



# Digital Eye Strain and Dry Eye Problems in Covid-19 Lockdown, At BBMCH, Balangir

Tarun Kumar Panda<sup>1</sup>, S. Soni<sup>2</sup>, Priyadarshini Nanda<sup>3</sup>

<sup>1</sup>Associate Professor, HOD, Department of Ophthalmology, BBMCH, Balangir, Odisha, India.

<sup>2</sup>Assistant Professor, Department of Ophthalmology, BBMCH, Balangir, Odisha, India.

<sup>3</sup>Post PG Resident, Department of Ophthalmology, BBMCH, Balangir, Odisha, India.

## Abstract

**PURPOSE:** Lockdown guidelines during COVID-19 pandemic increased the e-learning methods and gadgets use, basically to undergo classes, recreation procedures and media news updates, which subsequently upsurged asthenopic symptoms as digital eye strain (DES) epidemic amid COVID-19 lockdown. This is a descriptive cross-sectional questionnaire based study which is aimed to assess the prevalence, risk factors. Pattern of gadgets used, screen time and symptomatology of Digital eye strain among medical students, teaching doctor faculties and paramedical staff during COVID-19 lockdown at BBMCH, Balangir.

**METHODS:** This e-filled self survey analysed 570 responses from medical students of online classes (200), teachers of online classes (38), paramedical staff (122) and general population (210). A prevalidated CVS-Q and OSDI questionnaire regarding screen time spent, was used to calculate the DES score. Median DES Score was compared by medians or non-parametric tests. Categorical variables were compared by Chi Square test and predictors of DES were found by binary logistic regression. SPSS Version 21.0 was used to interpret and analyse the collected data.

**RESULTS :** Majority of survey participants (78%) had at least one symptom of digital eye strain; The reported symptoms during electronic device usage in decreasing frequency were Eye fatigue (65%), Eye strain (52%), Ocular discomfort (50%), headaches (48%), Burning eyes (42%), and Dry eyes (35%), watering (34%), shoulder pain (30%). DES symptoms were found to be more than that of dry eye symptoms. The prevalence of DES in students taking e-learning surpassed to those found with other health staff and general population. DES score was also observed to be on higher side for more screen time users, use of gadgets in dark, screen distance < 25cm. Lens or spectacle users suffered worsening of vision and needed change of glasses. No association between DES and exacerbation of pre-existing dry eyes and eye diseases were appreciated due to exclusion of such participants from our survey.

**CONCLUSION :** Eye care tips are needed at periodic intervals to create awareness and to reduce eye strain symptoms, closing of eyes on regular basis, maintaining reading distance between 25-30cm and reducing screen time by breaks can lessen the prevalence of DES. As because, use of gadgets were the major media for learning or communication, so ocular health, hygiene and practical precautions should be kept in mind.

**Keywords** Digital Eye strain, screen time, e-learning, medical students, Ocular surface disease index, Questionnaire.

DOI Number: 10.14704/nq.2022.20.10.NQ55662

NeuroQuantology 2022;20(10):6704-6711



## INTRODUCTION

Digital eye strain and dry eye conditions are symptomatic complex presentations that includes variable visual and ocular symptoms, mainly due to irrational use of electronic devices(1). Covid-19 pandemic lockdown guidelines were implemented from March 2020, in Balangir district of Odisha with social distancing norms, restrictions in transport and gatherings, e-learning and communications took upper hand. Electronic gadgets were used excessively by medical students for online classes, health staff for teleconsultation or communication and information or recreational tool by general public(2). National medical council and government guidelines adhered strictly to mandatory e-learning methods and digital transactions. The study aimed to assess the DES epidemic through its varied symptomatic presentations, excess screen time, irrational use of electronic gadgets, particularly during peak Covid period. The study also aimed to determine the effect of digital devices on ocular surface status as degree of dry eyes(OSDI)

## MATERIALS AND METHODS

A cross sectional questionnaire based online study was done including medical students of BBMCH health staff(teaching faculties and paramedical staff) and general public on excessive use of electronic devices like T.V, computers, smartphones, e-platform systems.

A prevalidated CVS-Q and OSDI questionnaire was circulated digitally as google forms and recirculated thereof, between July 2020 to September 2020(3 months period). Each participant was detailed about the survey, with submission of digital consent.

CVS-Q questionnaire collected the participant's personal data, screen time and details of symptomatic presentation. Grading of DES was done on basis of

frequency and intensity of selected 16 symptoms. Frequency scores ranged from 0 to 2 based on attacks of never, sometimes and always, respectively. Intensity score ranged from 1 as moderate, 2 as intense. DES score was estimated as  $E_{i=1}^{16}$  (frequency \* intensity). Digital eye strain was noted significant when DES Score is  $\geq 6$ .

The OSDI questionnaire included 12 parameters covering ocular symptoms, visual functions and environmental add ons for evaluating Dry eye disease.

Total of 570 responses were collected and finally taken for the study.

The collected data through questionnaire were coded in Excel sheet and analysed using IBM SPSSV20. Frequency, Percentage, Mean and Standard deviations were parameters for descriptive analysis. Categorical variables were compared using Chi-square test. 5% significance was fixed for all analysis.

## RESULTS

The study finally included 570 responders. The prevalence of DES and dry eyes were relatively higher among students of online classes as compared to health staff or general public. The age group of eligible participants ranged from 18yrs to 55 years with maximum cases found between 21 years to 45 years(460 cases). Females were affected more, as compared to males. Fatigueness of eye was the most common symptom(65%)(Figure-1), followed by headache (52%), ocular discomfort(50%), burning eyes(42%), dryness(35%), watering(34%) and shoulder pain(30%) DES manifestations were found more significant with ametropic patients on corrective glasses and contact lens use. Dry eyes symptoms got aggravated in participants with pre-existing Dry eye disease cases.

6705

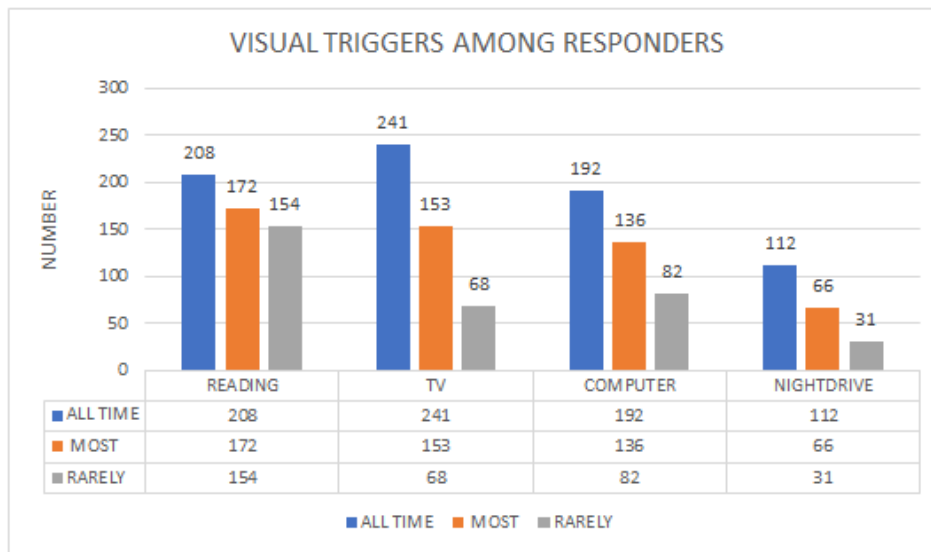


**FIGURE-1. Distribution of Eyestrain Symptoms frequency among responders**

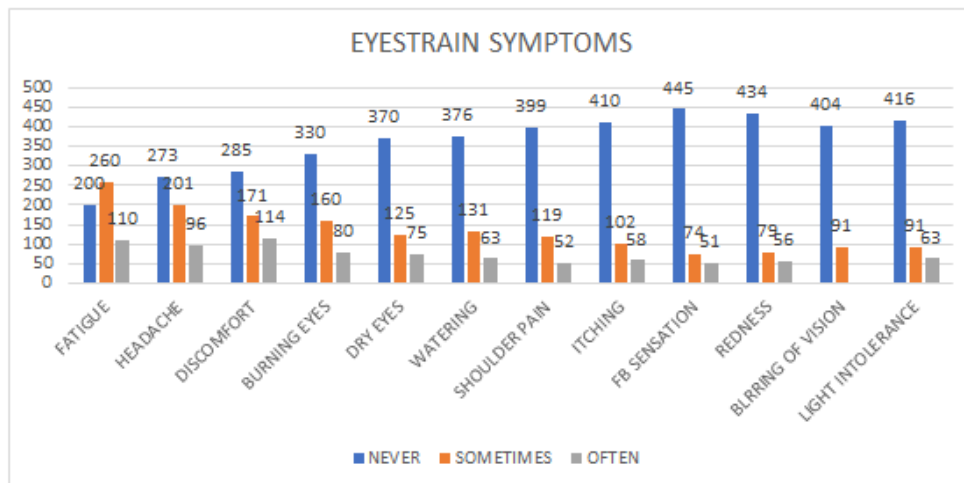
Eyestrain Symptoms	Never	Sometimes	Often
Eye Fatigue	200 (35%)	260 (45.6%)	110 (19.4%)
Headache	273 (48%)	201 (35.3%)	96 (16.7%)
Ocular Discomfort	285 (50%)	171 (30%)	114 (20%)
Burning Eyes	330 (58%)	160 (28%)	80 (14%)
Dry Eyes	370 (65%)	125 (22%)	75 (13%)
Watering	376 (66%)	131 (23%)	63 (11%)
Shoulder Pain and Backache	399 (70%)	119 (21%)	52 (9%)
Itching	410 (72%)	102 (18%)	58 (10%)

6706

**BAR CHART-1**



**BAR CHART-2**



Digital eye strain symptoms varied from mild to moderate, severe and very severe as per its intensity(**Figure- 2**). Very severe eye fatigueness was experienced by 18 responders but very severe headache and very severe backache was experienced by 12 participants only. 88 students had severe eye fatigueness whereas severe headache and severe backache were found in 78 and

72 participants respectively. Severe blurring of vision was complained by 38 participants. Severe eye pain and severe intolerance to light was noticed in 32 candidates. 28 responders felt severe itching in comparison with severe dry eye symptoms which was found in 25 cases. Severe redness was noticed in 21 cases and severe watering in 18 cases.

**FIGURE-2. Distribution of intensity of eyestrain symptoms among participants**

Eyestrain Symptoms	Mild	Medium	Severe	Very Severe
Fatigueness of Eye	154 (41.6%)	110 (29.7%)	88 (%)	18 (4.9%)
Headache	106 (%)	101 (34%)	78 (26.3%)	12 (4%)
Backache and shoulder pain	33 (19.3%)	54 (31.6%)	72 (42.1%)	12 (7%)
Blurring of Vision	62 (37.3%)	61 (36.7%)	38 (22.9%)	5 (3.1%)
Itching	71 (44.3%)	52 (32.5%)	28 (17.5%)	9 (5.7%)
Intolerance to light	70 (45.4%)	42 (31.1%)	32 (20.8%)	4 (2.7%)
Dry Eyes	85 (42.5%)	80 (40%)	25 (12.5%)	10 (5%)
Redness	52 (38.5%)	51 (37.8%)	21 (15.6%)	11 (8.1%)
Watering	96 (49.5%)	70 (36%)	18 (9.3%)	10 (5.2%)
Burning of Eyes	122 (50.8%)	98 (40.8%)	12 (5%)	8 (3.4%)

6707

(**Figure-3**) represents the disproportionate distribution of computer vision syndrome among different study groups. CVS score was implemented to access computer vision syndrome.

CVS score= frequency of symptoms \* degree of symptom. Total score of more than 6 was considered as significant CVS. It was found from the figure, that around 62%

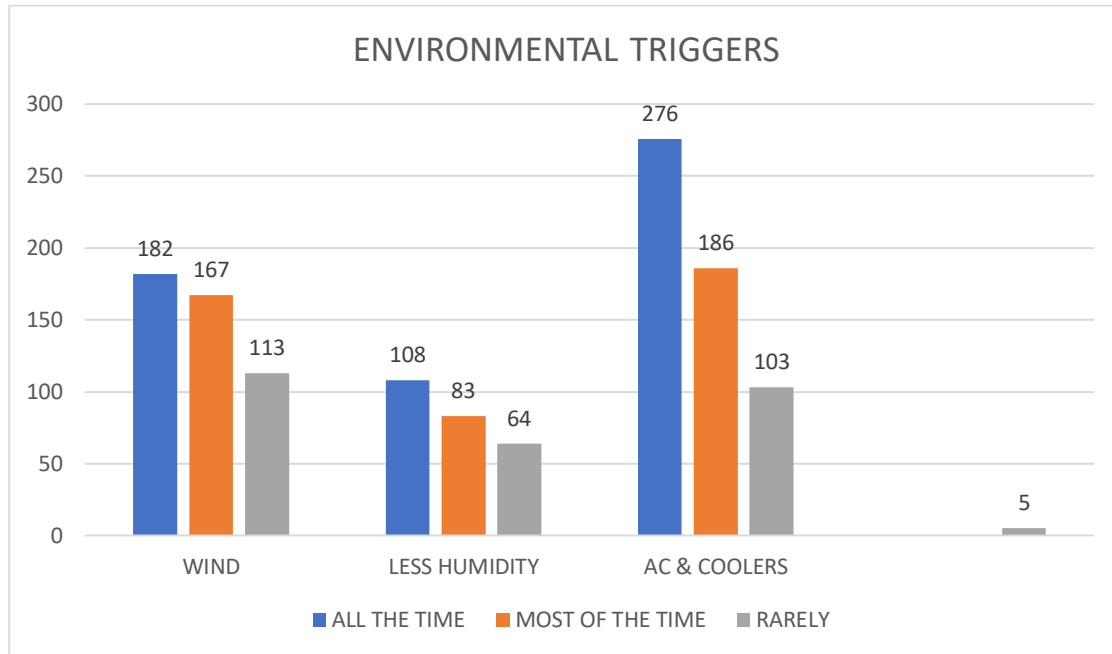
of responders had CVS. Fatigueness of eye was the most common CVS symptom which was seen in 62 students followed by headache in 32 cases, backaches in 30 cases, increased intolerance to light in 28 cases, blurred vision in 25 cases, itching in 20 cases, eye pain in 18 cases, tearing in 10 cases, coloured halos and FB sensation in 2 cases each.

**FIGURE-3. Distribution of CVS Symptoms among participants**

CVS Symptoms	Responders with CVS
Fatigue of Eyes	62 (10.9%)
Headache	32 (5.6%)
Backache	30 (5.3%)
Intolerance to Light	28 (4.9%)
Blurred Vision	25 (4.4%)
Itching	20 (3.5%)
Eye Pain	18 (3.1%)
Tearing	10 (1.7%)
Coloured Haloes	2 (0.35%)
F.B Sensation	2 (0.35%)



**BAR CHART- 3:Distribution of environment triggers among responders**



Screen time exposure also showed varied presentations in different study groups, (Figure- 4.)

The exposure time was categorised as <1hour, 1-4 hours, 4-8 hours, >=8 hours. Maximum number of study participants had exposure of less than 1 hour comprising 356 T.V users, 442 as laptop or desktop users

but in contrast more mobile users were in 1-4 hours and 4-8 hours time intervals as 184 and 176 respectively. Digital eye strain symptom was associated significantly with mobile users more than 8 hours particularly, fatiguability, excessive blinking and foreign body sensation.

6708

**FIGURE– 4Distribution of responders on electronic devices as per duration spent on screentime.**

Screen Time	T.V	Desktop	Laptop
< 1 hr	356 (62.4%)	442 (77.5%)	136 (23.8%)
1-4 hr	118 (20.7%)	166 (29.1%)	184 (32.3%)
4-8 hr	125 (21.9%)	153 (26.8%)	176 (30.9%)
>=8 hr	7 (1.2%)	18 (3.1%)	24 (4.2%)

Distribution of participants as per screen time spent on e-devices learning and social media are depicted in(Figure-5).

182 responders had used e-learning devices for time interval of 1-4 hours followed by 146 for >4 hours and 76 for <=1 hour.

Hardly any significant correlation was estimated between DES symptoms and e-learning. 212 study participants used social media for time period of 1-4 hours followed by 174 for more than 4 hours and 112 for <=1 hour.



**FIGURE -5. Distribution of respondents as per mode of media used**

Screen Time	E-Learning	Social Media
<= 1 hr	76 (13.3%)	112 (19.6%)
1-4 hr	182 (31.9%)	212 (37.1%)
4-8 hr	146 (25.6%)	174 (30.5%)
>=8 hr	18 (3.15%)	26 (4.56%)

(Figure 6) shows distribution of DED based on OSD1 score with varied presentations. Majority were in normal range (270)

followed by mild, moderate and severe degree as 110, 100 and 90 participants respectively.

**FIGURE – 6. Distribution of Dry eye disease based on OSDI score**

Degree of Dry Eye Disease	Number /percentage of respondents
Normal	270 (47.36%)
Mild	110 (19.3%)
Moderate	100 (17.54%)
Severe	90 (15.8%)

OSD1 questionnaire included ocular manifestations with visual and environmental triggers, so their distribution in different study groups are assessed in Figure 1,2,3.

Intensity ranges from 0 to 4 (none to all of the time). Total OSD1 score = [(sum of scores of all answered questions) \* 25] / (total number of answered questions). This score categorised the responders into normal (scores 0-12), mild (13-22), moderate (23-32) and severe dry eye (33-100).

## DISCUSSION

Fatigueness of eye was the commonest symptoms presented in our study participants group. Its prevalence along with dry eye was recorded as 65% which was relatively on a higher side as compared to other study outcomes i.e. Althahi et al (48.3%), Niveditha KP et al (21%). Headache was the second most common DES symptom, with prevalence of 52% and relatively on lower side as with Aqueen joju et al (76.1%), Kan AA et al (73.3%). But this

was found on higher side as to Logaraj et al study of 43.3% as prevalence rate. Ocular discomfort was seen in 50% study participants as compared to 41.6% in Aqueen Joju et al study and 29% of Bakhir FA et al study. Burning sensation in eyes was found in 42% responders in our study, but in Logaraj et al and Aqueen Joju study, it was 32.3% and 31% respectively.

Watering of eyes was seen in our study was 34% as to 49.6% and 58% in Aqueen Joju et al and Altathi et al studies.

Shoulder/back pain was experienced by 30% study participants and relatively less as found in Logaraj et al (61%) and Aqueen Joju et al (67.3%) and Tamil Nadu study (35.2%). The results of our study indicates an increased DES score in participants with increased screen time, increased use of electronic devices in dim light and close distance, less blinks/breaks in viewing. Significant correlation between DES and increased screen time was not found in several studies like ours. However,

6709



for some symptoms of DES(excessive blinking, FB sensation) significant association was noted. The median DES scores were found more with increased screen time hours during Covid 19 pandemic lockdown.

### CONCLUSION

This was a cross sectional study done on 570 responders(students, doctors, paramedical staff and general population) conducted at BBMCH, Balangir(Western Odisha). Subjective methodology and limited area of population were the limitations of our study ophthalmic investigations like critical flicker-fusion frequency and blinking characteristics can give better association outcomes. Even pre-existing ocular comorbidities were excluded in our study. Around 78% of responders experienced at least one DES symptom. Fatigueness was the most common symptom reported. No significant correlation was found between increased screentime and DES symptoms. Whereas, significant correlation existed between increased screentime and certain DES symptoms(excessive blinking, FB sensation). Increased use of electronic gadgets during pandemic resulted in more eye strain symptoms.

This study appears to encourage steps, forwards more awareness about changes in usage of eyes and promotion of ocular health, thereby avoiding this epidemic amid Covid 19 pandemic.

### SOURCE OF FUNDING

None

### CONFLICT OF INTEREST

None

### ACKNOWLEDGEMENT

We would like to thank all the participants who volunteered for this study.

### References

- [1] Hayes JR, Sheedy JE, Stelmack JA, Heaney CA. Computer use, symptoms, and quality of life. *Optometry and vision science*. 2007 Aug 1;84(8):E738-55.
- [2] Bahkir FA, Grandee SS. Impact of the COVID-19 lockdown on digital device-related ocular health. *Indian Journal of Ophthalmology*. 2020 Nov;68(11):2378.
- [3] Jahan F, ul Islam Z, Rafei M. Factors Leading Computer Vision Syndrome in Medical Students: A Descriptive Analysis
- [4] Bhattacharya S, Saleem SM, Singh A. Digital eye strain in the era of COVID-19 pandemic: An emerging public health threat. *Indian J Ophthalmol*. 2020 Aug 1;8.
- [5] Logaraj M, Madhupriya V, Hegde SK. Computer vision syndrome and associated factors among medical and engineering students in Chennai. *Annals of medical and health sciences research*. 2014;4(2):179-85.
- [6] Reddy SC, Low CK, Lim YP, Low LL, Mardina F, Nursaleha MP. Computer vision syndrome: a study of knowledge and practices in university students. *Nepalese journal of Ophthalmology*. 2013 Sep 23;5(2):161-8.
- [7] Sarwar M, Soomro TR. Impact of smartphone's on society. *European journal of scientific research*. 2013 Mar 2;98(2):216-26.
- [8] Del Mar Seguí M, Cabrero-García J, Crespo A, Verdú J, Ronda E. A reliable and valid questionnaire was developed to measure computer vision syndrome at the workplace. *Journal of clinical*

6710





- epidemiology. 2015 Jun 1;68(6):662-73.
- [9] Von Stroh R. Computer vision syndrome. Occupational health & safety (Waco, Tex.). 1993 Oct 1;62(10):62-6.
- [10] Niveditha KP, DheepakSundar M. Digital vision syndrome (DVS) among medical students during Covid-19 pandemic curfew. International Journal of Research in Pharmaceutical Sciences. 2020:1128-33.
- [11] Altalhi A, Khayyat W, Khojah O, Alsalmi M, Almarzouki H. Computer vision syndrome among health sciences students in Saudi Arabia: prevalence and risk factors. Cureus. 2020 Feb;12(2).
- [12] Schiffman RM, Christianson MD, Jacobsen G, Hirsch JD, Reis BL. Reliability and validity of the ocular surface disease index. Archives of ophthalmology. 2000 May 1;118(5):615-21.
- [13] Rafi AM, Varghese PR, Kuttichira P. The pedagogical shift during COVID 19 pandemic: online medical education, barriers and perceptions in central Kerala. Journal of Medical Education and Curricular Development. 2020 Aug;7:2382120520951795.

6711

