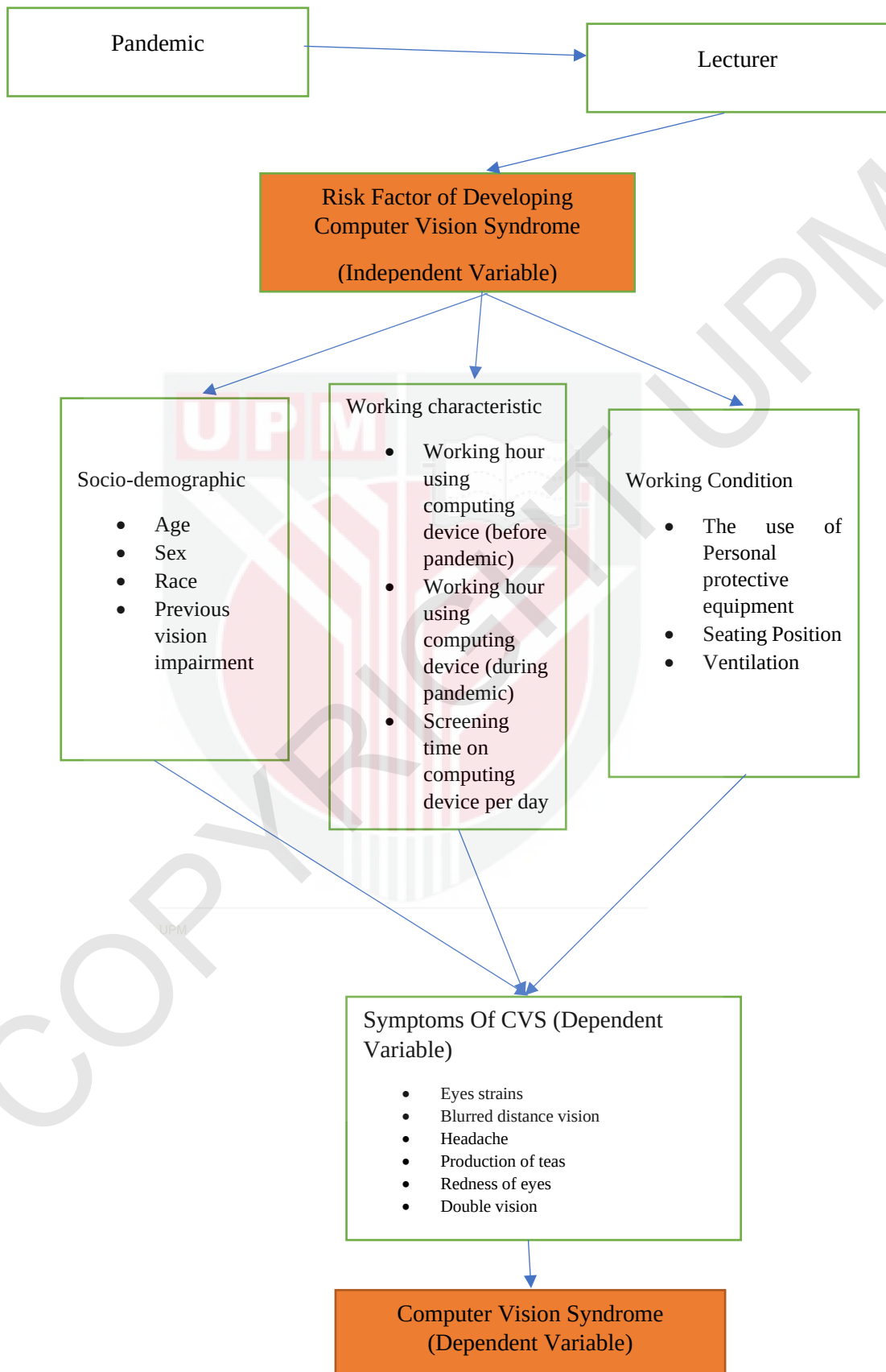
The relationship between other potential factors with the effect of prolong use of computing device will be determine and controlled in this study. Previous vision syndrome is add into the sociodemographic factor because there is a high risk of CVS. (Alemayehu, 2014).

Working hour using computing device is being measure because the base on study, the working hour on computing device influencing the symptoms of CVS. (Shantakumani, 2014).

The risk factor of CVS will be assessed be using self-perception questionnaire closed questions divided into four dimensions for the perception posture.



Figure 1: Conceptual Framework



CHAPTER 2: LITERATURE REVIEW

2.1 OVERVIEW

This study is about the risk of developing computer vision syndrome (CVS) among lecturer at Universiti Putra Malaysia and Universiti Teknologi MARA in Malaysia. This literature review explains about how the university lecturer daily habit can cause computer vision syndrome (CVS) during pandemic in Malaysia. This type of syndrome is being underestimated because of the lifestyle and ignorance about this topic. The lecturer in covid-19 situation use at least one or more electronic equipment working from home. There are limited resources on the study in Malaysia regarding the Ergonomic issues on Computer Vision Syndrome. To summarized, in the following review of the literature review are the definition of Computer Vision Syndrome (CVS), method and target population, the symptom of computer vision syndrome, risk factor of Computer Vision Syndrome (CVS), and how to overcome the Computer Vision Syndrome (CVS).

2.1.1 ANATOMY OF THE EYE

The eye consists of the cornea, a tough anteriorly translucent outer coat, and the posterior opaque sclera. The limbus was the intersection of both the cornea and the sclera. The choroid posteriorly and the ciliary body and iris anteriorly form a rich vascular coat that was the uvea, while the choroid lines the retina in which it was securely attached and nourished the outer two-thirds of its external (James et al., 2003).

When objects are at a distance, Zonule fibres provide tension to the lens, giving it an elongated form. On the other hand, the contraction of the ciliary body causes the lens to take on a more curved form that allows surrounding objects to focus (James et al., 2003).

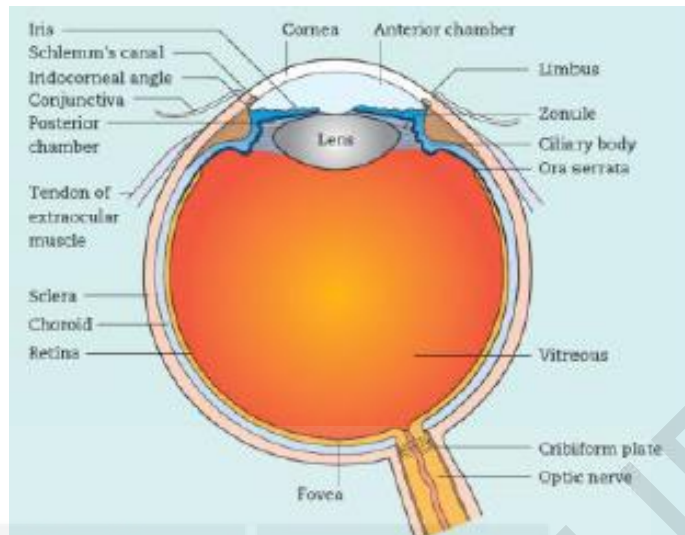


Figure 2: The basic anatomy of eye (James et al., 2003)

2.1.2 PROCESS VISION

The lens refracted about one-third of the light, while the remainder was from the cornea. As the light on the retina was refracted, the projected image was reversed, minimized, and real. The lens has a biconvex shape that improves the focusing power, flexibility and can alter the curvature to accommodate the distance of light and object (Troncoso et al., 2011).

The photoreceptor layer is excited when light reaches the retina. The photoreceptor layer consists of cones responsible for fine information and colour vision in bright light, and these photons will then be picked up by rods for vision under dim light and transformed into electrical impulses to be processed by the brain. Via amacrine and bipolar cells, these electrical impulses are then absorbed by the ganglion cells and send their outputs to the brain for interpretation in the form of optic nerve action potential (Troncoso et al., 2011).

2.2 DEFINITION OF COMPUTER VISION SYNDROME (CVS).

Computer Vision Syndrome (CVS) is characterized as according to the American Optometric Association, a group of eye and vision-related problems arising from repeated use of computers, tablets, e-readers and cell phones. When watching digital screens for a longer period of time, people may experience eye pain and vision problems. The level of discomfort suggests a rise in the amount of use of the digital screen. (American Optometric Association, N.A)

Visual discomfort associated with computer work that can be characterized by the appearance of one or more eye symptoms is Computer Vision Syndrome (CVS). Ocular-surface defects or accommodative spasms and extraocular ethology may also trigger it. (Blehm et al, 2005)

The word computer vision syndrome (CVS) is used collectively for a series of different symptoms in computer users that are either regularly or compulsively using computers during the day and night for an extended period of time. (Alhumaidan & Al Rashidi, 2017)

2.2.1 CAUSE OF COMPUTER VISION SYNDROME.

It is often harder for the eyes to read text on a computer screen or digital device than to read written text. Therefore, working for a few hours on a computer could trigger eye issues. Several factors, such as screen glare, poor lighting, poor posture when using a computer, Viewing a device at the wrong distance and angle and issues with uncorrected vision. (Computer Vision Syndrome, n.d.)

2.3 RISK FACTOR OF COMPUTER VISION SYNDROME (CVS).

2.3.1 RELATIONSHIP BETWEEN SOCIO-DEMOGRAPHIC AND CVS

The socio-demographic factors are gender, age, marital status, and previous vision impairment. The socio-demographic is chosen is based on the research study and the relationship with the CVS. The gender is chosen because it is show that female is more prone toward CVS. (Reddy et al, 2013). The data of gender effect CVS is in the table 1.

Table 1: Most disturbing symptoms following computer usage in male and female students (Reddy et al, 2013).

Symptom	Male	Female	Total	Percent
Headache	57	100	157	19.7%
Eye strain	51	79	130	16.4%
Dry eye	32	76	108	13.6%
Blurred vision	38	43	81	10.2%
Neck pain	36	43	79	9.9%
Backache	18	36	54	6.8%
Shoulder pain	7	34	41	5.2%
Watery eye	18	16	34	4.3%
Red eye	10	9	19	2.4%
Discomfort	4	5	9	1.1%
Double vision	1	2	3	0.3%
No symptoms	41	39	80	10.1%
Total	313	482	795	100.0%

The age influences the likelihood of getting CVS among study population. The research show that the increasing of age has the higher chance of getting CVS. People with age 30 old and above have more risk of getting CVS compared to a people with age above 25 years old (Aseefa, 2017).

The martial status is one of the factors that influence the risk of getting CVS as martial status as martial status effect the quality of life as its influence the quality

of health status of the individual. (Han, 2014). Single person is more prone of getting CVS compared to the married person (Sa et al, 2012).

The previous visual impairment is including in socio-demographic because some of the respondent may have the possibility of having visual problem that have them wearing a visual aid. The use of visual aid were 3 times more likely to expose CSV after comparing with people with no visual aid. (Aseefa et al, 2017). The risk of getting CVS is higher among people with visual aid.

Uncorrected vision issues such as farsightedness and astigmatism, aging eye changes such as presbyopia, loss of eye focusing or eye control capacity may all lead to the development of Computer Vision Syndrome while using digital devices, based on the study carried out by the American Optometric Association. After stopping computer work or using digital devices, most visual symptoms encountered by users are only transient and will decrease. However, some people can experience continued decreased visual capabilities, such as perception of blurred distance distances, even after stopping work on a screen or digital device. With subsequent digital screen use the symptoms may begin to recur and may worsen. (American Optometric Association, N.A).

2.3.2 RELATIONSHIP BETWEEN WORKING HOUR ON COMPUTER AND COMPUTER VISION SYNDZROME (CVS).

The working hour on computing device show that the people who work on computing device for the certain period of time experience eyestrain, blurred distance vision and, headache respectively. The data can be refer at table 2 . (Chiemেকে et al, 2007).

Table 2 : Visual Related Symptoms of Respondents (Chiemেকে et al, 2007).

Number of hours on computer	No of Respondents	Eyestrain		Vision		Headache	
		Yes	No	Yes	No	Yes	No
<1hour	02 (1.9%)	—	02	—	02	—	02
1-2hours	18 (17.5%)	06	12	05	13	01	17
3-5hours	19 (18.4%)	06	13	05	14	04	15
6-8hours	27 (26.2%)	09	18	13	14	09	18
> 8hours	37 (35.9%)	22	15	24	13	15	22

Other study shows that the people working on computing device more than 5 hour have high risk of CVS compared to the people working less than 5 hours a day. (Assefa et al, 2013).

2.3.3 RELATIONSHIP BETWEEN WORKING CONDITION AND CVS

The working condition can influence the effect of CVS. The worker who worked as the administrative staff show to have highly prevalence of developing computer vision syndrome (Zainuddin and Isa, 2014). The person who had not taken a break within 20 minutes suffered more significantly from CVS, because the eyes will not usually remain focused for a long time on the pixel-generated images on a computer screen, and as such, the eyes must concentrate and refocus thousands of times within 20 minutes by taking regular breaks (high refresh rate that the computer screen is repainted to create an image) and if, a high flickering screen causes the refresh rate to be too slow, this leads to the development of CVS symptoms (Assefa et al, 2017).

As compared to those with sufficient sitting posture, improper sitting position was 2.3 times more likely to be associated with CVS. This may be clarified by the fact that improper sitting posture gives the eye pain and tension, which causes the eye to

be more concentrated and causes more spastic eye muscles and CVS symptoms. (Assefa et al, 2017)

The majority of people who did not use any filter on the monitor that minimized radiation. The people who not helped by the use of this filter to reduce the symptoms of CVS. People who viewed the computer screen below eye level had substantially reduced CVS symptoms than those who viewed the screen at or above eye level. (Reddy et al, 2013).

The people who does not taking brake during working with computer increase the risk of developing computer vision syndrome base on (Zairina and Suhaila, 2011).

2.4 HOW TO OVERCOME THE COMPUTER VISION SYNDROME

The treatment that suggested requires an approach combining with ocular therapy or eye care. The ocular therapy such as eye lubricating drops is important as it can help relieve ocular surface-related symptoms. (Blehm et al, 2005). Eyeglasses or contact lenses prescribed for general use may not be enough for digital work. If possible, the use of special glass is recommended. (American Optometric Association, N.A). Prescribed eye glass has higher prevalence of CVS among eye glass wearers may be because professional spectacles were not recommended, resulting in either incorrect prescription or lack of surfaces for glare or reflection protection (Assefa, 2017).

To make adjustment to the workstation, first, by altering, computer screen location, reference content, lighting, anti-glare displays, seating position, rest breaks and blinking, viewing habit can be altered. Second, for an optimum viewing angle, the position of the computer screen should be 15 to 20 degrees below eye level (about 4 to 5 inches) as measured from the middle of the screen and 20 to 28 inches from the eyes. (American Optometric Association, N.A)

Next, adjust lighting by periodically wiping dust and fingerprints from the surface to get rid of glare and harsh reflections, since smudges can minimize contrast and create problems such as glare and reflections. Using your screen's anti-glare filter or your computer's eye protection mode, if possible. (Seltman, 2020)

Finally, to minimize CVS computer vision syndrome is to periodically blink, make a habit of the 20-20-20 law, maintain appropriate lighting and wear computer eyeglasses. Many individuals fail to blink periodically while operating on a digital

screen. Blinking is important because it keeps your eyes lubricated, as dry eyes will increase your risk of digital eye strain. (Snively R., 2019)

2.5 CONCLUSION

Research from previous studies have proved that computer vision syndrome (CVS) among people is one of the important aspects that people need to take serious. In the modern day, people use computer and digital screen device frequently and more often. This digital screen device have become part of the daily life. To make things worse, the use of the computer and digital screen device is increasing due to restricted movement control around the world. This study to give people awareness about the effect of spending time on screen over a longer period.

CHAPTER 3: METHODOLOGY

3.1 STUDY LOCATION

The study is conducted in Malaysia specifically in the Universiti Putra Malaysia and Universiti Teknologi MARA. The Universiti Putra Malaysia and Universiti Teknologi MARA is the universities that implement working from home and learning from home during (COVID-19) pandemic as mentioned in the official notice (Figure 3) below.

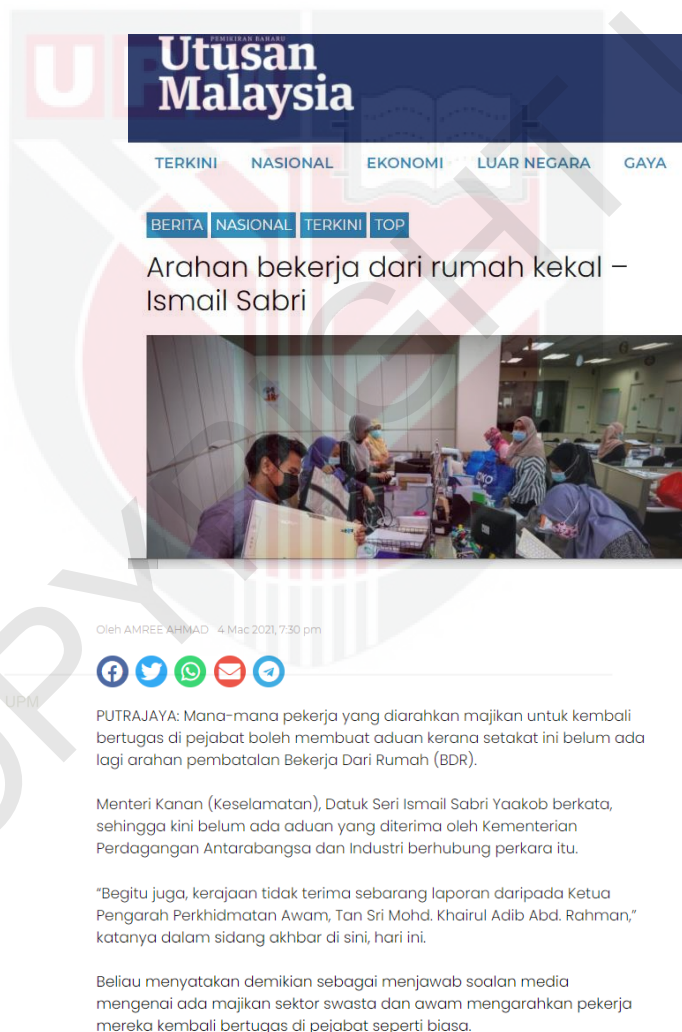


Figure 3: Work From Home Notice (Ahmad, A., 2021, March 04)

3.2 STUDY DESIGN

This is a quantitative cross-sectional to determine the prolong use of computing device on risk factor of computer vision syndrome (CVS) among lecturer in Malaysia. The quantitative cross-sectional study is used because base on the literature review by, Al Rashdi et al (2017), Shantakumari et al (2014) and Assefa et al (2017), the best method to use is the quantitative cross-sectional study.

The advantage of this study are inexpensive, fast, multiple variable and can be used for further study. The study is inexpensive because it use self- report questionnaire and the ability to collect a large volume of data from a large pool of participants. In order to see how differences in sex, age, educational status, and income, for example, could interact with the critical variable of interest, researchers can collect data on a few different variables. Cross sectional study can be use to analysis for hints that can act as a useful tool for more experimental research when looking at a public health issue, such as whether a specific activity may be related to a specific disease. (Cherry, 2019)

3.3 SUBJECT SELECTION

The study will be conducted with 165 lecturers in Universiti Putra Malaysia and Universiti Teknologi MARA. In the sample size calculation. The study needs to be identify using study population via listing of lecturer provided by the university. The study population was selected because of movement control order by the government of Malaysia starting on 18 March 2020 (Ministry of Health Malaysia, 2020). The lecturer is one of the most effected on the new norms during the MCO.

From Universiti Teknologi MARA and Universiti Putra Malaysia, the only 165 lecturers are involved in the study which are randomly selected. The lecturer that in

the exclusion criteria cannot participate in the study. The population will be expressed as "n" in the sampling formula if the target population is 288 lecturers at Putra Malaysia University and Universiti Teknologi MARA. Since all of these university lecturers are involved in this analysis, the sampling frame is all 288 lecturers.

3.4 SAMPLING METHOD

The sampling method use are simple random sampling, there are six step of simple random sampling base Leard Dissertation: Simple Random Sampling (n.d) for this study which are:

Step 1: Define Population

The population is determining in the study base on study population.

Step 2: Choose Your Sample Size

The sample size is calculated and define as n .

Step 3: List the Population

The list of population is obtained from the University Department.

Step 4: Assign Number to The Units

Each of the respondent that submit the questionnaire is assign by the number.

Step 5: Find Random Number

Generated the random number by using computer app such as RANDOM.ORG.

Step 6: Select The Number

Select the questionnaire number base on the generated random number.

3.4.1 SAMPLE SIZE DETERMINANT

The sample size for the study was calculated using prevalence formula.

Prevalence Formula

$$\text{Sample size, } n = \frac{Z^2 P(1-P)}{d^2}$$

Figure 4: Sample Size calculation

Where;

n = sample size

Z = Z statistic for a level of confidence

P = expected prevalence or proportion

d = precision (0.05)

The proportion value calculated for asthenopia was P= 0.899. The allowable standard confidence interval error was set to Z = 95% (1.96) and the desired precision was set to d = 0.05 in the formula.

Meanwhile, the calculation for chi-square by Krejcie and Morgan, (1970):

$$\text{Sample size, } N = \frac{\chi^2 N P(1-P)}{e^2 (N-1) + \chi^2 P(1-P)}$$

Figure 5: Sample Size Calculation

In this study, the sample size calculates by using the $P = 0.899$ which sample size calculate, $N=150$.

Therefore, for the research to be significantly representative of the population, the sample size that was sampled was 165 human respondents.

3.4.2 SUBJECT SAMPLING

For the purpose of this analysis, only a minimum requirement of 165 respondent was sampled. The sampling of the participants was subject to the availability of the participating respondents' free time. This study was calculated to have a confidence interval of 95% with permissible errors of 5% to detect the association between asthenopia and its associated risk factors among Universiti Putra Malaysia and Universiti Teknologi MARA lecturer.

3.4.3 INCLUSION AND EXCLUSION CRITERIA

Inclusion Criteria

Age: 18 years old and above. The age criteria are selected because 18 years old is the age that is categorized as adult based on the Children and Young Person Act (Employment) 2019.

Work: lecturer at Universiti Putra Malaysia and Universiti Teknologi MARA. The work as lecturer in Universiti Putra Malaysia and Universiti Teknologi MARA is chosen because of the study population.

Working Experience: More than 1 year working at Universiti Putra Malaysia and Universiti Teknologi MARA. The duration of working experience is chosen because to assess the working condition during and before pandemic (COVID-19).

Exclusion Criteria

Anyone having the symptoms or signs of computer vision syndrome before using computer and anyone with ocular disease. (i.e. Glaucoma, conjunctivitis). To avoid systematic error in the research.

3.5 DATA ANALYSIS

For the purpose of the study, the types of data collected were coupled with the research goals to ensure that only adequate data collection was carried out. The research goals and types of data collected lay hand-in-hand with each other in Table 3.

Table 3 Type of Data Collection

No.	Specific objectives	Type of Data Collected
1.	To determine the socio-demo, work characteristics, and working condition of respondents	Quantitative and Qualitative
2.	To determine the prevalence of CVS among lecturers.	Quantitative and Qualitative
3.	To measure the association between socio-demo, working characteristics, working condition and CVS	Quantitative and Qualitative

3.6 MATERIALS AND INSTRUMENTATION

The questionnaire is given to the respondent via online method because of the Covid-19 pandemic after the ethical approval. The respondent needs to meet the requirement of inclusion and exclusion criteria before participate in the research. The letter of consent will be given to the participant that meet the criteria. The respondent needs to confirm that they agree to participate, and their data is collected. The questionnaire is given via google form due to the pandemic restriction and as an effort to break Covid-19 chain.

Awareness of body posture, prevalence of muscle and joint disorders, and Computer Vision Syndrome among Lecturers During Covid-19.

Ladies and gentlemen:

I am a 4th year student, Bachelor of Environmental and Occupational Health Science from the Faculty of Medicine and Science, UPM Serdang, currently conducting research for my final Year Project. This study was conducted to examine the level of BODY POSTURE AWARENESS, PREVALENCE OF MUSCLE AND JOINT DISORDERS, AND COMPUTER VISION SYNDROME AMONG LECTURERS During Covid-19.

Subjects will find out about their health status in terms of body posture and computer vision syndrome while working from home. Moreover, the information obtained may be useful for future research in related fields. You will NOT be compensated for participating in this study.

All information obtained from respondents will be CONFIDENTIAL. Any publications or results obtained will be reported publicly (collectively) while the identity of the respondent WILL NOT BE DISCLOSED.

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Figure 6: Online Questionnaire

3.6.1 SELF-ADMINISTERED QUESTIONNAIRE

For selected respondents from the population, two sets of updated self-administered questionnaires were distributed. These updated self-administered questionnaires, based on a credible and validated questionnaire published by Segui et al (2015), have been translated from English to Malay. 10 percent of the sample size was piloted on the self-administered questionnaires. Such questionnaires have acceptable internal consistency with the alpha coefficient of Cronbach, $\alpha = 0.7333$ (68 number of item).

The first set was used to screen qualified respondents who met inclusive requirements (pre-survey questionnaire). The second set (respondent questionnaire) was then used to determine the prevalent symptoms of asthenopia and its risk factors among the participants screened.

Information was gathered on socio-demographic characteristics, work characteristic, working condition and symptom of using computing device.

3.6.2 QUESTIONNAIRE CONSTRUCTION

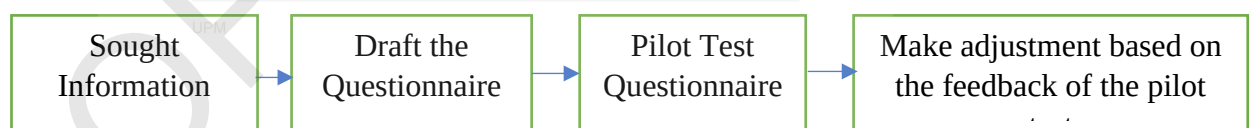


Figure 7: Questionnaire Construction

To create the questionnaire, the information is sought base on the objective of the study. The objective of the study required the data of socio-demographic, work characteristic, work condition, and symptoms of CVS.

The draft of the questionnaire was adapted by Sa et al (2012). The information that was collected are, socio-demographic, work characteristic, work condition and symptoms of CVS. The questionnaire consists of 4 parts.

Part A: Socio-demographic information of the respondents.

This part is used to gather information which include Age, Gender, Race, Previous vision impairment. The choice of answer is given based on the questions. There are 7 questions related to the socio-demographic information of the respondents.

Part B: Working characteristic.

The questions are job tenure, faculty, Total years working with computing device, working hour using computing device (before pandemic) and Working hour using computing device (during pandemic). The certain period of timeframe is given to the respondent as a choice of the question. There are 7 questions related to working characteristic.

Part C: Working Condition.

The question is based on Ergonomic Workplace Analysis (EWA) by Sharan D (2012) to assess the factor of satisfaction or discomfort in the working environment.

The questions consist of 5 alternatives which are: never, rarely, sometimes, often and always. There are 15 questions on working condition.

Part D: Symptom of using computing device.

The example of symptoms that will be included in the questionnaire are Eyes strains, Blurred distance vision, Headache, Production of tears, Redness of eyes, Double vision, Headaches. The question are consist of 5 alternative which are: never, rarely, sometimes, often and always. There are 9 question on symptoms of using computing device..



3.7 DATA COLLECTION PROCESS

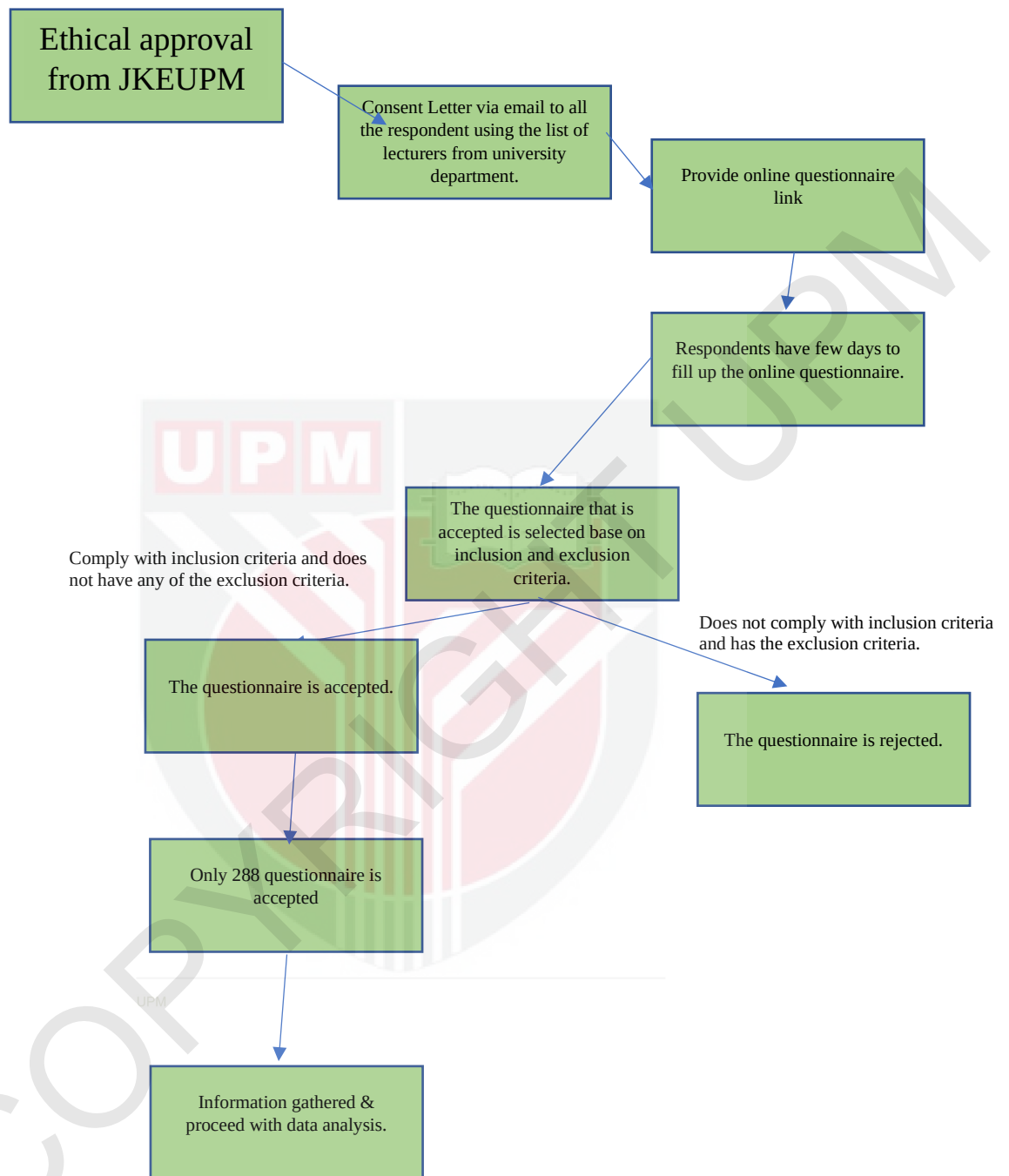


Figure 8: Data Collection Process

3.8 STATISTICAL ANALYSIS

The statistical study will be carried out with IBM SPSS Statistics 25 and a statistical significance level of 0.05. If the data is normally distributed, descriptive data will be analysed using univariate analysis, with the results for categorical data presented as frequencies and percentages and the results for continuous variables presented as means and standard deviation. The median and interquartile range will be recorded for normally distributed data (IQR).

The Chi-Square test would be used to see whether there are any important correlations between two categorical variables and two continuous variables. Only when no more than 20% of cells have expected frequencies of 5 and no cell has expected frequency of 1 is the Chi Square test result appropriate. Fisher's Exact Test is an alternative to a chi-square test when predicted counts are less than 5.

Table 4: Statistical analysis

No.	Specific objectives	Statistical Analysis
1.	To determine the socio-demo, working characteristics, and working condition of respondents	Descriptive analysis
2.	To determine the prevalence of CVS among lecturers.	Descriptive analysis.
3.	To measure the association between socio-demo, working characteristics, working condition and CVS	Chi-square

CHAPTER 4: RESULT

4.1 SOCIO-DEMOGRAPHIC, WORKING CHARACTERISTIC, AND WORKING CONDITION INFORMATION OF THE RESPONDENT.

4.1.1 SOCIO-DEMOGRAPHIC OF THE RESPONDENT

The result for the analysis of the socio-demographic is based on 174 respondents to calculate the frequency and the percentage of the sociodemographic. The socio-demographic that is account for are, university, gender, age, race, status, and teaching experience.

The table 5 show that the Universiti Putra Malaysia (UPM) have 75 respondent (43.1%). While the Universiti Teknologi MARA (UITM) have 99 respondent (56.9%). The respondents were more favourable to female respondents [132 respondents (75.9%)] than of male counterpart [42 respondents (24.1%)]. Based on ethnicity, Malay [158 respondents (90.8%)], Chinese [12 respondent (6.9%)], Indian [2 respondents (1.1%)], and others [2 respondents (1.1%)].

For age group, age group 20-30 old making 5.2% of respondent, 31-40 years old 59.2 % of total respondents, age group 20-30 years old 27.0% of respondent are from age group 41-48 years old and 8% are from 51-60 years old. The status of 39 (22.4%) respondent is single while 135 respondent (77.6%) is married. The use of visual aids such as spectacles and contact lens are 149 (85.6%), while does not use any visual aids are only 25 respondent (14.4%).

As much as 103 (59.2%) of the respondents had 11 to 20 years of teaching experience while 66 (37.9%) of respondents had 1 - 10 years of teaching experience, and only 5 (2.9%) of respondents had 21-30 years of teaching experience.

Table 5: Descriptive Analysis for Socio-Demographic

		Frequency	Percentage (%)
University	UPM	75	43.1
	UITM	99	56.9
Gender	Male	42	24.1
	Female	132	75.9
Age	20-30 Years	9	5.2
	31-40 Years	103	59.2
	41-50 Years	48	27.6
	51-60 Years	14	8
Race	Malay	158	90.8
	Chinese	12	6.9
	Indian	2	1.1
	Other	2	1.1
Status	Single	39	22.4
	Married	135	77.6
Teaching Experience	1-10 Years	66	37.9
	11-20 Years	103	59.2
	21-30 Years	5	2.9

4.1.2 WORKING CHARACTERISTIC OF THE RESPONDENT

The result for working characteristic of the 174 respondent is recorded as frequency and percentage. The working characteristic are, computing device, visual aids, working hour before and during Covid-19 per day.

Table 6 shows that computing device used by the respondent is laptop which [135 respondent (77.6%)], followed by computer [29 respondent (16.7%)] and smartphone [10 respondent (5.7%)]. Before the covid-19 pandemic, 98 respondents (56.3%) work for 1-4 hours a day while 76 respondent (43.7%) work for 5-8 hours a day. During the Covid-19 pandemic, 163 respondent (93.7%) work for 5-8 hours while only 11 respondent (6.3%) working with computing device at 1-4 hours a day.

Table 6: Descriptive Analysis for Working Characteristic

		Frequency	Percentage (%)
Computing Device	Computer	29	16.7
	Laptop	135	77.6
	Smartphone	10	5.7
Visual Aids	Yes	149	85.6
	No	25	14.4
Working hours before Covid-19 per day	1-4 Hours	98	56.3
	5-8 Hours	76	43.7
Working hours during Covid-19 per day	1-4 hours	11	6.3
	5-8 hours	163	93.7

4.1.3 WORKING CONDITION OF THE RESPONDENT

The working condition of the respondent is recorded from the respondent. The respondent is given five choices which is never, rarely, sometimes, often and always. The working condition that is recorded are, the use of antiglare or blue light protection, the use of computer glasses, went for eye examination, working at night, working during days, turn on the light, sufficient lighting, short break while using computing device, seating position (too close, and too far from computing device), usage of eye lubrication, seating position, screen position, air ventilation and screen contrast. Table 7 shows the data from the respondent.

Table 7: Descriptive Analysis for Working Condition

		Frequency	Percentage (%)
Use of Antiglare or blue light protection	Never	113	64.9
	Rarely	16	9.2
	Sometimes	13	7.5
	Often	9	5.2
	Always	23	13.2
Use of Computer glasses	Never	92	52.9
	Rarely	27	15.5
	Sometimes	16	9.2
	Often	16	9.2
	Always	23	13.2
Went to eye examination	Never	17	9.8
	Rarely	34	19.5
	Sometimes	103	59.2
	Often	12	6.9
	Always	8	4.6
Working at night	Never	7	4
	Rarely	10	5.7
	Sometimes	86	49.4
	Often	52	29.9
	Always	19	10.9
working during day	Never	4	2.3
	Rarely	4	2.3
	Sometimes	20	11.5
	Often	100	57.5
	Always	46	26.4

	Never	3	1.7
	Rarely	4	2.3
	Sometimes	52	29.9
	Often	73	42
Turn on light	Always	42	24.1
	Rarely	7	4
	Sometimes	55	31.6
	Often	76	43.7
Sufficient lighting	Always	36	20.7
	Rarely	19	10.9
	Sometimes	97	55.7
Short Break while using computing device	Often	39	22.4
	Always	19	10.9
	Never	14	8
	Rarely	36	20.7
	Sometimes	101	58
Seating too close with computing device	Often	19	10.9
	Always	4	2.3
	Never	36	20.7
	Rarely	78	44.8
	Sometimes	49	28.2
Seating too far with computing device	Often	8	4.6
	Always	3	1.7
	Never	123	70.7
	Rarely	21	12.1
	Sometimes	21	12.1
Eye lubrication	Often	9	5.2
	Never	1	0.6
	Rarely	11	6.3
	Sometimes	98	56.3
	Often	53	30.5
Comfortable with seating position	Always	11	6.3
	Rarely	11	6.3
	Sometimes	92	52.9
	Often	60	34.5
Comfortable with screen position	Always	11	6.3
	Never	8	4.6
	Rarely	6	3.4
	Sometimes	94	54
	Often	53	30.5
Comfortable with air ventilation	Always	13	7.5
	Never	1	0.6
	Rarely	9	5.2
	Sometimes	89	51.1
	Often	62	35.6
Comfortable with screen contrast	Always	13	7.5

4.2 THE PREVALENCE OF COMPUTER VISION SYNDROME.

Table 8 shows the prevalence of the symptoms for computer vision syndrome. The frequency and magnitude are recorded with the mean $\pm$ SD. The frequency is the percentage of the prevalence of the symptoms CVS occurs during working with computing device. For the frequency (mean $\pm$ SD) of the symptoms, Eyes Strain 43.1% ($\pm$ 0.49665), Blurred Distance 36.8% ($\pm$ 0.4836), Headaches 44.3% ($\pm$ 0.49812), Redness of Eye 19% ($\pm$ 0.39316), Double Vision 16.1% ($\pm$ 0.36852), Dry Eyes 27.6% ($\pm$ 0.44824), Eye Fatigue 52.3% ($\pm$ 0.50091), Eye Itching 28.2% (0.45108), and Eye Tearing 24.1% (0.42915). Table 9 shows the prevalence on the computer vision syndrome. The prevalence of the computer vision syndrome is recorded at 77.6% (0.41822). Magnitude is the number of the respondent that have the symptoms of CVS. For magnitude, table 8 show Eyes Strain (75), Blurred Distance (64), Headaches (77), Redness of Eye (33), Double Vision (28), Dry Eyes (48), Eye Fatigue (91), Eye Itching (49), Eye Tearing (42). Table 9 the magnitude of computer vision syndrome is at 135.

Table 8 Prevalence of Computer Vision Syndrome's Symptom

	Magnitude	Frequency, f (%)	Mean	$\pm$ SD
Eyes Strain	75	43.1	0.431	0.49665
Blurred Distance	64	36.8	0.3678	0.4836
Headaches	77	44.3	0.4425	0.49812
Redness of Eye	33	19	0.1897	0.39316
Double Vision	28	16.1	0.1609	0.36852
Dry Eyes	48	27.6	0.2759	0.44824
Eye Fatigue	91	52.3	0.523	0.50091
Eye Itching	49	28.2	0.2816	0.45108
Eye Tearing	42	24.1	0.2414	0.42915

Table 9 Prevalence of Computer Vision Syndrome

	Magnitude	Frequency, f (%)	Mean	SD
CVS Symptom	135	77.6	0.7759	0.41822

4.3 THE ASSOCIATION BETWEEN SOCIO-DEMOGRAPHIC, WORKING CHARACTERISTICS, WORKING CONDITION WITH CVS.

Relationship between socio-demographic and the occurrence of computer vision syndrome among lecturer were analysed according to categories base on university, age and status of respondents as shown in table 10. The data was analysed using chi-square test, and significant value was set at $p > 0.05$. Only the variable of base on the university ($p = 0.003$) was significantly with occurrence of computer vision syndrome. The other variables such age and status were not having enough evidence of significant correlation ($p < 0.05$) with occurrences of computer vision syndrome.

Table 10: The Association Between Socio-demographic and CVS

		Computer Vision Syndrome		x ²	p
		No	Yes		
University	UPM	25(16.8)	50(58.2)	9.038	0.003
	UITM	14(22.2)	85(76.8)		
Age	40 and below	27(25.1)	85(86.9)	0.518	0.472
	Above 40	12(13.9)	50(48.1)		
Status	Single	9(8.7)	30(30.3)	0.013	0.91
	Married	30(30.9)	105(104.7)		

The relationship of the working characteristic and occurrence of computer vision syndrome among lecturer were analysed according to categories base on visual aid and working hour. Base on the table 11, the chi square is set at significant value was set at $P > 0.05$.

Table 11: The Association Between Working Characteristic and Computer Vision Syndrome

		Computer Vision Syndrome		x ²	p
		No	Yes		
Visual Aid ^a	Yes	34(33.4)	115(115.6)	0.098	0.754
	No	5(5.6)	20(19.4)		
Working Hour ^a	1-4 Hours	5(2.5)	6(8.50)	3.535	0.049
	4-8 Hours	34(36.5)	129(163.0)		

^aa = χ^2 Pearson correlation with expected value less than 0.05

^bb = χ^2 Yates's correction with expected value less than 0.05

Table 12 shows the association between working condition and computer vision syndrome. The condition that recorded are, use of antiglare and blue light, use of computer glasses, doing eye examination, working at night, working in day, turn on light during working, use of sufficient lighting, take a short break from using computing device, seating to close from the computer device, seating to far from computing device, use of eye lubrication, have a good sitting position, have a good screen position, have a good air ventilation, and have a good screen contrast. Base on the table 12 the Chi-square is set at significant value was set at $P > 0.05$.

Table 12: The Association Between Working Condition and Computer Vision Syndrome

		Computer Vision Syndrome			
		No	Yes	χ^2	p
Used of Antiglare and Blue Light ^a	No	35(28.9)	94(100.1)	6.385	0.12
	Yes	4(10.1)	41(34.9)		
Used of Computer Glasses ^a	No	32(26.7)	87(92.3)	4.339	0.037
	Yes	7(12.3)	48(42.7)		
Doing Eye Examination ^a	No	6(11.4)	45(39.6)	4.705	0.03
	Yes	33(27.6)	90(95.4)		
Working at Night ^b	No	1(3.8)	16(13.2)	3.79	0.052
	Yes	38(35.2)	119(121.8)		
Working in Day ^b	No	1(1.8)	7(6.2)	0.537	0.464
	Yes	38(37.2)	128(128.8)		
Turn on Light During Working ^b	No	1(1.6)	6(5.4)	0.306	0.58
	Yes	38(37.4)	129(129.6)		
Used of Sufficient lighting ^b	No	1(1.6)	6(5.4)	0.306	0.58
	Yes	38(37.4)	129(129.9)		
Take a Short Break from Using Computing Device ^b	No	3(4.3)	16(14.7)	0.578	0.447
	Yes	36(34.7)	119(120.3)		
Seating to close from the computer device ^a	No	5(11.2)	45(38.8)	6.217	0.013
	Yes	34(27.8)	90(96.2)		
Used of Eye Lubrication ^a	No	37(32.3)	107(111.7)	5.169	0.023
	Yes	2(6.7)	28(23.3)		
Have a good Sitting Position ^b	No	2(2.7)	10(9.3)	0.261	0.609
	Yes	37(36.3)	125(125.7)		
Have a good air ventilation ^b	No	3(3.1)	11(10.9)	0.009	0.926
	Yes	36(35.9)	124(124.1)		
Have a good screen contrast ^b	No	3(2.2)	7(7.8)	0.329	0.566
	Yes	36(36.8)	128(127.2)		

*a = χ^2 Pearson correlation with expected value less than 0.05

**b = χ^2 Yates's correction with expected value less than 0.05

CHAPTER 5: DISCUSSION

5.1 DESCRIPTIVE ANALYSIS FOR SOCIO-DEMOGRAPHIC, WORKING CHARACTERISTIC AND WORKING CONDITION

5.1.1 DESCRIPTIVE ANALYSIS FOR SOCIO-DEMOGRAPHIC

Of the 174 respondent most of the respondent are from UITM followed by UPM. The participation is mostly female and range age between 31-40 years old. The office worker normally dominated by female base on Zarina and Suhaila (2001). The race is dominated by Malay and most of the lecturer are married. The study by Yaacob (2019) reveal that university lecturer are mostly from Malay ethnicity. The result show same pattern from Zainuddin and Isa (2014), where female dominate in administrative based work. This is due to the distribution of the population.

5.1.2 DESCRIPTIVE ANALYSIS FOR WORKING CONDITION

From the study the lecturer feels comfortable working with laptop rather than computer, as laptop have the advantage of the mobility. The lecturer also chooses to use visual aid such as contact lens and spectacles. The use of visual aid is common among professional worker base on research from Reddy (2013) with multiple university in Malaysia. The working hour for the lecturer with computing device is increase before Covid-19 and during Covid-19. This happens due to the administrative control by the government of Malaysia to protect the citizen of Malaysia from Covid-19. The administrative order on the covid-19 control causes the increase on the working hour of the lecturer during Covid-19 compared before Covid-19. To support this result the usage of computing device is increasing in trend in term of usage from maximum of 5 hours to maximum of 10 hours a day for professional worker during Covid-19 base on Bahkhir and Grandee, (2020).

5.1.3 WORKING CONDITION OF THE RESPONDENT

The working condition is dividing into two category which is environmental factor and occupational factor. For environmental factor on the working condition, the respondent, often [73 respondent (42.0%)] turn on the light during working with the computing device. The sufficient lighting is also an issue with the respondent where they often [76 respondent (43.7%)] have a sufficient lighting for their working environment. The air ventilation plays a major role for the environmental risk, the study recorded that the respondent gets sufficient air ventilation sometimes [94 respondent (54.9%)]. The data show that working at night is sometimes [86 respondent (49.4%)] done by the lecturer as working hours with computing device. For working at night, it is often [100 respondent (57.5%)] done by the respondent.

On the ergonomic approach with the working condition, this study find out that 113 (64.9%) of the respondent never use antiglare or blue light protection for their computing device. For the use of computer glasses while working with computing device, most of the respondent [92 respondent (52.9)] never wear computer glasses. The respondent declares that they sometimes [103 respondent (59.2)] had eye examination. The eye lubrication usage during the working with computing device is recorded that never of the respondent use the lubrication [123 respondent (70.7%)]. The screen contrasts also sometimes [89 respondent (51.1%)] use for the comfort of the working condition. This also, study find out that the participant sometimes [97respondent (55.7%)] take a short break during the working with computing device. The sitting position of the respondent reported that they sometimes [98 respondent (56.3%)] comfortable with their seating position. The respondent sometimes [101 respondent (58.0%)] seating to close to the computing device, while rarely [78 respondent (44.8%)] to far from the computing device. For the screen position of the

computing device the respondent sometimes [92 respondent (52.9%)] feel comfortable with the screen position. A study form **Wahlstro, (2000)** found out that the ergonomic can prevent the musculoskeletal disorder and ocular injuries. Improving the ergonomic of working with computing device can reduce ocular injuries, (Zainuddin and Isa, 2014).

5.2 PREVALENCE COMPUTER VISION SYNDROME

For the prevalence of Computer Vision Syndrome among university's lecturer, the prevalence of Computer Vision syndrome Symptoms from the previous study which are most common 2 symptoms shown in table 13.

Table 13: Prevalence of Computer Vision Syndrome's Symptoms in research.

Author and Year	Most Common Two Symptoms	
	First	Second
Reddy (2013)	Headache (19.7%)	Eye Strain (16.4%)
Shantakumari (2014)	Double Vision (54%)	Headache (53.3%)
Alemayehu (2014)	Blurred Vision (88%)	Eyestrain (71%)

From this study, 9 symptoms of Computer Vision Syndrome were selected and assessed for the frequency and magnitude of symptoms. Scoring for computer vision syndrome cases were based on the recoded total summation from frequency and magnitude of the 9 symptoms of Computer Vision Syndrome.

Among the 9 symptoms of asthenopia, the top 5 frequently reported symptoms of computer vision syndrome with mean $\pm$ SD are, eye fatigue 52.3% (0.523 $\pm$ 0.5),

headaches 44.3% (0.44 ± 0.498), then eye strain 43.1% (0.431 ± 0.497) next was blurred distance vision 36.8% (0.368 ± 0.497) and eye itching 28.2% (0.282 ± 0.0451). On the other hand, the least reported symptoms of computer vision syndrome with mean $\pm$ SD were dry eyes 27.6% (0.275 ± 0.448), followed by eye tearing 24.1% (0.241 ± 0.429), next was redness of eye 19% (0.19 ± 0.393), then double vision 16.1% (0.161 ± 0.369).

For the magnitude of computer vision syndrome symptoms, the top 5 most intense symptoms were reported to be eye fatigue with 168 respondents, followed by eye fatigue with 91 respondents, next was headaches with 77 respondents, then was eyes strain with 75 respondents, blurred distance with 64 respondent and eye itching 49 respondents. On the other hand, the 4 least intense magnitude of computer vision syndrome symptoms were dry eye, eye tearing, redness of eye and double vision.

Base on the, comparing of the previous research from table 13 it is show that the headache, eye fatigue and eye strain are the most common two symptom that occur for Computer Vision Syndrome. Similarly, based on this research, we found out that eye fatigue, headache and eye strain are the common symptom.

The prevalence for the computer vision syndrome is calculate by selecting respondent that have one or more symptom of Computer Vision Syndrome. The prevalence that is calculate is 77.6% with magnitude of 135 respondent. From the study by Sa, (2012) the prevalence is 54.6%, while by Reddy, (2013) the prevalence is 89.9% and Stella (2007) the prevalence is 73%).

5.3 THE SIGNIFICANT RELATIONSHIP BETWEEN SOCIO-DEMOGRAPHIC, WORK CHARACTERISTIC, AND WORK CONDITION WITH COMPUTER VISION SYNDROME.

The result show that work place has significant with computer vision syndrome. The Universiti Putra Malaysia is a research university while Universiti Teknologi Mara is the teaching university. The difference between teaching and research university is that teaching university have many classes to teach compared with the research university. Age and marital status do not have significant with computer vision syndrome due to since our study population is only lecturer who mostly female Malays, no significant different could be establish due to the homogeneity of the sampling population. From the previous study by Zainuddin, (2014) show that there is no significant relationship with computer vision syndrome base on gender, age, status, ethic and working experience. To support the finding of the study, based on Assefa, (2017) also show that there is no significant relationship with computer vision syndrome base on gender, age and marital status.

Visual Aid, such as spectacle and contact lens, does not have significant with Computer Vision Syndrome. Unfortunately, From the research by Assefa, (2017) it is show that visual aid has the significant with computer vision syndrome with the P value 0.001. Furthermore, the research from Reddy, (2013) shows the same result where there is a significant relationship with the P value 0.0001. The result is deference because of the type of study population Assefa (2017) study population were bank worker while Reddy, (2013) was university student.

The result show that most of the lecturer never wears computer glasses, eye lubrication and blue light protection. This show that the lack of knowledge among

lecturer on the safety of working with computing device. To protect lecturer from exposures to occupational hazards is fundamental to implement hierarchy of control, in this case engineering control such as blue light, anti-glare protection and eye lubrication, and personal protective equipment such as computer glasses base on CDC (2015).

There is a significant with working hour with computer vision syndrome base on the result. Working with a long duration can increase Computer Vision Syndrome. The statement is proven with the study conducted by Stella et al (2007) show that the longer the person expose working with computing device the chance of getting computer vision syndrome is increase. The use of computer glasses and frequently doing eye examination can reduce computer vision syndrome. The Canadian Centre of Occupational Health and Safety in 2021 suggested that worker should wear computer glasses while working with computer device and have an eye examination once or two every year to avoid having eye problem.

The significant of seating position from computing device can increase the chance of getting Computer Vision Syndrome. Base on Stella, (2007) there is recorded that there is significant different between computer vision syndrome and seating position.

Use of Eye Lubrication can reduce computer vision syndrome as the result show the significant with computer vision syndrome. The study from Reddy (2013) found out that there is a significant between eye lubrication with computer vision syndrome ($P = 0.001$). The American Academy of Ophthalmology in 2021 encourage the worker to use eye lubrication where eye lubrication can reduce dry eye which is one of Computer Vision Syndrome.

CHAPTER 6: CONCLUSION

6.1 CONCLUSION

This study aimed to explore self-reported on computer vision syndrome and their association with socio-demographic, working characteristic and working condition. It is reveals that the computer vision syndrome among lecturer have high prevalent especially during Covid-19 pandemic as the working hour with computing device increase. The symptoms of computer vision syndrome present among lecturer such as eye fatigue, headache, eye strain and blurred vision. The hierarchy of control such as use computer glasses, suitable seating position, eye lubrication and eye examination are recommended to implement to the university lecturer to avoid and reduce the symptom of computer vision syndrome as there is a significant with the computer vision syndrome. This study also to encourage the management at university to understand the occupational hazard toward the lecturer that are working with computer vision syndrome.

6.2 RECOMMENDATION

The recommendation from this study, every lecturer should go for the further check-up if the symptoms prolonged. It's recommended to properly take care of eye and healthy working condition. It is suggested to use, computer glasses, suitable seating position, eye lubrication and eye examination to improve working productivity. It is needed to do more survey and study on the prevalence of computer vision syndrome among lecturer and also focus on industrial workers and administrative worker to fulfil the gap and collect more data as a reference to plan on further strategies to reduce the prevalence of computer vision syndrome among the workers during Covid-19 pandemic.

6.3 LIMITATION

The study is conducted during the Covid-19 pandemic as a result the questionnaire is given via online platform. There is a lecturer that cannot be contacted as some private their contact information. The use of online platform is less appealing in term of getting the attention of the lecturer to answer the question. There is also a bias in term of working place where the Universiti Putra Malaysia is a research university while Universiti Teknologi MARA is teaching university. This creates a different teaching culture among the two university.

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**ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA**

Research title	: The Prolonged Use of Computing Device on the Risk Developing Computer Vision Syndrome (CVS) among Lecturers During COVID-19 Pandemic in Malaysia.
Study Site	: University Putra Malaysia and University Teknologi MARA.
JKEUPM Ref No.	: JKEUPM-2021-069
Researcher	: Luqman Hakim Mohd Jelani
Supervisor	: Assoc. Prof. Dr. Iruiza Rasdi

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 2 dated 9/4/2021
2. Respondent Information Sheet & Consent (English), Version 2 dated 9/4/2021
3. Respondent Information Sheet & Consent (Malay), Version 2 dated 9/4/2021
4. Proposal (English), Version 2 dated 9/4/2021
5. Questionnaire/Interview (English), Version 2 dated 9/4/2021
6. Questionnaire/Interview (Malay), Version 2 dated 9/4/2021
7. Curriculum Vitae of:
 - a. Assoc. Prof. Dr. Iruiza Rasdi
 - b. Dr. Sharifah Norkhadajah Syed Ismail

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

- ☒ Approved
- ☒ **Permission MUST BE OBTAINED from the respective hospitals/ institutions before conducting the research**
- ☐ Disapproved

Please note that the approval is **VALID UNTIL 3 MAY 2022**

Researchers should comply with the following:

- I. Complete a Study Final Report upon study completion (Form 3.2).
- II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.
- III. Applicable for Clinical Trial Studies and Clinical interventional Studies only: Progress Report has to be submitted to JKEUPM at every 6 months from the date of approval (Form 3.1). Report occurrences of all Serious Adverse Events (SAEs), Suspected Unexpected Serious Adverse Reaction (SUSARs) and Protocol Deviation/ Violation at all JKEUPM approved sites to JKEUPM. SAEs are to be reported within 15 calendar days from awareness of event by investigator. Initial report of SUSARs are to be reported as soon as possible but not later than

APPENDIX B: QUESTIONNAIRE

Questionnaire

(English Version)

Questionnaire on The Prolong Use Of Computing Device On Risk Factor Of Computer Vision Syndrome (CVS) Among Lecturer During Pandemic In Malaysia

Part A: Background Information

1. Gender : ☐ Male ☐ Female
2. Age : ☐ 20-30 ☐ 31-40 ☐ 41-50 ☐ 51-60
5. Race : ☐ Malay ☐ Chinese ☐ Indian ☐ Others
6. Marital Status : ☐ Single ☐ Married
7. Visual impairment : ☐ Amblyopia ☐ Cataracts ☐ Diabetic Retinopathy
☐ Glaucoma
☐ Macular ☐ Trachoma ☐ None of above

Part B: Work Characteristics

1. Teaching Experience:

Less than 1 year ☐ 1-10years ☐ 11-20years ☐ 21-30years ☐ 31-40years ☐

2. The frequent computing device use:

Computer ☐ Laptop ☐ Tablet ☐ Smartphone ☐

3. Use of visual aid device (Eg: spectacles or contact lens)

Yes ☐ No ☐

4. Daily working hour before Covid-19 (not include weekend):

☐ 1 hour or less ☐ 2-4 hour ☐ 4-6 hour ☐ 6-8 hour ☐ more than 8 hour

5. Time spend on computing device before Covid-19 for working purposes?

☐ Less than 1 hour ☐ 1 to 2 hour ☐ 2 to 3 hour ☐ 3 to 5 hour ☐ 5 to 6 hours
☐ 6 to 7 hours ☐ 7 to 8 hour ☐ more than 8 hour

6. Daily working hour during Covid-19 (not include weekend):

☐ 1 hour or less ☐ 2-4 hour ☐ 4-6 hour ☐ 6-8 hour ☐ more than 8 hour

7. Time spend on computing device during Covid-19 for working purposes?

☐ Less than 1 hour ☐ 1 to 2 hour ☐ 2 to 3 hour ☐ 3 to 5 hour ☐ 5 to 6 hours
☐ 6 to 7 hours ☐ 7 to 8 hour ☐ more than 8 hour

**Part C: Questionnaire on working condition and habit of lecturers during pandemic
(Covid-19 Pandemic).**

Mark only one answer on each question.

Indicator: (1= Bad; 2= Poor; 3= fair; 4= Good; 5=Great)

Question/ dimensions					
With respect to your working condition and habit during Work, do you:					
Use anti-glare or blue light protection in your computing device.	1	2	3	4	5
Use computer glasses during working with computing device.	1	2	3	4	5
When for eye examination.	1	2	3	4	5
Working at night with your computing device.	1	2	3	4	5
Working at day with your computing device.	1	2	3	4	5
Turn on light while working with computing device in dark.	1	2	3	4	5
Have sufficient lighting while working with your computer	1	2	3	4	5
Take short break during a working with computing device.	1	2	3	4	5
Being to close from computing device screens.	1	2	3	4	5
Being to far from computing device screens.	1	2	3	4	5
Use any eye lubrication during working with computing device	1	2	3	4	5
Feel comfortable with the sitting position while working with computing device.	1	2	3	4	5

Feel comfortable with the position of the screen on computing device while working with computing device.	1	2	3	4	5
Feel comfortable with the air ventilation in your workplace while working with computing device.	1	2	3	4	5
Feel comfortable with the screen contrast of your screen contrast	1	2	3	4	5



Part D: Questionnaire on visual discomfort during working with computing device during pandemic (Covid-19 Pandemic).

Mark only one answer on each question.

Indicator: (1= Never; 2= Rarely; 3= Sometimes; 4= Often; 5= Always)

Question/ dimensions					
With respect to your visual discomfort during work with computing device, do you experience:					
Eyes strain	1	2	3	4	5
Blurred distance vision	1	2	3	4	5
Headache	1	2	3	4	5
Redness of eye	1	2	3	4	5
Double vision	1	2	3	4	5
Dry eye	1	2	3	4	5
Eye fatigue	1	2	3	4	5
Eye itching	1	2	3	4	5
Eye Tearing	1	2	3	4	5

Questionnaire

(Versi Bahasa Malaysia)

**Soal Selidik Mengenai Penggunaan Alatan Berkomputer Ke Atas Factor Penyebab Sindrom
Penglihatan Computer (CVS) Dalam Kalangan Pensyarah Di Malaysia Semasa Pandemik.**

Bahagian A: Maklumat Latar Belakang

1. Jantina : ☐ Lelaki ☐ Perempuan
2. Umur (Tahun) : ☐ 20-30 ☐ 31-40 ☐ 41-50 ☐ 51-60
5. Bangsa : ☐ Melayu ☐ Cina ☐ India ☐ Lain-lain
6. Status : ☐ Bujang ☐ Berkhawin
7. Masalah penglihatan : ☐ Amblyopia ☐ Cataracts ☐ Diabetic Retinopathy
☐ Glaucoma
☐ Macular ☐ Trachoma ☐ Tiada masalah.

Bahagian B: Ciri-ciri pekerjaan

1. Pengalaman bekerja:

☐ < 1 tahun ☐ 1-10 tahun ☐ 11-20 tahun ☐ 21-30 tahun ☐ 31-40 tahun

2. Alatan berkomputer yang kerap digunakan:

☐ Komputer ☐ Komputer riba ☐ KomputerTablet ☐ Telefon pintar

3. Penggunaan alat bantu penglihatan (seperti; Cermin mata atau kanta mata)

Ya ☐ Tidak ☐

4. Waktu bekerja sehari sebelum Covid-19 (tidak termasuk hari minggu):

☐ 1 jam atau kurang ☐ 2-4 jam ☐ 4-6 jam ☐ 6-8 jam ☐ lebih dari 8 jam

5. Masa penggunaan alatan berkomputer sebelum bekerja semasa pandemic Covid-19?

☐ kurang dari 1 jam ☐ 1 to 2 jam ☐ 2 to 3 jam ☐ 3 to 5 jam ☐ 5 to 6 jam
☐ 6 to 7 jam ☐ 7 to 8 jam ☐ lebih dari 8 jam

6. Waktu bekerja sehari semasa Covid-19 (tidak termasuk hari minggu):

☐ 1 jam atau kurang ☐ 2-4 jam ☐ 4-6 jam ☐ 6-8 jam ☐ lebih dari 8 jam

7. Masa penggunaan alatan berkomputer semasa bekerja semasa pandemic Covid-19?

☐ kurang dari 1 jam ☐ 1 - 2 jam ☐ 2 - 3 jam ☐ 3 - 5 jam ☐ 5 - 6 jam
☐ 6 - 7 jam ☐ 7 - 8 jam ☐ lebih dari 8 jam

Bahagian C: Soal selidik mengenai keadaan dan tabiat bekerja semasa pandemik (Pandemik Covid-19).

Tandakan 1 jawapan sahaja pada setiap soalan.

Penunjuk: (1= Tidak pernah; 2= Jarang-jarang; 3= Kadang-kadang; 4=Kerap; 5= Selalu)

Soalan/ dimensi					
Berkenaan dengan keadaan dan tabiat bekerja, adakah anda:					
Adakah anda menggunakan anti-silau atau penghalang cahaya biru semasa menggunakan alatan berkomputer.	1	2	3	4	5
Menggunakan alat bantu penglihatan semasa menggunakan alatan berkomputer.	1	2	3	4	5
Membuat pemeriksaan mata.	1	2	3	4	5
Bekerja sewaktu malam dengan alatan berkomputer.	1	2	3	4	5
Bekerja sewaktu siang dengan alatan berkomputer.	1	2	3	4	5
Membuka lampu Ketika bekerja dalam keadaan gelap dengan alatan berkomputer.	1	2	3	4	5
Mempunyai pencahayaan yang mencukupi sewaktu bekerja dengan alatan berkomputer.	1	2	3	4	5
Mengambil masa berehat sewaktu bekerja dengan alatan berkomputer.	1	2	3	4	5
Terlalu dekat dengan skrin alatan berkomputer sewaktu bekerja.	1	2	3	4	5
Terlalu jauh dengan skrin alatan berkomputer sewaktu bekerja.	1	2	3	4	5

Meggunakan penitik mata semasa bekerja dengan alatan berkomputer.	1	2	3	4	5
Berasa selesa dengan keadaan duduk sewaktu bekerja dengan alatan berkomputer.	1	2	3	4	5
Berasa selesa dengan posisi skrin alatan berkomputer sewaktu bekerja.	1	2	3	4	5
Berasa selesa dengan pengaliran udara didalam tempat bekerja sewaktu bekerja dengan alatan berkomputer.	1	2	3	4	5
Berasa selesa dengan kontras skrin alatan berkomputer sewaktu bekerja dengan laatan berkomputer.	1	2	3	4	5

Bahagian D: Soal selidik mengenai ketidakselesaan penglihatan semasa bekerja dengan alat berkomputer semasa pandemik (Pandemik Covid-19).

Tandakan 1 jawapan sahaja pada setiap soalan.

Penunjuk: (1= Tidak pernah; 2= Jarang-jarang; 3= Kadang-kadang; 4=Kerap; 5= Selalu)

Soalan/ Dimensi					
Berkenaan dengan ketidakselesaan penglihatan, adakah anda berasa:					
Ketegangan Mata	1	2	3	4	5
Penglihatan kabur pada jarak jauh	1	2	3	4	5
Sakit kepala	1	2	3	4	5
Kemerahan pada mata	1	2	3	4	5
Penglihatan berganda	1	2	3	4	5
Mata kering	1	2	3	4	5
Keletihan mata	1	2	3	4	5
Kegatalan mata	1	2	3	4	5
Mata berair	1	2	3	4	5