THE PREVALENCE OF DRY EYE DISEASE IN ADOLESCENTS ASSOCIATED WITH PROLONGED USE OF SMART PHONES

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Introduction

Dry eye disease (DED) is defined according to TFOS DEWS II workshop as a multifactorial disease affecting the ocular surface and characterized by a loss of homeostasis of the tear film, accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles.

Visual display terminals (VDTs) are becoming a growing concern as VDT users frequently report symptoms such as eye discomfort, dryness, redness, light sensitivity, and tearing, along with headaches, neck and back pain, and reduced attention which are collectively referred to as Computer Vision Syndrome (CVS). COVID-19 pandemic has increased screen time, so the full impact—especially on dry eye disease (DED)—has yet to emerge. DED related to VDT use has been linked to reduced productivity in students. However, the prevalence of DED related to VDT use varies widely across studies.

Aim of the work

The aim of this article is to estimate the prevalence of dry eye disease (DED) among subjects (aged 12 to 16 years) who use smartphones for at least three hours per day. By focusing on a younger population without significant comorbidities or preexisting ocular conditions, the research seeks to isolate smartphone use as a key factor influencing ocular surface health and tear film stability. A cross-sectional study was conducted to evaluate the excessive use of smart phones.

Patients and methods

•**Inclusion criteria:**- Age: from age 12 to 16 years old. -Gender: Any gender. -Smart phone use for 3 hours or more per day.

•**Exclusion criteria:**

- History of eye drops use within the previous 2 weeks.
- History of a previous ocular surgery or ocular trauma.
- Systemic disorders affecting the ocular surface (Sjorgen syndrome, SLE and DM).
- Drugs which are associated with higher risk of dry eye disease (antihistamine, steroids, isotretinoin and NSAID). - Ocular disease (acute conjunctivitis, allergic conjunctivitis, blepharitis, meibomianitis and meibomian glands dysfunction).
- Contact lens wear.
- Lagophthalmos.

Subjects undergo comprehensive ophthalmic examination, DED questionnaire, non-invasive DED exams that were conducted by Ocular surface analyzer (OSA) by SBM Sistemi, Italy and involved (tear meniscus height estimation, non-invasive break up time, lipid layer interferometry and meibography) and invasive test that included (Schirmer test and fluorescein staining).

Results

The study included 50 subjects; of them 16 were males and 34 females aged 12–16 with a mean age of 14.83 ± 1.32 years.

Table (1):Relation between daily hours of phone use and Lipid layer interferometry (n = 50).

Lipid layer interferometry (nm)	Phone use				□□	MCp
	< 6 hrs (n = 24)		≥6 hrs (n = 26)			
	No.	%	No.	%		
OD						
A	1	4.2	4	15.4	3.133	0.392
B	19	79.2	17	65.4		
C	3	12.5	5	19.2		
D	1	4.2	0	0.0		
OS						
A	1	4.2	6	23.1	7.209*	0.039*
B	20	83.3	14	53.8		
C	2	8.3	6	23.1		
D	1	4.2	0	0.0		

Table (2): Comparison of meibomian gland loss area between the upper eyelids and the lower eyelids in the right and left eyes (n = 50).

Meibomian gland loss area	OD		OS	
	No.	%	No.	%
Upper				
Normal (<33%)	42	84.0	43	86.0
Abnormal (≥33)	8	16.0	7	14.0
Min. – Max.	0.0 – 55.0		0.0 – 38.0	
Mean ± SD.	17.12 ± 12.91		19.04 ± 10.34	
Median (IQR)	13.0 (8.0 – 23.0)		18.0 (12.0 – 26.0)	
Lower				
Normal (<33%)	35	70.0	42	84.0
Abnormal (≥33)	15	30.0	8	16.0
Min. – Max.	5.0 – 49.0		0.0 – 58.0	
Mean ± SD.	29.10 ± 9.80		25.28 ± 11.12	
Median (IQR)	27.50 (22.0 – 35.0)		23.50 (18.0 – 30.0)	
Z(p)	4.457*(<0.001*)		3.050*(0.002*)	

Meibomian glands loss area was compared between the upper eyelids and the lower eyelids of the right and left eyes. There was a statistically signification relation in the percentage of loss area between the upper and lower eyelids of the right eye (p<0.001*) and the left eye (p=0.002*) demonstrating more loss area percentage in the right and left lower eyelids than the right and left upper eyelids (Table 2) DED in the current study was diagnosed by DEWSII diagnostic criteria based on positive OSDI score and low NIBUT which included DED group (1) and DED was diagnosed based on positive OSDI score and positive fluorescein grading of grade 1, grade 2, grade 3 or grade 4 which included DED group (2). According to OSDI and NIBUT, 17 subjects (34%) were diagnosed as normal with no DED and 33 subjects (66%) were diagnosed with DED and represented as DED group (1) as seen in (Fig. 1).

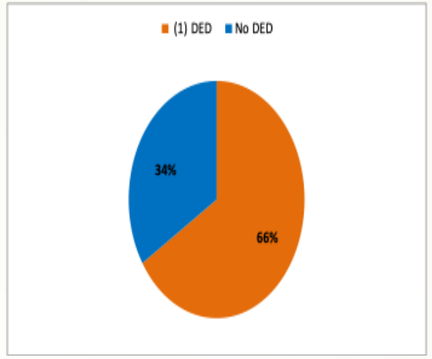

Figure (1): Prevalence of DED in the studied sample based on OSDI and NIBUT, 34% of the subjects had no DED and 66% of the subjects had DED (DED group 1).

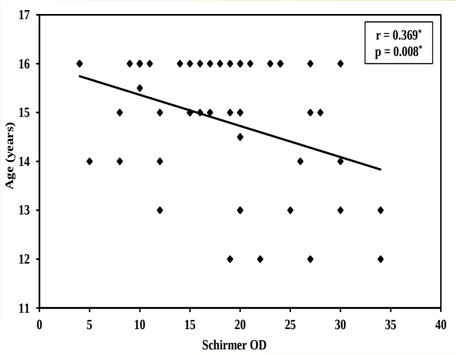

Figure (2): Correlation between age and Schirmer test wetting in the right eye (n = 50) demonstrating an inverse relationship. (p= 0.008*)

Conclusion

Symptomatic DED assessed by OSDI was highly prevalent. Objective tests revealed within normal tear volume reservoir as TMH height had average values, also tear volume and meibomian gland loss area was within normal, but tear film instability was noted as NIBUT demonstrated low results in most of the study subjects, however none of these findings had a significant relation to hours spent using smart phones per day except lipid layer interferometry that demonstrated significantly diminished lipid layer thickness in the left eyes of the subjects with smart phone use > 6 hours per day. The lower eyelids had significantly higher meibomian glands loss area than the upper eyelids, Schirmer test was significantly inversely related to aging and nearly half of participants showed signs of ocular surface damage. DED diagnosed according to DEWS diagnostic criteria based on positive OSDI and low NIBUT was highly prevalent and DED subjects had higher mean hours of smart phone use than subjects with no DED.