



# Prevalence of dry eye in relation with online study among secondary and higher secondary level students in Agartala

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## Abstract:

**Introduction:** All educational institute throughout the world including India have been closed since March 2020 to prevent the spread of the coronavirus disease (Covid). Online digital study was the only way to continue the student's educational life. Online study develops dry eye symptoms. **Methodology:** The study is to determine the prevalence of dry eye symptoms before and after online study during the COVID-19 pandemic and to know the frequency of dry eye, and associated risk factors of online study among the students of secondary and higher secondary level schools, those who are using smart phone for their online classes. The study was conducted in different schools' students, affiliated by CBSE and TBSE of the capital city Agartala of Tripura in the period of 1<sup>st</sup> July 2021 to 31<sup>st</sup> August 2021, by trainee optometrists under the supervision of the author. A door-to-door survey were done maintaining Covid protocols, with Snellen's visual acuity chart, binocular loupe with torch light, Schirmer's tear test strips for assessing tear secretion levels before and after attending online classes. **Results:**144 students were assessing their ocular symptoms before and after attending their online classes in that period. Everyday each student was attending online classes not less than 7 hours including school classes as well as their subject specific extra tuition classes. Girls' students' participations were more than boys. 86.81% students had found different types ocular symptoms, like redness, itching, blurring vision, fatigueness, foreign body sensation, burning sensation, headache and eyeache, which are also the symptoms of dry eye. 14.58% students were suffering dry eye symptoms before starting online classes, which was increases 67.36% after finishing their five hours online classes and 19.45% students were suffering severe dry eye symptoms. **Conclusions:** The study highlights the prevalence of dry eye in relation with online study among secondary and higher secondary level students in the pandemic situation of the COVID-19 period.Students should be encouraged to blink when continuing online study on screens. Avoid keeping the device close to the eyes, and include a healthy vitamin-A related diet or vitamin-A supplement. Take adequate drinking water. Adequate sleep is also necessary. Avoid air-conditions room for study. In severe conditions instillation of artificial tear to protect cornea.

**Key words:** covid-19 pandemic; dry eye; secondary and higher secondary students; Agartala; Schirmer's test;

## Introduction:

The novel coronavirus originated from Wuhan city of China. The main transmission ways of coronaviruses are direct or indirect human contact, or viral droplets.So, social distancing and hygiene maintain are very much important to prevent the spread of the Covid-19. The common symptoms of the diseases sore throat, cough, and fever. Sometimes it may be asymptomatic or severe in some patients, leading to renal failure, respiratory failure, and multiple organ failure. The World Health Organization (WHO) declared it as a *pandemic*. This situation challenged the education system across the world and forced educators to shift to an online mode of teaching overnight.

Educational institutions in the country have been closed since March, 2020 to halt the spread of the novel coronavirus disease (COVID). However, there is uncertainty as to when these schools will reopen. Since there is no immediate solution to stop the spread of the COVID pandemic, the closure of schools will continue, having a large effect on the learning of children. The outbreak has changed the traditional teaching method of using black boards to digital device-assisted online classes<sup>[1]</sup>.

This means that an extra time of sitting in front of a digital device will be required for this new e-learning system. Spending long hours in front of these devices can lead to many ocular problems in children. Digital eye strain (DES) is the most common eye problem associated with prolonged digital device use, characterized by symptoms such as dry eyes, itching, foreign body sensation, watering, blurring of vision, and headaches<sup>[2]</sup>.

Higher prevalence rates of DES were observed in adolescents using smartphones or in those who were regularly and excessively using digital devices (>2 h daily and continuously)<sup>[3]</sup>.

Few studies were found about ocular complications due to abuses of digital device among young adults. There were no proper studies and reports were found related to dry eye as ocular complications due to excessive uses of digital devices during online classes in COVID-19 pandemic periods.

### **Aims & Objectives of the Study:**

1) The aim of this study is to determine the prevalence of dry eye symptoms before and after online study during the COVID-19 pandemic in Agartala city. 2) To know the frequency dry eye, and associated risk factors of online study among the students of secondary and higher secondary level schools who use digital devices to attend online classes during the COVID-19 pandemic in Agartala city.

### **Back Ground & Profile of the Study Area:**

Tripura is a small state of North-East region of India. The whole study was conducted in capital city of Tripura. The capital of Tripura is Agartala. There are so many CBSE and TBSE affiliated schools in the city Agartala. Students are more serious in secondary and higher secondary levels, as there are more competitions among these levels students to get better chance in higher study. Besides school classes they also taking subject specific extra tuitions in different tuition centres, which also taking online mode through digital devices. Every day secondary and higher secondary levels students taking more than 6 to 8 hours online classes through digital devices.

### **Materials and Methods:**

This was a questionnaire-based study among secondary and higher secondary school students who were attending online classes during the COVID-19 pandemic by digital devices. A door-to-door questionnaire-based survey was done by trainee optometrists guided by the authors maintaining COVID-19 protocol, which comprised of three sections: demography of the students with digital device information, Visual performance-based questionnaires, and clinical observation of the students before and after online classes by digital device during pandemic situation. The whole study was conducted in the month of 1<sup>st</sup> July 2021 to 31<sup>st</sup> August 2021. Snellen's Visual acuity chart both near and distance, Torch light with binocular loupe, Schirmer Tear Test Strips.

The students those who were studying in class IX to class XII or their parents were asked to indicate the average time in hours per day spent on each of the following activities: computer or smartphone use during online classes including school classes and extra tuition classes, watching TV, and playing of video games during the COVID – 19 pandemic situations as well as the total duration of online digital classes during the COVID – 19 pandemic situations. Digital eye strain symptoms and their severity and frequency were recorded in this study. Eye strain-related symptoms are including burning sensation, itching in the eyes, foreign body sensation, watering, excessive blinking, redness, eye pain, heaviness in the eyelids, dryness, blurring of vision, double vision, difficulty in near vision, intolerance to light, eye-ache and headache.

Students those who were experiencing with any ocular symptoms, they were examined anterior segment by binocular loupe with torch light, visual acuity assessment both near and distance by Snellen's chart, Schirmer's test to assess their tear secretion level.

Schirmer's test is used to determine the sufficient tear produces to keep the eye moist. The test is performed by placing tear test strips inside the lower fornix of the eye. After 5 minutes, the strips is removed and note the moisture content of the strip. More than 10 mm moisture of the strip consider of normal level of tear production. Less than 10 mm and more than 5 mm moisture of the strip is considered as low level of tear production, means dry eye. Less than 5 mm moisture of the strip is considered severe dry eye.

**Result:**

Total 144 students were surveyed and examined door-to-door basis, those who were studying in different CBSE and TBSE affiliated schools in class IX to XII. Out of 144 students 59(40.97%) were male students and 85(59.03%) were female students [Table No. 1].

Male Students	Female Students	Total Students
59 (40.97%)	85 (59.03%)	144 (100%)

**Table No. 1**

Out of total students, 103(71.53%) students were regularly attending four hours online classes conducted by their school; six days per week and after that average three hours daily subject specific extra tuition classes. Out of 103 students, Girls' students were found maximum attendance [71(49.31%) girls] in online school classes as well as tuition classes regularly.

Out of total students, only 19 (13.19%) students had no ocular symptoms after attending their online digital classes. Otherwise, rest 125 (86.81%) students had found different types of ocular symptoms like redness 19(13.19%), Itching 11(7.64%), blurring vision 14(9.72%), fatigueness 13(9.03%), foreign body sensation 16(11.11%), burning sensation 29(20.14%), headache and eye-ache 23(15.97%) [Table No. 2].

**Students suffering different types of Ocular symptoms after attending online classes**

Ocular symptoms	No.'s of sufferers	% of sufferers
Redness	19	13.19%
Itching	11	7.64%
Blurring vision	14	9.72%
Fatigueness	13	9.03%
Foreign body sensation	16	11.11%
Burning sensation	29	20.14%
Headache & eye-ache	23	15.97%
Total	125	86.81%

**Table No. 2**

Every student was started their online class since around last 12 months. Every student was assessed their visual acuity both near and distance by Snellen's chart. Most of the student found that their visual abnormalities either near or distance. Every student was assessed their tear secretion level by Schirmer's test. Before starting online digital classes only 21 students Schirmer's test result were less than 10mm, which was below normal range. After one hour of the starting online digital classes more 04 students were found less than 10mm; after two hours of the starting online digital classes another 17 students were added less than 10mm, after three hours of the starting online digital classes another 37 students were added less than 10mm and 11 students were found less than 5mm, after four hours of the starting online digital classes more 12 students were found less than 10mm and another 13 students were found less than 5mm, after five hours of the starting online digital classes 6 more students were found less than 10mm and another 3 new students were found less than 5mm [Table No. 3].

**Schirmer's test result before and after starting online classes**

Online class duration	More than 10mm	Less than 10mm	Less than 5mm	Total
Before starting online class	123(85.42%)	21(14.58%)	0	144
After 1 hour starting online class	119(82.64%)	25(17.36%)	0	144
After 2 hours starting online class	102(70.83%)	42(29.17%)	0	144
After 3 hours starting online class	54(37.50%)	79(54.86%)	11(7.64%)	144
After 4 hours starting online class	29(20.14%)	91(63.19%)	24(16.67%)	144
After 5 hours starting online class	19(13.19%)	97(67.36%)	28(19.45%)	144

**Table No. 3**

In this study, it was also found that students those who were suffering severe ocular symptoms either avoid their online classes or could not completed their lesson properly. As a result, students were suffering academically as well as unsuccess in their academic competition.

In this study, it was found that 14.58% students were suffering dry eye symptoms before starting online study, which were increases 29.17% after finishing their two hours online classes. It was found that after finishing three hours online classes dryness were increased 62.50%, where 7.64% students were suffering severe dry eye. After finishing 5 hours online classes around 86.81% students were suffering dry eye symptoms, in which 19.45% students were suffering severe dry eye symptoms.

## 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. However, the closure of schools has affected the education of more than 1.5 billion children and youths worldwide [4].

Online study was very much important in pandemic situation, which protects our students as well as to avoid educational session loss of the running students. In this study most of students were used smart phone in spite of others digital devices for online classes.

A study done in the UK, in which the participants spent approximately 4 h per day on digital devices [5]. In a study conducted in rural western India, they reported that the average time spent in front of a screen among children was approximately  $2.7 \pm 1.7$  h [6].

In this study, 71.53% students were conducted average 7 hours online classes everyday by smart phone in pandemic situation. The trends of attendance in the online classes were more in girls' students around 49.31%. But around 13.19% students had no ocular symptoms after attending online classes. 86.81% students had found different types ocular symptoms, like redness, itching, blurring vision, fatigueness, foreign body sensation, burning sensation, headache and eyeache, which are also the symptoms of dry eye also.

In this study it was found that 14.58% students were suffering dry eye symptoms before starting online study, which were increases 29.17% after finishing their two hours online classes. It was found that after finishing three hours online classes dryness were increased 62.50%, where 7.64% students were suffering severe dry eye. after finishing 5 hours online classes around 86.81% students were suffering dry eye symptoms, in which 19.45% students were suffering severe dry eye symptoms.

DES constitutes a range of visual symptoms; its prevalence may be 50% or more among computer users [7]. Continuous smartphone use leads to a decrease in the blink rate, causing dry eye-related problems. Smartphones are also used with a short viewing distance because of their small screens, thus causing more asthenopia symptoms [8].

The purpose of the study was to collect data on impact of online study related to dry eye symptoms and to make the students and guardians aware of good ocular health tips in connection of online digital study in pandemic situations. Students should be encouraged to blink when online study on screens. Avoid keeping the device close to the eyes, and include a healthy vitamin-A related diet or vitamin-A supplement. Sufficient drinking water should be taken. Adequate sleep is necessary. Avoid air-conditions room for study. In severe conditions instillation of artificial tear to protect cornea. Regular eye check-ups are strongly recommended.

## Conclusion

The study highlights the prevalence of dry eye in relation with online study among secondary and higher secondary level students in the pandemic situation of the COVID-19 period and the effect of the online study on the secondary and higher secondary student's ocular health. The findings highlighted the importance of student eye health issue in the pandemic period and make the parents, teachers, and eye care providers to be considerate to avoid the effects of online study in secondary and higher secondary level students. Students should be encouraged to blink when continuing online study on screens. Avoid keeping the device close to the eyes, and include a healthy vitamin-A related diet or vitamin-A supplement. Adequate drinking water taking is important. Adequate sleep is also necessary. Avoid air-conditions room for study. In severe conditions instillation of artificial tear to protect cornea.

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