

Incidence of Dry Eye in the Students who are Active Electronic Users

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Abstract: ***Introduction:** Visual display terminal (VDT) use is increasingly common not only in VDT workers but also in the general population due to the widespread use of mobile devices and smart phones. Smartphone use has significant impact on daily life activity. Smartphones enable varied activities including browsing the web, watching video, group chatting, and social networking as compared to those in the previous generation. Therefore, time spent viewing at display screens has increased with the use of smartphone use than ordinary cellular phone. Previous studies reported that ordinary cellular phones affect human health as well as daily life. With the increasing use of smartphones, recent studies have reported an association between ocular health and smartphone use. Excessive use of smartphone also led to acute acquired comitantesotropia in adolescents. Excessive use of smartphones may affect the tear film and the ocular surface. Office workers who spent more than 4 h watching VDT experienced severe ocular symptoms, similarly, excessive smartphone use has been associated with multiple ocular symptoms. Blue light emitted from the smartphone screen had adverse effect on the corneal epithelial cells in humans. Overexposure to blue light caused deterioration of the tear film and increased levels of inflammatory markers. **Aim:** To determine the incidence of dry eyes in students visiting SMCH ophthalmology OPD. **Materials and methodology:** Schirmer's test was first performed on students to evaluate the degree of dry eyes and the value was recorded. The results were interpreted based on the following values and the degree of severity that is, Normal (>15mm), Mild (14-9mm), Moderate (8-4mm), Severe (<4mm). OSDI (Ocular surface disease index) was assessed on a scale of 0 to 100, with higher scores representing greater disability. The index demonstrates sensitivity and specificity in distinguishing between normal subjects and patients with dry eye disease. The values ranged from Normal (1-10). **Results:** 200 students of Saveetha Medical College students were evaluated in that According to schirmer's test, In the right eye - 144 were normal, 40 were mild, 14 were moderate & 2 were having severe dryness. In the left eye - 151 were normal, 38 were mild, 8 were moderate & 3 severe. According to OSDI SCORING, 142 were normal, 45 were mild, 13 were moderate dryness. **Conclusion:** Dry eye in the student population is due to more use of computers and cell phones*

Keywords: dry eyes, computers and cell phones, students

1. Aim

To determine the incidence of dry eyes in students who are active electronic device users.

2. Objectives

The primary objective of the study is to determine the incidence of dry eyes in student population. The secondary objective of the study is to determine the association between dry eyes and electronic device usage.

3. Introduction

Due to the widespread use of mobile devices and smart phones visual display terminal (VDT) use is increasingly common not only in VDT workers but also in general population. [1] Smartphone use has significant impact on daily life activity. Smartphones enable varied activities including browsing the web, watching video, group chatting, and social networking as compared to those in the previous generation. Therefore, time spent viewing at display screens has increased with the use of smartphone use than ordinary cellular phone. One study reported that the average time spent using a smartphone nearly doubled from 98 minutes per day in 2011 to 195 minutes in 2013. [2]

Human health as well as daily life is affected by the ordinary cellular phones users. Many health problems such as sleep disorder, headaches, leukemia, brain tumors and malignant

melanoma of the eyes are correlated with the use of cellular phones. [3,4] With the increasing use of smartphones, recent studies have reported an association between ocular health and smartphone use. [5] Excessive use of smartphone has been the leading cause for acute acquired comitantesotropia in adolescents. [6] Because increased time of use of smartphone is related to DED, excessive use of smartphones may affect the tear film and the ocular surface. Office workers who spent more than 4 h watching VDT experienced severe ocular symptoms, similarly, excessive smartphone use has been associated with multiple ocular symptoms. [3,7] Our recent study indicated that blue light emitted from the smartphone screen had adverse effect on the corneal epithelial cells in humans. [8] Overexposure to blue light caused deterioration of the tear film and increased levels of inflammatory markers and reactive oxygen species (ROS) production at the ocular surface of mice. [9]

4. Materials and Methodology

The study's protocol was approved by the institutional board review of Saveetha Medical College and Hospital, Thandalam. Informed consent was obtained by the students participating in the study and for performing tests regarding the study. Our study was prospective, which was done among the students visiting the OPD of the Department of Ophthalmology, Saveetha Medical College and Hospital, Thandalam. The study was conducted between January 2019 to March 2019. Our sample size was statistically evaluated by our college's statistician and it was 200. The

demographic details of the student participating in the study was recorded including the name, age, sex, date of visit, address, associated clinical symptoms. Schirmer's test was first performed on students to evaluate the degree of dry eyes and the value was recorded. The results were interpreted based on the following values and the degree of severity that is, Normal (>15mm) , Mild (14-9mm) , Moderate (8-4mm) , Severe (<4mm). OSDI (Ocular surface disease index) was assessed on a scale of 0 to 100, with higher scores representing greater disability. Sensitivity and specificity in distinguishing between normal subjects and patients with dry eye disease has been demonstrated in the index. The values ranged from Normal (1-10)

Inclusion criteria:

- Students age between 18 to 26.
- Students with the increased usage of cell phones and computers [>4hrs].
- Comes the ophthalmology OPD with the complaints of dry eyes.

Exclusion criteria

- All the students below the age of 18 and above 26.
- **Surgeries** -laser-assisted in-situ keratomileusis (LASIK).
- **Diseases** -(Sjogren's syndrome , rheumatoid arthritis, keratoconjunctivitis sicca. Collagen vascular diseases, diabetes, lupus, scleroderma, thyroid disorders ,vitamin A deficiency,Pink eye, Keratitis, Lagophthalmos(Problems that don't allow your eyelids to close the way they should),shingles, Bell's palsy,HIV infection& Parkinson's disease.
- **Medications** -(hormone replacement therapy, anti hypertensives,angiotensin-converting enzyme (ACE) inhibitors,antihistamines,decongestants,some sleeping pills ,Diuretics, antidepressants , some acne drugs, specifically isotretinoin-type medications, morphine and other opiate-based painkillers

Sample size

200 received in the Ophthalmology out- patient department who are willing to participate in the study with fulfilling the inclusion criteria.

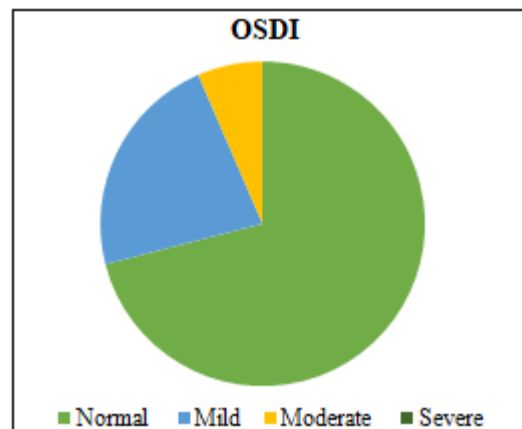
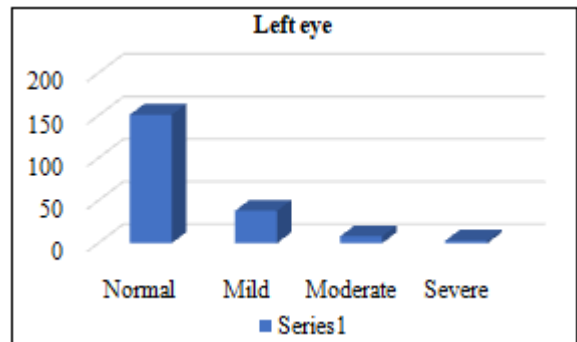
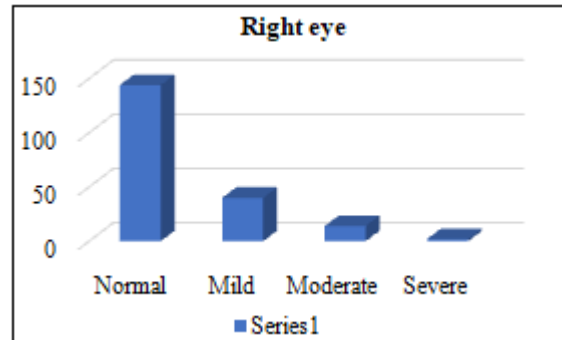
5. Result

The incidence of dry eye among the student population were analysed using the schirmer's test and by evaluating the OSDI (ocular surface disease index) score.

According to the schirmer's test ,In the right eye 72% were found to be normal , 20% were mild,7%were moderate and 1% were found to be having a severe dryness in the eye. In the left eye 75.5% were found to be normal , 19% were mild,4%were moderate and 1.5% were found to be having a severe dryness in the eye. According to the OSDI score,71% were found to be normal, 22.5% were mild,6.5%were moderate and none were found to be having a severe dryness in the eyes.

6. Discussion

The eyes are the most sensitive sense organ which produce tears all the time and not when the emotions are expressed . Tear film is a clear fluid which covers a pair of healthy eyes. It always remains static every time a person blinks . **The tear film is composed of three layers -oil , water and mucous.**



The **top layer** is the oily layer which produced from the edges of the eyelids which is precisely the meibomian glands. The oil helps in smoothing the tear surface and helps in reducing the rate of evaporation. Thus, it helps the eyes from not becoming dry and help in producing clear vision. The average person blinks for about 5 times every 60 seconds.

Every time a person blinks the eyelids will spread the thin film of tears evenly along the eyes's surface. Any problems of these eyelids will affect the blinking motion and prevents the tear film from spreading evenly.

The **middle layer** is the thickest, consisting of water and salt. The lacrimal glands, or tear glands, produce this layer. They cleanse the eyes and wash away particles and irritants. Problems with this layer can lead to film instability. If the water layer is too thin, the oil and mucus layers may touch each other, resulting in a stringy discharge, a hallmark sign of dry eyes.

The **inner layer**, mucus, enables the tears to spread evenly over the eyes. A malfunction can lead to dry patches on the cornea, the front surface of the eye.

The eyes commonly become dry when the blinking rate become low and when performing activities like **reading ,driving a vehicle , using a computer monitor which requires increased visual concentration**. Irregular oil levels can make the tears evaporate quickly leaving the eyes dry. Dry eyes can also occur as a result of digital eye strain. **Common cause of digital eye strain is the use of computer screens and digital devices**. Blue light is most notably seen in the **display screens of computers, electronic notebooks, smartphones** and other digital devices emit significant amounts of blue light. The amount of HEV light these devices emit is only a fraction of that emitted by the sun.

Blue light exposure may increase the risk of macular degeneration. The fact that blue light penetrates all the way to the retina (the inner lining of the back of the eye) is important, because laboratory studies have shown that too much exposure to blue light can damage light-sensitive cells in the retina. **The blue light emitted from the screens are of shorter wavelength and more energy**. This causes eye muscle fatigue thus causing muscle strain and eventually dry eyes.

Hence, **it has been advised to reduce the screen time, using screen filters, computer glasses and anti-reflective lenses to protect the eyes from blue light thus preventing dry eyes to some extent**.

Inflammation along the edge of the eyelids, known as blepharitis, as well as rosacea and some other skin disorders, can cause the meibomian glands to become blocked, making dry eyes more likely. **Blue light emitted from the smartphone screen had adverse effect on the corneal epithelial cells in humans**.

7. Conclusion

The study concludes that the incidences of the dry eye among the student population is due to the excessive usage of electronic gadgets like computers and mobile phones as recent study indicated that blue light emitted from the smartphone screen had adverse effect on the corneal epithelial cells in humans and that causes deterioration of the tear film.

References

- [1] Uchino M, Yokoi N, Uchino Y, Dogru M, Kawashima M, Komuro A, et al. Prevalence of dry eye disease and its risk factors in visual display terminal users: the Osaka study. *Am J Ophthalmol.* 2013;156(4):759–66. 10.1016/j.ajo.2013.05.040 [PubMed] [CrossRef] [Google Scholar]
- [2] Consumer smartphone usage 2014: headline results. Available at <http://www.analysismason.com>. Accessed April 26 2017.
- [3] Kim J, Hwang Y, Kang S, Kim M, Kim TS, Kim J, et al. Association between exposure to smartphones and ocular health in adolescents. *Ophthalmic Epidemiol.* 2016;23(4):269–276. 10.3109/09286586.2015.1136652 [PubMed] [CrossRef] [Google Scholar]
- [4] Heo JY, Kim K, Fava M, Mischoulon D, Papakostas GI, Kim MJ, et al. Effects of smartphone use with and without blue light at night in healthy adults: A randomized, double-blind, cross-over, placebo-controlled comparison. *J Psychiatr Res.* 2017;87:61–70. 10.1016/j.jpsychires.2016.12.010 [PubMed] [CrossRef] [Google Scholar]
- [5] Alim-Marvasti A, Bi W, Mahroo OA, Barbur JL, Plant GT. Transient smartphone “Blindness.” *N Engl J Med.* 2016;374(25):2502–2504. [PubMed] [Google Scholar]
- [6] Moon JH, Kim KW, Moon NJ. Smartphone use is a risk factor for pediatric dry eye disease according to region and age: a case control study. *BMC Ophthalmol.* 2016;16(1):188 10.1186/s12886-016-0364-4 [PMC free article] [PubMed] [CrossRef] [Google Scholar]
- [7] Kojima T, Ibrahim OMA, Wakamatsu T, et al. The impact of contact lens wear and visual display terminal work on ocular surface and tear functions in office workers. *Am J Ophthalmol.* 2011;152(6):933–940.e2. 10.1016/j.ajo.2011.05.025 [PubMed] [CrossRef] [Google Scholar]
- [8] Lee JB, Kim SH, Lee SC, Tsuyama A, Ogawa J, Matsumoto Y, et al. Blue light-induced oxidative stress in human corneal epithelial cells: protective effects of ethanol extracts of various medicinal plant mixtures. *Invest Ophthalmol Vis Sci.* 2014;55(7):4119–4127. 10.1167/iovs.13-13441 [PubMed] [CrossRef] [Google Scholar]
- [9] Lee HS, Cui L, Li Y, Choi JS, Choi JH, Li Z, et al. Influence of light emitting diode-derived blue light overexposure on mouse ocular surface. *PLoS One.* 2016;11(8):e0161041 10.1371/journal.pone.0161041 [PMC free article] [PubMed] [CrossRef] [Google Scholar]