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# Effect of Online Classes on Dry Eye Disease in Children: A Hospital Based Survey

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## ABSTRACT

**Purpose:** To determine the effect of online classes on dry eye disease in children.

**Study Design:** Cross sectional study.

**Place and Duration of Study:** Department of Ophthalmology HSK hospital, Navanagar, Bagalkot, India, from October 2020 to November 2020.

**Methods:** A total of 454 students attending online classes between the ages of 3 – 18 years were selected. Questionnaire was presented which included name, age, sex, residence, duration of online studies and duration in hours per day along with the various signs and symptoms according to SPEED questionnaire. Statistical analysis was performed using the IBM SPSS version 17. Quantitative variables were presented as mean ± standard deviation, while qualitative data was presented as frequency and percentages and compared by chi square test. P-value of < 0.005 was considered as significant.

**Results:** Of the 454 responses, 316 (69.6%) had symptoms of dry eye disease, of which 159 were girls and 157 boys. There was no significant difference between boys and girls. Children taking online classes for 2 – 3 hours and for 4 to 6 months duration were more affected by the dry eye disease. Based on severity of grading system, 246 (84.2%) had mild symptoms, 42 (9.3%) had moderate symptoms and 28 ([6.2%) had severe symptoms. One hundred and twenty children visited ophthalmologist and 28.5% had their treatment of dry eye started.

**Conclusion:** Online classes have resulted in increase in the frequency of dry eye disease in children. Proper education about the usage of screen time and educating parents about early treatment is essential.

**Key Words:** Dry eye disease, Symptoms, Headache, Online learning.

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## INTRODUCTION

Dry eye disease (DED) is a chronic ocular disease and a major global health problem that manifests as a group of symptoms such as burning, photophobia, tearing, and grittiness. Patients with DED experience problems in their routine activities and compromising their quality of life.[1] The symptoms and irritation felt by the person with DED hardly match up with the intended clinical tests.[2] Other factors for example topographical location, atmospheric conditions, and living style of the population also affect the DED.[3-5] There is a need to expand epidemiological studies of DED using standardized questionnaires and uniform diagnostic criteria. Some studies are available from the subcontinent with variable prevalence of up to 33%.[6-10] The dry eye disease is noticed much less frequently in

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pediatric population but it has become a matter of concern when the children develop clinical symptoms and signs. The problem has increased nowadays because of the online classes, which have changed the norms all over the world.

DED if present in children below 5 years of age it is due to some congenital or related systemic illnesses such as Sjögren's syndrome, Steven Jonson syndrome, Juvenile rheumatoid arthritis or it may be due to increased exposure to screen. However diagnosing dry eye is much more cumbersome in pediatric age group, because of non-compliance of children. Usually the parents notice excessive blinking, itching of eyes and excessive rubbing leading to infections of eyes and meibomian gland dysfunction.[11] They might even develop astigmatism due to excess rubbing of eyes. Decreased outdoor activities and increased indoor activities have also led to the excessive use of mobile and computer screens.

For the diagnosis of dry eye, taking an accurate medical history of the patient is critical. For this purpose, the ocular surface disease index (OSDI) can be regarded as the established standard questionnaire but the standard patient evaluation of eye dryness (SPEED) questionnaire has recently been developed. The advantages of the SPEED questionnaire are the lower number of questions and easier interpretability.[12] Over the time SPEED questionnaire has proved to be a sound measure for dry eye symptoms even in epidemiological studies and clinical practice for dry eye symptom assessment.[13]

We performed this study to find out the frequency of DED in children attending online classes. The results can be helpful in modifying the virtual classes and taking preventive measures before DED takes the form of epidemic.

## METHODS

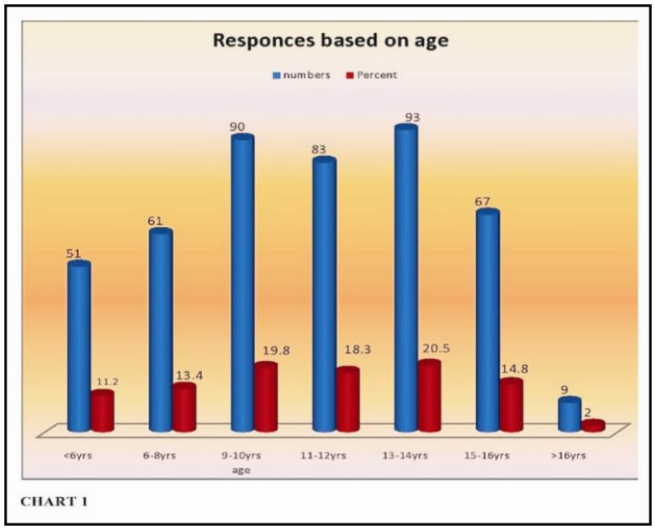
This cross-sectional survey was conducted by Department of Ophthalmology HSK hospital, Navanagar, Bagalkot, India, from 12/10/2020 to 11/11/2020. Online classes had been started in the month of June. Informed consent was obtained from all participants. Institutional ethics committee approval was obtained and this study was done according to the tenets of Declaration of Helsinki.

All students attending online classes between the age group of 3 – 18 years were selected irrespective of the gender and social status. Patients more than 18 and less than three years of age were excluded. As this was an online survey, ocular examination was not carried out. Questionnaire was presented which included name, age, sex, residence, duration of online studies and duration in hours per day along with the various signs and symptoms according to SPEED questionnaire. A pilot study was done, based on symptoms of dry eye disease. By taking P = 70%, 5% error at 95% confidence interval and using open Epi version 2 software we got a sample size of n = 323. As we got 454 responses in duration of 1 month the data was analyzed and results tabulated. All the data that was collected from the respondents was exported as Microsoft Excel sheets from the Google drive link, and statistical analysis was performed using the IBM SPSS version 17. Quantitative variables were presented as mean ± standard deviation, while qualitative variables were presented as numbers and percentages. Qualitative data like gender was presented as frequency and percentages and compared by chi square test. P-value of < 0.005 was considered as significant.

## RESULTS

Of the 454 responses, 316 (69.6%) had symptoms of dry eye disease, of which 159 were girls and 157 boys. There was no significant difference between boys and girls. Majority of students were between 9 – 14 years (Chart: 1). Children taking online classes for 2 – 3 hours and for 4 to 6 months duration were more affected by the dry eye disease (Chart: 2). There was a significant statistical association between symptoms of dry eye and duration of exposure, with a significance of 0.000 in Pearson chi square test in our study (Table 2).

Two hundred and eighty children had gritting and itching sensation in eyes, 263 had burning sensation in eyes and 268 had headache. Based on severity grading system, designed by Korb and Blakie in order to quickly track progression scores given from 0 – 28. Mild is 0 – 4, moderate is 4 – 8, > 8 as severe,[14] We classified the responses accordingly. Of the 316 (69.9%) symptomatic children, 246 (84.2%) had mild symptoms, 42 (9.3%) had moderate symptoms and 28 ([6.2%) had severe symptoms. One hundred and twenty children visited ophthalmologist and 28.5% had their treatment of dry eye started.



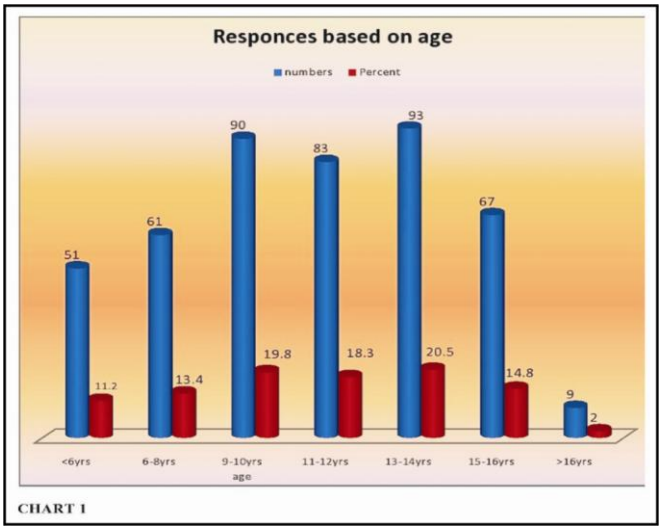




**Table 1:** *Age-wise Distribution of the Symptoms of Dry Eye Disease.*

| Age | Asymptomatic | Symptomatic | Total | Chi-Square Tests | Point Probability |
|---|---|---|---|---|---|
| < 6 Years | 37 | 14 | 51 | Pearson Chi-Square | |
| 6 – 8 Years | 23 | 38 | 61 | Likelihood Ratio | |
| 8 – 10 Years | 28 | 62 | 90 | Fisher's Exact Test | |
| 10 – 12 Years | 12 | 71 | 83 | Linear-by-Linear Association | .000[c] |
| 12 – 14 Years | 24 | 69 | 93 | N of Valid Cases | |
| 14 – 16 Years | 12 | 55 | 67 | | |
| 16 Years | 2 | 7 | 9 | | |
| Total | 138 | 316 | 454 | | |

**Table 2:** *Duration of Online Learning and Symptoms of Dry Eye Disease.*

| Duration in Hours | Asymptomatic | Symptomatic | Total | | Value | Df | Asymp. Sig. (2-Sided) | Exact Sig. (2-Sided) | Exact Sig. (1-Sided) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Pearson Chi-Square | 61.619a | 3 | 0.000 | 0.000 | |
| 1 – 2 hr | 47 | 21 | 68 | Likelihood Ratio | 57.952 | 3 | 0.000 | 0.000 | |
| 2 – 3 hr | 47 | 115 | 162 | Fisher's Exact Test | 57.308 | | | 0.000 | |
| 3 – 4 hr | 29 | 101 | 130 | Linear-by-Linear Association | 44.260b | 1 | 0.000 | 0.000 | 0 |
| > 4 hrs | 15 | 79 | 94 | N of Valid Cases | 454 | | | | |
| Total | 138 | 316 | 454 | | | | | | |

## DISCUSSION

COVID-19 pandemic has resulted in life-style changes throughout the world. There has been nationwide lockdowns in different countries in order to maintain social distance and as a means to halt the spread of COVID-19. This has affected education of about 1.5 billion students world-wide.[15] In our study the mean age of participants was 9-14 yrs. The frequency of DED in our study was 69.6% which is higher than the study conducted by Amit M et al, which is 50.2%.[16]

There was no gender difference regarding DED in our study. However, Visual symptom scores in digital device users were higher among females than males in a study done by Shima et al.[17]

When duration of online study was analyzed, our results showed that children who used online sources for 2 to 4 hours per day were maximally affected with DED. A study conducted by Ichhpujani P, reported that the prevalence of DES was significantly higher in individuals who spent > 4 h per day on digital devices.[18] Similar results were found in another study, conducted by Kanitkar K et al, which reported that the duration in front of a screen was directly proportional to the DES symptoms.[19] There is even a significant

statistical association between symptoms of dry eye and duration of exposure, with a significance of 0.000 in Pearson chi square test in our study.

A recent meta-analysis reported that the pooled prevalence of DES was 19.7% in children.[20] In a study conducted in the private schools of west India, it was reported that the prevalence of DES was 17.9%.[18] It was comparable to our study where it showed 15.5% prevalence of moderate to severe disease in children.

In our study, Pearson chi-square test shows significant association that is 0.000 between dry eyes related with age, probably because, as the age increases, duration of exposure to online classes is also increased. In a study conducted by Moon et al. it was pointed out that symptoms of dry eye diseases were higher in the children of older age group. It was because of spending more hours on smart phone use, which may lead to a higher DED prevalence in older children.[21]

Shortening the duration of digital device use has a significant effect on the symptoms of DES. The 20/20/20 rule proposed by Misawa T et al should be taught to reduce asthenopic symptoms during computer use. After every 20 minutes of digital device use, look at a distance of 20 feet for at least 20 seconds.[22] Children should be instructed to blink while using screens. The device should be held at least at an arm's length away from the eyes. Regular eye check-ups has to be recommended for early diagnosis and treatment.

There are certain limitation of this study. As the survey was done online, we were unable to examine the participants.

## CONCLUSION

The results of this study emphasizes the importance of early diagnosis of DED in children involved in online classes. Proper education about the usage of screen time and educating parents about early treatment is essential.

## Ethical Approval

The study was approved by the Institutional review board/Ethical review board (SNMC/IECHSR/2021-2022/A-6/1.1)

## Conflict of Interest

Authors declared no conflict of interest.

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## Authors' Designation and Contribution

Sangameshwarayya Salimath; Assistant Professor: *Concepts, Design, Literature Search, Data acquisition, Data Analysis, Manuscript Preparation, Manuscript Editing, Manuscript Review.*

Salma Sultana; Post Graduate Trainee: *Concepts, Design, Literature Search, Data Acquisition, Data Analysis, Manuscript Preparation, Manuscript Editing, Manuscript Review.*

Brijesh Appasaheb Patil; Professor: *Concepts, Design, Literature Search, Data Analysis, Manuscript Preparation, Manuscript Editing, Manuscript Review.*

Kalpana Kulkarni; Statistician: Concepts, *Data Analysis, Manuscript Preparation, Manuscript Editing, Manuscript Review.*

Shishir K Nyamagoudar; Post Graduate Trainee: *Concepts, Literature search, Data Acquisition, Manuscript Preparation, Manuscript Editing.*