



## A STUDY TO ASSESS THE VISUAL IMPACT OF E-LEARNING AMONG STUDENTS DURING COVID- 19 PANDEMIC

|                                    |                                                                                                               |
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**ABSTRACT** **Background;** The global spread of COVID-19 was triggering a range of public health responses and paved the way for introducing digital learning. E-learning tools helping schools and universities facilitate student learning during the closure of universities and schools during lock down period. Spending long hours in front of these devices can lead to many ocular problems in children such as dry eyes, itching, foreign body sensation, watering, blurring of vision, and headaches. **Purpose;** The aim of this study was to assess the visual impact of E-learning among students during the COVID-19 pandemic. **Methods;** A descriptive cross-sectional online survey was conducted among students of various colleges who were attending online classes during the COVID-19 Pandemic lockdown. **Results;** Out of 360 students majority of them were using smart phones 89 (24.72%) for online class than other devices like Laptop or computer and almost 85% of students were attending online classes more than 5 hours per day. 63.33% of students were not maintaining normal distance of 18 inches from eyes during online classes which was affected over all eye health. Online education eye health scale shows 70% of them have moderate deterioration of eye health and 68.9% of students have reported with asthenopic symptoms. There is a high significant association with demographic variables of the students with age, device used, duration of hours attending online classes per day at  $p < 0.001^{***}$  and gender and distance of device from eye shows  $p < 0.001^{**}$  significant level. There is positive correlation between ocular health with asthenopic symptoms as  $r = 0.173$ ,  $p = 0.0009$  respectively. **Conclusion;** E-learning is a good opportunity to continue education but in the context of ocular health there is an increased prevalence of asthenopic symptoms among children in COVID 19 era. Students should be considerate about duration, type and distance of digital device use to avoid symptoms in future

**KEYWORDS :** E-learning, COVID-19, asthenopic symptoms, visual impairment, Digital devices

### Introduction;

The mandatory e-learning has emerged as a method for current teaching and learning method of universities and schools with the foothall of COVID-19 pandemic. The virtual classroom platforms like videoconferencing (Google Hangouts Meet, Zoom, Slack, Cisco, WebEx) and customizable cloud-based learning management platforms such as Elias, Moodle, Big Blue Button and Skype are increasingly being used. COVID-19 has rapidly affected our day to day life, businesses, disrupted the word trade and movement. It is now a usual routine for our children to spend most of the time (8–12 h per day) attending e-classes in front of a computer or mobile screens. These devices cause harm by emitting short high energy waves that can penetrate eyes and can eventually contribute to photochemical damage to the retinal cells, making an individual vulnerable to a variety of eye problems ranging from dry eye to age-related macular degeneration<sup>(1,6)</sup>. In the modern era the use of digital screens is quite common for our children. Besides, the instigation of unlimited e-classes for such children has rested overt burden on their already overburdened eyes. During this pandemic time young people attending schools, colleges has to stay at home, as a part of social distancing and their classes have been converted from offline to online educational system. As a result they have to spend hours with screen time which effects their mental and physical health adversely<sup>(2)</sup>. Students attending online classes at home are not bound to have classroom professionalism, as a result of lack of physical activities leads to obesity in students. In addition to that increasing anxiety and depression due to home confinement along with sleep disorders and increasing eyesight problems asthenopic symptoms with frequent headaches are attributed to prolonged screen time<sup>(18)</sup>.

Asthenopia also known as visual fatigue, often manifest itself via various somatic or perceptive symptoms such as headache, sore eyes, eyestrain, tearing, dryness, blurred vision, diplopia, and foreign body sensation. Prolonged digital device usage without taking any breaks in between is a risk factor of asthenopic symptoms not only that it may affect the tear film and the ocular surface, because of the decreased blinking rate and increased evaporation of tearfilm<sup>(10)</sup>

Parul Ichhpujani et al conducted a study among 576 students of 11-17 years age based on their digital device usage an found that increased use of digital devices caused digital eye strain at an early age<sup>(1)</sup>. In a study conducted by KimDJ et al among 59 volunteers who were exposed to computer screen stimuli for 1 hour found that even after enabling the state-of-the-art display technology visual fatigue and discomfort were significantly increased<sup>(4)</sup>

Uncontrolled usage of digital devices will lead to several physical problems like, blurred vision, dry eyes. Abudawood et al conducted a study among 651 undergraduate medical students and high prevalence of CVS was observed among them<sup>(3)</sup>. In a cross sectional study conducted by Gammoh Y to understand the prevalence and severity of digital eye strain among university students in Jordan found out CVS is highly prevalent in students due to the increased dependence on online education due to coronavirus disease<sup>(9)</sup>

The increased used of digital devices may contribute toward the rising prevalence of asthenopia in the young<sup>(5)</sup>. Han et al.,(2013) reported the prevalence of 57% in chinese students. In another study, the prevalence of asthenopia was found to be 53% in college students.

### Relevance of The Study:

According to UNESCO monitoring as of 7th July 2020, approximately 1,067,590,512 learners have been affected due to school closures in response to pandemic, 110 countries have implemented nationwide closures, impacting about 61% of the world's student population. Several other countries have implemented localized closures impacting millions of additional learners.

The institution closures are impacting not only the students, teachers, and families, but have far-reaching economic and societal consequences. In response to school closures, UNESCO recommended the use of distance learning programs and open educational applications and platforms that schools and teachers can use to reach learners remotely and limit the disruption of education<sup>(11)</sup>

In this era the use of digital devices is increasing day by day which is causing eye strain and associated ocular problems and due to covid-19 we all have shifted our offline work to online which rapidly increased use of digital device. The blue light emitting from digital device directly affect our ocular health. So in this study we are aiming to find out the impact of E-Learning on eye health problem during COVID-19 among college students population aged between 18-25 years

### Objectives;

- To assess the digital device usage effect on ocular health in students
- To assess the relationship of screen time with asthenopic symptoms
- To find out the association between asthenopic symptoms with selected socio-demographic variables

**MATERIALS AND METHODS:**

**Research Design:** Descriptive Cross sectional study

**Population:** In this study, both private and government college students aged between 18-25 years who were attending online classes. Setting of the study: Selected Colleges at Mahe

**Population:** Population comprised of both private and government college students studying at Mahe

**Sample:** The sample comprised of students belonging to the age group of 18 – 25 years studying at various Colleges

**Sampling technique:** Convenient sampling technique was used  
 Sample size: 360 subjects were selected Based on the study-“Visual implication of digital device usage in school children a cross-sectional study” conducted by Ichhpujani P, etal, and the sample size was generated using power and sample size analyzer version 3.2.1

**Study Duration:** 6 months

**Inclusion criteria**

- Students attending online classes
- Aged between 18-25 years

**Exclusion criteria**

- children under 17 years
- Individuals above 25 years

**Tool;**

- Online education eye health scale in Covid-19
- Eye fatigue questioner

**Data Analysis:** The data was compiled and analyzed using inferential statistics

**Result;**

A total of 360 students were responded to the questionnaire within the set time frame. The mean age of students was 22 ± 2.45 years of whom 211(58.61%) were females. Of the respondents 58.61% of respondents were of age group 21-23 years ,doing post graduation 33.89% and using smart phone 24.72% for online classes .306 (85%)students were attending online classes for >5h per day. In total, 63.33% of children were not maintaining normal distance of digital devices during online classes.

**Table-1: Area wise Mean , SD And Mean% To Assess The Visual Impact Of Online Classes Among Students On Current Pandemic Of Covid 19 (n=360).**

| Health Problem                    |            |       |      |      |       |
|-----------------------------------|------------|-------|------|------|-------|
|                                   | Max. score | Range | Mean | SD   | Mean% |
| Online education eye health scale | 8          | 8-0   | 4.43 | 1.70 | 55    |
| Eye strain symptom assessment     | 12         | 12-1  | 7.07 | 2.03 | 59    |
| Overall                           | 20         | 18-1  | 11.5 | 2.87 | 58    |

Above mentioned table shows the mean, SD and mean % of health problems among students due to online classes. Overall score of mean was 11.5,SD was 2.87and mean % was 58%,which shows majority of the respondents has health problems due to online classes during Covid 19 pandemic.

**Figure 1 .Frequency and Percentage wise distribution of students on ocular health on digital device usage.**

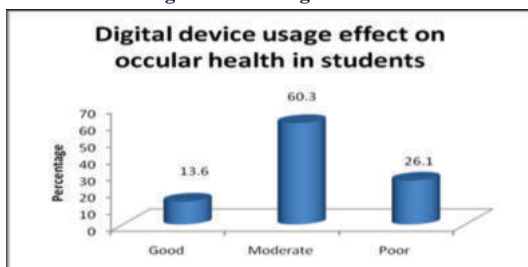
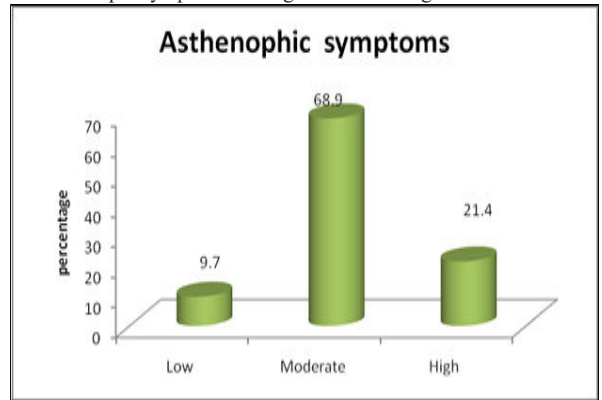


Figure 1 Highlights the effect of online studies on eye health in students where majority of the student's eye health was moderately affected with online classes 60.3%

**Figure 2.** Frequency And Percentage Wise Distribution Of Students On Asthenopic Symptoms On Digital Device Usage



Above figure shows that majority of students had moderate grade of asthenopic symptoms 68.9% and 21.4%of them had high grade symptoms and 9.7%of students developed low grade of symptoms.

**Table 2: Association Of Asthenopic Symptoms And Selected Demographic Data (n=360).**

| Demographic variables                                                                         | Good |      | Moderate |       | Low |       | χ2-value      | p-value         |
|-----------------------------------------------------------------------------------------------|------|------|----------|-------|-----|-------|---------------|-----------------|
|                                                                                               | f    | %    | F        | %     | F   | %     |               |                 |
| 1.Age (in Years) :                                                                            |      |      |          |       |     |       | 23.49 (df=4)  | P<0.001 *** HS  |
| 18-20 years                                                                                   | 2    | 0.56 | 71       | 19.72 | 5   | 1.39  |               |                 |
| 21-23 years                                                                                   | 10   | 2.78 | 139      | 38.61 | 60  | 16.67 |               |                 |
| 24-25 years                                                                                   | 4    | 1.11 | 42       | 11.67 | 27  | 7.50  |               |                 |
| 2.Gender :                                                                                    |      |      |          |       |     |       | 73.46 (df=2)  | P<0.001 *** S   |
| Male                                                                                          | 5    | 1.39 | 71       | 19.72 | 73  | 20.28 |               |                 |
| Female                                                                                        | 11   | 3.06 | 181      | 50.28 | 19  | 5.28  |               |                 |
| 3.Religion:                                                                                   |      |      |          |       |     |       | 2.14 (df=2)   | 0.342 NS        |
| Hindu                                                                                         | 5    | 1.39 | 123      | 34.17 | 41  | 11.39 |               |                 |
| Christian                                                                                     | 11   | 3.06 | 129      | 35.38 | 51  | 14.17 |               |                 |
| Muslim                                                                                        | 0    | 0    | 0        | 0     | 0   | 0     |               |                 |
| 4.Education :                                                                                 |      |      |          |       |     |       | 4.96 (df=6)   | 0.548 NS        |
| UG                                                                                            | 3    | 0.83 | 47       | 13.06 | 15  | 4.17  |               |                 |
| PG                                                                                            | 5    | 1.39 | 76       | 21.11 | 28  | 7.78  |               |                 |
| UG+Other courses                                                                              | 4    | 1.11 | 91       | 25.28 | 27  | 7.50  |               |                 |
| PG+Other courses                                                                              | 4    | 1.11 | 38       | 10.56 | 22  | 6.11  |               |                 |
| 5.Class room learning attended :                                                              |      |      |          |       |     |       | 2.83 (df=2)   | 0.243 NS        |
| No                                                                                            | 5    | 1.39 | 110      | 30.56 | 32  | 8.89  |               |                 |
| Yes                                                                                           | 11   | 3.06 | 142      | 39.44 | 60  | 16.67 |               |                 |
| 6.Family member motivate for online class:                                                    |      |      |          |       |     |       | 2.59 (df=2)   | 0.273 NS        |
| No                                                                                            | 7    | 1.94 | 133      | 36.94 | 40  | 11.11 |               |                 |
| Yes                                                                                           | 9    | 2.50 | 119      | 33.06 | 52  | 14.44 |               |                 |
| 7. The visual aids help in the saving of teachers and students time in preparing of lessons : |      |      |          |       |     |       | 2.59 (df=2)   | 0.273 NS        |
| Disagree                                                                                      | 7    | 1.94 | 133      | 36.94 | 40  | 11.11 |               |                 |
| Agree                                                                                         | 9    | 2.50 | 119      | 33.06 | 52  | 14.44 |               |                 |
| 8. Device used for online class :                                                             |      |      |          |       |     |       | 37.29 (df=10) | P<0.001 **** HS |
| Single device                                                                                 | 1    | 0.28 | 44       | 12.22 | 13  | 3.61  |               |                 |
| Multiple device                                                                               | 1    | 0.28 | 50       | 13.89 | 1   | 0.28  |               |                 |
| Smart phone                                                                                   | 6    | 1.67 | 46       | 12.78 | 37  | 10.28 |               |                 |
| Laptop                                                                                        | 4    | 1.11 | 34       | 9.44  | 16  | 4.44  |               |                 |
| Desktop                                                                                       | 1    | 0.28 | 22       | 6.11  | 11  | 3.06  |               |                 |
| Tablet                                                                                        | 3    | 0.83 | 56       | 15.56 | 14  | 3.89  |               |                 |

|                                                                            |    |      |     |       |    |       |              |                |
|----------------------------------------------------------------------------|----|------|-----|-------|----|-------|--------------|----------------|
| 9. Do you agree that through visual aids the direct experience increased : |    |      |     |       |    |       | 4.66 (df=2)  | 0.094 NS       |
| No                                                                         | 6  | 1.67 | 160 | 44.4  | 60 | 16.67 |              |                |
| Yes                                                                        | 10 | 2.78 | 92  | 25.56 | 32 | 8.89  |              |                |
| 10. Duration of digital device usage (COVID era)/day :                     |    |      |     |       |    |       | 17.28 (df=2) | P<0.001 *** HS |
| <5hours                                                                    | 5  | 1.39 | 25  | 6.94  | 24 | 6.67  |              |                |
| >5hours                                                                    | 11 | 3.06 | 227 | 63.09 | 68 | 18.89 |              |                |
| 11. How many hours using mobile apart from online education                |    |      |     |       |    |       | 1.66 (df=4)  | P=0.797 NS     |
| <1 hours                                                                   | 6  | 1.67 | 122 | 33.89 | 39 | 10.83 |              |                |
| 1-2 hours                                                                  | 3  | 0.83 | 38  | 10.56 | 17 | 4.72  |              |                |
| >2 hours                                                                   | 7  | 1.94 | 92  | 25.56 | 36 | 10    |              |                |
| 12.Distance of digital device from eyes during online classes              |    |      |     |       |    |       | 6.33 (df=2)  | 0.042* S       |
| <18 inches                                                                 | 14 | 3.89 | 151 | 41.94 | 63 | 17.50 |              |                |
| >18 inches                                                                 | 2  | 0.56 | 101 | 28.06 | 29 | 8.06  |              |                |
| 13. Use of television Not watching                                         |    |      |     |       |    |       | 6.97 (df=6)  | 0.324 NS       |
| <1 hours/day                                                               | 1  | 0.28 | 7   | 1.94  | 6  | 1.67  |              |                |
| 1-2 hours/day                                                              | 9  | 2.50 | 92  | 25.56 | 35 | 9.72  |              |                |
| >2 hours/day                                                               | 4  | 1.11 | 71  | 19.72 | 27 | 7.50  |              |                |
|                                                                            | 2  | 0.56 | 82  | 22.78 | 24 | 6.67  |              |                |

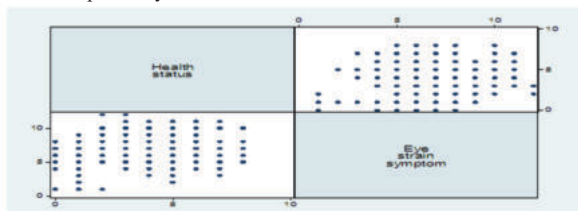
\*p<0.05 significant, \*\* p<0.01 & \*\*\*p<0.001 Highly significant.

Table 2 Shows that Asthenopic symptoms was significantly associated with age p<0.001\*\*\* (df=4)male gender p<0.001\*\*\*((df=2) device used for online class p<0.001\*\*\* (df=10) ,duration of digital device usage age p<0.001\*\*\*((df=4) and digital device distance of 18 inches p<0.042 \*(df=2)in chi -square analysis.

**Table 3: Correlation Between Level Of Digital Device Usage Effect On Ocular Health In Students And Asthenopic Symptoms.**

|                     | 'r' value | p-value |
|---------------------|-----------|---------|
| Health and symptoms | 0.173     | 0.0009  |

Table 3 highlights the positive correlation between eye health and asthenopic symptoms .Asthenopic symptoms were less when student's eye health is in good condition as “r” value is 0.173 and p-value is 0.0009 respectively



**DISCUSSION:**

Due to the spreading of the COVID 19 pandemic worldwide, many states or central governments have decided to close schools in order to maintain social distancing, as means of halting the transmission of this deadly virus .web-based online learning has become the mainstream public learning mode during the pandemic .In our study it is evident that 85% students were attending online classes for >5h per day and 63.33% of children were not maintaining normal distance of digital devices during online classes. Incorrect posture and over usage of screen time affected students eye health.68.3% of students reported

with moderate grade of asthenopic symptoms and there is positive correlation between eye health condition and severity of asthenopic symptoms

The findings drawn from this study:

- Majority of the Students eye health was moderately deteriorated due to online studies which was assessed by Online education eye health scale
- 68.3% of students has developed moderate grade of asthenopic symptoms
- Device used for online class, screen time and improper distance of digital device from eyes shows highly significant association with asthenopic symptoms at p<0.001\*\* level

**Recommendation:**

Based on the study findings, the following recommendations have been made for further study.

Children, teenagers, and even adults should pay attention to eye care habits while making full use of online learning resources Online teaching should be planned scientifically, including reasonable scheduling of online classes and increasing eyesight protection Knowledge regarding protective measures for visual function and increased Public awareness of visual health should be used to avoid damage to visual function and eye diseases caused by inappropriate online learning methods Similar study can be conducted to Primary , junior and senior high school students to assess the severity of visual impact on E-learning A similar study can be done among computer professionals

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