Digital eye strain among undergraduate medical students in a tertiary eye care hospital of south India – A questionnaire based study

Aiman Ahmed Khan¹, Rashmi Jain², Vidya Hegde³, Anupama Bappal⁴, Rashmi S⁵

¹Junior Resident, ², ⁴Associate Professor, ³Professor, ⁵Assistant Professor, Dept. of Ophthalmology, Yenepoya Medical College Hospital, Mangaluru, Karnataka, India

*Corresponding Author: Rashmi Jain
Email: drrashjain@gmail.com

Abstract

Purpose: To assess the frequency of digital eye strain (DES) among undergraduate medical students in a tertiary eye care hospital in South India and to correlate the optical correction and device usage factors with DES related symptoms.

Materials and Methods: A cross sectional questionnaire based study on undergraduate medical students was done in Yenepoya medical college over the period of 2 months after obtaining ethical clearance from institutional ethics committee, the filled questionnaire was collected, data was tabulated and analysed.

Result: In our study the male to female ratio was almost equal. Out of the total 120 participants, 55.83% had symptomatic DES females were more affected (53.7%). Headache was the most common symptom experienced (73.33%) followed by Dry eyes (63.33%), Eye strain (53.33%), 64 (84.21%) of 76 participants who used their digital devices for > 4 hours per day and, 33 (67.34%) of 49 participants who held their device approximately at < 33cm had symptomatic DES. 8 (80%) of 10 infrequent spectacle users had symptomatic DES. 22 of 43 using spectacles used antiglare and only 3 (13.63%) of these had symptomatic DES. All 3 frequent users of contact lens had symptomatic DES.

Conclusion: DES is more prevalent in females, and higher the hours of use of digital device, greater is the risk of DES. A greater viewing distance and high contrast reduce the chances of developing DES and hence is advisable. Frequent use of habitual refractive correction is recommended with antiglare, however, prolonged use of contact lens especially in air conditioned environment should be avoided.

Keywords: Asthenopia, Blurred vision, Computer vision syndrome, Digital eye strain, Questionnaire.
Results
A total number of 120 participant’s responses were analysed. Mean age of total participants was 21.55 with a standard deviation of 0.91 (Ranging from 20-26 years of age). The male to female ratio was almost equal. Out of the total 120 participants, 67 (55.83%) had symptomatic DES and higher numbers of females were affected 36 (53.7%) as compared to males 17 (25.37%).

Mobile phones were the most commonly used digital device (94.16%) and the most important reasons for usage of digital device were, social media (70%), communication (57.5%) and YouTube (50%).

Headache was the most common symptom experienced by participants 88 (73.33%), followed by dry eyes 76 (63.33%), eye strain 64 (53.33%), tired eyes 85 (48.33%) and irritated and burning eyes 56 (46.66%).

Table 1: Gender and DES severity score

| Gender | DES score <20 | DES score >20 | Total |
|--------|---------------|---------------|-------|
| Male   | 44            | 17            | 61    |
| Female | 23            | 36            | 59    |
| Total  | 53            | 67            | 120   |

Out of the 120 participants, 76 (63.33%) used their digital devices for more than 4 hours per day, of these 64 (84.21%) participants had symptomatic DES. 49 (40.83%) participants held their digital device at less than 33cm, 33 (67.34%) of these participants had symptomatic DES, both parameters were statistically significant (p<0.01).

Of the total participants, 29 (24.16%) used low contrast settings, of which 20 (68.9%) had symptomatic DES and 99 (82.5%) spent > 4 hours in air conditioned environment and 75(75.57%) of these had symptomatic DES. Both parameters were statistically significant. (p<0.01)

Out of the total 120 participants, 49 (40.83%) used habitual refractive correction. Among 43 spectacle users, 10 (23.25%) used their optical aid infrequently and 8 (80%) of these had symptomatic DES. Also, of 43 spectacle users 22 used antiglare and only 3 (13.63%) of these had symptomatic DES. Both parameters were statistically significant with p<0.01.

Of the 49 participants using habitual refractive correction, only 6 were using contact lens when using optical device, 3 (50%) of which were frequent users and all 3(100%) had symptomatic DES, this was statistically significant with p<0.01.

Table 2: Symptoms of DES and percentage of responses by participants

| Symptom                                      | Response : None - Mild | Response : Moderate - Severe |
|----------------------------------------------|------------------------|-----------------------------|
| Blurred vision at near distances             | 111 (92.5%)            | 9 (7.5%)                    |
| Blurred vision at intermediate distances     | 111 (92.5%)            | 9 (7.5%)                    |
| Blurred vision at far distances              | 89 (74.16%)            | 31 (25.83%)                 |
| Difficulty in refocusing eyes from one distance to another | 113 (94.16%) | 7 (5.83%)              |
| Irritated or burning eyes                    | 64 (53.33%)            | 56 (46.66%)                 |
| Dry eyes                                     | 44 (36.66%)            | 76 (63.33%)                 |
| Eye strain                                   | 56 (46.66%)            | 64 (53.33%)                 |
| Headache                                     | 32 (26.66%)            | 88 (73.33%)                 |
| Tired eyes                                   | 35 (29.16%)            | 85 (48.33%)                 |
| Sensitivity to bright lights                 | 77 (64.16%)            | 43 (35.83%)                 |

Table 3: Digital device related parameters and DES score

| Digital device related parameters | Response | Participants with DES score <20 | Participants with DES score >20 |
|----------------------------------|----------|---------------------------------|---------------------------------|
| Average hours of use per day     |          |                                 |                                 |
| >4 hours                         | 12       | 64                              |
| <4 hours                         | 31       | 13                              |
| Distance of holding device       |          |                                 |                                 |
| >33 cm                           | 10       | 1                               |
| 33cm                             | 49       | 11                             |
| <33cm                            | 16       | 33                             |
| Contrast settings                |          |                                 |                                 |
| Low                              | 9        | 20                             |
| Medium                           | 70       | 14                             |
| High                             | 5        | 2                              |
| Hours spent in air conditioned environment |          |                                 |                                 |
| < 4 hours                        | 13       | 8                               |
| >4 hours                         | 24       | 75                             |

Table 4: Optical device related parameters in participants using habitual refractive correction and DES score

| Optical device related parameters in participants using habitual refractive correction | Response | Participants with DES score <20 | Participants with DES score >20 |
|--------------------------------------------------------------------------------------|----------|---------------------------------|---------------------------------|
| Use of spectacle with power                                                         | Yes      | 22                              | 11                              |
|                                                                                    | Sometimes | 2                               | 8                               |
| Use of contact lens                                                                | Yes      | 0                               | 3                               |
|                                                                                    | Sometimes | 2                               | 1                               |
| Use of Antiglare                                                                   | Yes      | 19                              | 3                               |
|                                                                                    | No       | 5                               | 16                              |
Discussion

According to the American Optometric Association, the most common symptoms associated with DES are eye strain, headaches, blurred vision, dry eyes and pain in the neck and shoulders.6 Our study showed similar results with headache being the most common symptom experienced by participants (73.33%), followed by Dry eyes (63.33%), Eye strain (53.33%).

Our study found a prevalence of DES of 55.83% comparable to a study in 2016 of digital eye strain which found prevalence of self reported symptoms of 65%. The same study showed females (69%) were more affected than males (60%)4 Another study7 found a similar finding in that, females had a higher prevalence of DES symptoms among 250 office workers. Our study showed similar results with females more affected (53.7%) as compared to males (25.4%), this may be due to gender difference in dry eye prevalence.8,9

Digital eye strain symptoms were found to be significantly higher in higher hours of computer use according to Hayes et al11 Which was similar to our study which showed, participants using digital devices more than 4 hours per day had higher DES (84.21%) than participants who used their digital device for less than 4 hours (15.79%).

Our study showed, participants with lower viewing distance (<33cm) had higher DES symptoms (67.3%) which was similar to findings in a study in 201612 where it was found that greater the viewing distance, lesser was the reported eye strain. Our study also assessed contrast used in digital device and hours of spent in air conditioned environment, and it was found that participants using low contrast (68.9%) and those who spent more than 4 hours per day (75.57%) in air conditioned environment had higher incidence of DES.

With optical correction related parameters, we analysed the effect of spectacles with and without antiglare and also contact lens use with relation to DES. We found that, participants with infrequent use of spectacle had high incidence of DES (80%) and that participants using antiglare had low percentage of symptomatic DES (13.63%). Contact lens users, had higher incidence of DES (100%) which was similar to a study done in 2016 where it was found that prolonged use of digital device with contact lens had higher prevalence of DES.13

Drawback of our study was a very small sample size. A prospective community-based study, especially where long hours of digital device usage is required will bring out the true prevalence rate and factors associated with digital eye strain.

Conclusion

DES is more prevalent in females, and higher the hours of use of digital device, greater is the risk of DES. A greater viewing distance and high contrast reduce the chances of developing DES and hence is advisable. Frequent use of habitual refractive correction is recommended with antiglare, however, prolonged use of contact lens especially in air conditioned environment should be avoided.

Conflict of Interest: None.

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