JAMP

Original Research Article

IMPACT OF DIGITAL SCREEN USE IN RELATION TO DRY EYE SYMPTOMS AND QUALITY OF SLEEP: A STUDY IN TERTIARY CARE CENTRE

Vandana Batham[1], Bhawani Shankar Modi[2], Chetna Thakur[3], Tejendra Singh[4]

[1]F H Medical College & Hospital, Etmadpur Agra, U.P, India.
[2]F H Medical College & Hospital, Etmadpur Agra, U.P, India.
[3]F H Medical College & Hospital, Etmadpur Agra, U.P, India.
[4]F H Medical College & Hospital, Etmadpur Agra, U.P, India.

Abstract

Background: Digital device use has become an integral part of our lifestyle due to ease of multifunctional approach. Digital eye symptoms include occular discomfort like burning & watering of eyes. Use of social media is prominent among younger adults with 87% of individuals aged 20–29 years. **Material & Methods:** 637 respondendts were asked prevalidated 10 item Mini Sleep Questionnaire (MSQ) to check the quality of sleep. The Standard Patient Evaluation of Eye Dryness (SPEED) dry eye scale was used to findout the prevalence of dry eye symptoms among health care students at tertiary care centre. **Results:** In our study 78.80% respondents reported dry eye symptoms. The association between digital screen time spent and speed score which was found more significant with p-value <0.0001 when daily screen time use and sleep quality (MSQ score) was compared, there was no significant association found (p =0.161). Good sleep wake quality was observed in 50.98% students in those screen time use was <2 H daily. The association between SPEED score and sleep quality (MSQ score) which was found highly significant (P-value < 0.0001). **Conclusion:** our study deleneats increased screen time use has an ill effect on health like dry eye and sleep deprivation which may pose global burden to community.it is strongly recommended to digital device users that preventive measure should be taken on priority like use of computer glasses, eye lubricating drops and proper sleep specially.

INTRODUCTION

In new developed era involvement with digital devices has increased in recent years, particularly in the field of mobile media.[1] Use of social media is prominent among younger adults with 87% of individuals aged 20–29 years reporting use of two or more digital devices simultaneously.[2]Computer vision syndrome has a prevalence of more than 50% among computer users. Computer vision syndrome (CVS) is characterised by a range of eye and vision-related symptoms and has been a recognised health problem for over 20 years.[3,4] Dry eye from digital media use is produced due to decreased and incomplete blinks leading to an unstable tear film.[5] Dry eye causes a major financial burden to patients and society through both the direct cost of treatment and indirect cost of lost productivity at work.[6] On the other hand, sleep is essential to our physical and mental well-being.Poor quality and short duration of sleep have been shown to reduce quality of life.[7,8] An increased digital device use and occular health problems motivated us for the further study specially in contest of students of tertiary health care center.

Aim of the study was to enhance the knowledge and provide additional information about the impact of digital devices use on quality of sleep and occular problems, especially in this modern era of technology and social media.

1. To find out the prevalence of dry eye symptoms among health care students.
2. To evaluate the association of daily screen time and prevalence of dry eye strain among health care professional students
3. To assess the association of daily screen time and the quality of sleep
4. To correlate between the dry eye and quality of sleep

2415

MATERIALS AND METHODS

Study Type
Cross sectional study was conducted and comparative questionnaire were asked to participants. A pre structured and pre validated survey questionnaire were used to collect relevant information required for study.

Study Setting
The study was conducted at F H medical college & Hospital,Agra U.P that accommodates > 1000 students in various medical streams (medical / paramedical / nursing / BAMS).

Sampling strategy: the study population includes students of various medical streams of F H Medical College & Hospital those attending classes in campus.

Inclusion Criteria
1. College going students between the age 18-30 years
2. Those give consent for the study

Exclusion Criteria
Those having preexisting medical conditions, any past history of eye surgery, on the treatment for diagnosed chronic eye disease, having primary insomnia, taking benzodiazepines or hypnotics or other any drug that alters sleep pattern were excluded from the study.

Data Collection Procedure
Ethical approval for the study was taken from institutional ethics committee of F H Medical College on date 13/07/2022 with reference No. FHMC/IEC/R.Cell/2022/11. Duration of study was from 13/07/2022 to 21/03/2023. Informed consent were also taken from the participants prior to the study.

Sample Size Calculation
- Based on previous study: 95% confidence interval, 5% margin of error & population proportion of 87.2% of dry eye symptoms[9], the sample size obtained was 172 using the formula.

$$n = \frac{Z_{1-\alpha/2}^2 p(1-p)}{d^2}$$

$$\text{where } Z_{1-\alpha/2} = 1.96$$

$$p = \text{Expected proportion}$$

$$d = \text{Absolute precision.}$$

Questionnaire
A 10 item Mini Sleep Questionnaire (MSQ) were used to check the quality of sleep.[10]

The Standard Patient Evaluation of Eye Dryness (SPEED)[11]dry eye scale was used to find out the prevalence of dry eye symptoms among health care students.

General characteristic features were asked to participants for collection of data like screen time use and to rule out any chronic illness specially related to eye & sleep pattern. Thus questionnaire contains following category
1. Demographic and general questions
2. SPEED questionnaire (for assessment of dry eye)
3. Mini sleep Questionnaire consist of 10 items based on the 7 point Likert scale (for assessment of sleep quality): in accordance with validated Pittsburgh Sleep Quality Index (PQSI).

Diagnosis and scoring
For the Sleep Wake parameter, the respondents score was divided into four categories[10]:10–24 points for Good Sleep Wake quality,25–27 points for mild Sleep Wake difficulties, 28–30 points for moderate Sleep Wake difficulties and >30 points for Severe Sleep Wake difficulties.

For the Dry Eye parameter, based on the score of the items on severity and frequency of the dry eye symptoms, the respondents were divided into three categories[11]: 0–5 (no symptoms),6–14 (mild to moderate symptoms),15–28 (severe symptoms)

Statistical analysis: In the present study total of 654 students were participated and 17 student's response were excluded as per exclusion criteria thus effective sample was found 637. All the data collected from respondant exported as microsoft excel sheets then analysed by using SPSS software. Quantitative variabels were represented in mean ± standarad deviation while qualitative variabels were represented in numbers & percentages. Continuous variables and descrete variables were compared by student's T test and Chi-square test respectively. P value less than 0.05 was considered statistically significant for the all tests.

RESULTS

[Table-1] summarizes the characteristics of the respondents. Total 637 students, male-377 (59.18%) & female-260 (40.82%) of various medical streams were participated. All the respondents were classified into three groups age wise for the convenience:18-21Y, 22-26Y, 27-30Y. Most of the students were aged between18-21Yrs (49.45%) followed by 42.55% (22-26Y) and 8%(27-30Y). Most frequently used device was mobile screen in 555 students (87.13%) followed by tablets/ipad (8.5%) then laptops (4.4%). Table shows that 448 (70.4%) participants had spent >4 hours daily ondigital devices. In our study 502 (78.80%) respondents reported dry eye symptoms.SPEED score was found between 0-5 in 314 (49.30%) respondents, 6-14 score in 208 (32.65%) and 15-28 score in 115 (18.05%) participants. Accordingly, Good sleep wake quality found in 235(36.90%) and severe sleep wake difficulty was seen in 157(24.65%) participants respectively.

2416

International Journal of Academic Medicine and Pharmacy (www.academicmed.org)
ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 1: Characteristics of the study population

	Overall count 637(n)		% (n)
Sex	MALE	377	59.18
	FEMALE	260	40.82
Age(years)	18 – 21	315	49.45
	22 -26	271	42.54
	27 – 30	51	8.01
Maximum digital divice used	MOBILE	555	87.13
	Laptop/desktop	28	4.40
	Tablet	54	8.48
No of Hours (H)daily time spent	0 -2 H	51	8.01
	2 - 4 H	138	21.66
	4 -6 H	227	35.64
	6 Or More	221	34.69
Dry eye symptoms reported	Yes	502	78.80
	No	135	21.20
Dry eye	No dry eye	314	49.30
	Mild to Moderate dry eye	208	32.65
	Severe dry eye	115	18.05
Sleep wake quality	Good sleep wake quality	235	36.89
	Mild sleep wake difficulty	113	17.74
	Moderate sleep wake difficulty	132	20.72
	Severe sleep wake difficulty	157	24.65
Spectacle Use	Yes	267	41.92
	No	370	58.08

Table 2: Association between Screen time and dry eye symptoms (speed score)

Screen time (hrs)	Speed Score									
	0-5 (No Dry eye)		6-14 (Mild-moderate)		15-28 (severe)					
	N	%	N	%	N	%	N	%		
0-2	42	82.35	7	13.73	2	3.92	51	100.00	Chi-square value=326.56 p-value =<0.0001	
2-4	106	76.81	28	20.29	4	2.90	138	100.00		
4-6	116	51.10	101	44.49	10	4.41	227	100.00		
>6	1	2.21	72	32.58	99	44.80	221	100.00		
Screen time and mean Speed score										
Screen time (hrs)	N		Speed score		f-value		p-value		CD at 5%	
			Mean	SD						
0-2	51		2.84	4.49	87.81		<0.0001		0.23	
2-4	138		3.46	4.60						
4-6	227		5.86	4.89						
>6	221		12.43	7.72						

[Table 2] shows association between digital screen time spent on the device and speed score which was found more statistically significant with p-value <0. 0001.Students who had spent >6H on screen were found severe dry eye symptoms (44. 80%).Accordingly mean speed score was also found statistically significant with p-value <0.0001.

Table 3: Association between Screen time and sleep wake quality (MSQ score)

Screen time (hrs)	MSQ score									
	10-24 (Good sleep)		25-27 (Mild)		28-30 (Moderate)		>30 (Severe)			
	N	%	N	%	N	%	N	%		
0-2	26	50.98	11	21.57	5	9.80	9	17.65	Chi-square value=13.03 p-value =0.161	
2-4	55	39.86	27	19.57	22	15.94	34	24.64		
4-6	77	33.92	40	17.62	56	24.67	54	23.79		
>6	77	34.84	35	15.84	49	22.17	60	27.15		
Screen time and mean MSQ										
Screen time (hrs)	N		MSQ		f-value		p-value		CD at 5%	
			Mean	SD						
0-2	51		22.78	6.59	3.931		0.010		0.29	
2-4	138		25.38	8.69						
4-6	227		26.41	6.95						
>6	221		26.31	7.14						

[Table 3] describes that when daily screen time use and sleep quality (MSQ score) was compared, there was no significant association found (p =0.161) however table depicts good sleep wake quality were observed in50.98% students in those screen time use was lesser than 2 hour daily while poor sleep quality (MSQ score

2417

International Journal of Academic Medicine and Pharmacy (www.academicmed.org)
ISSN (O): 2687-5365; ISSN (P): 2753-6556

>30) were seen in 27.15% participants those screen time use was more than 6 hour daily. When screen time and mean MSQ score was compared it was found significant with P value =0.010.

Table 4: Association between MSQ score and Speed score

MSQ score	Speed Score						Total		
	0-5 (No Dry eye)		6-14 (Mild-moderate dry eye)		15-28 (severe dry eye)				Chi-square value=46.12 p-value =<0.0001
	N	%	N	%	N	%	N	%	
10-24 (Good sleep-wake quality)	151	64.26	46	19.57	38	16.17	235	100	
25-27 (Mild sleep-wake difficulty)	58	51.33	36	31.86	19	16.81	113	100	
28-30 (Moderate sleep-wake difficulty)	52	39.39	53	40.15	27	20.45	132	100	
>30 (Severe sleep- wake difficulty)	53	33.76	73	46.50	31	19.75	157	100	

MSQ score and mean Speed score						
MSQ score	N	Speed Score		f-value	p-value	CD at 5%
		Mean	SD			
10-24 (Good sleep)	235	5.76	7.09	7.283	<0.0001	0.28
25-27 (Mild)	113	7.21	7.24			
28-30 (Moderate)	132	5.76	7.09			
>30 (Severe)	157	8.86	6.76			

Above table delineating the association between SPEED score and sleep quality (MSQ score) which was found highly significant with P-value < 0.0001 means patients with no dry eye symptoms had good sleep-wake quality. Likewise 40.15% and 46.50% respondents those speed score has between 6-14 suffererd from moderate sleep-wake difficulties and severe sleep wake difficulties respectively. When MSQ score and mean Speed score was compared it also shows p-value <0.0001 which was highly significant.

DISCUSSION

In recent Era digital device screen use has been increased on large scale by professionals or students or social media users. Use of social media is prominent among younger adults with 87% of individuals aged 20–29 years reporting use of two or more digital devices simultaneously.[2] In our study 502 (78.80%) respondents out of 637 reported dry eye symptoms. Many author described the prevalence of dry eye symptoms in various study population as given below.

Table 5: Prevalence of digital eye symptoms:a comparison between various studies

Author	year of study	study population	prevalence of dry eye sypmtoms
present study	2022	637 medical students	78.80%
Gupta PC et al[9]	2021	547 colloge girls of northern india	87.20%
Mohammed F el al[12]	2020	227 medical students	89.90%
Abudawood et al[13]	2019	651 medical students in Jeddah	95%
Sanodiya et al[14]	2019	200 college students in Indore	89.50%
Iqbal et al[15]	2017	100 medical students in Egypt	86%
Logaraj et al[16]	2014	201 college students in Chennai	78.60%

In present study association between digital screen time and speed score which was found more significant with p-value <0. 0001.Students who had spent >6H on screen were found severe dry eye symptoms(44.80%) while no dry eye symptoms develops in those 82.35% respondandts who had spent less screen time daily (0-2 H). Mohammed F et al.[12] studied in 2020 on 227 medical students also found significant association between digital screen time and dry eye symptoms in those who used >4 H.

Agrawal et al.[17] in 2013 described that occularcompliants were more in those using devices >6H daily.Moon etal.[18] in 2016 studied on 916 school childrens also concluded dry eye symptoms were more among childrens with a higher mean duration of device use.

Our analysis 32.65% and 18.05% participants encountered with mild to moderate and severe dry eye symptoms respectively. Gupta PC et al[9] in 547 colloge girls of northern india observed 53.24% participants were facing mild/moderate dry eyes and 14.46% with severe dry eye symptoms.

2418

Our results shows poor sleep quality (MSQ score >30) were seen in 27.15% participants those screen time use was more than 6 hour a day.When screen time and mean MSQ score was compared it was found significant with P value =0.010.Recent review founds 90% of the studies found an association between screen use & late bed time/ diminished sleep time.[19].

Study found that 40.10% respondents with severe dry eye symptoms had also reported moderate to severe sleep-wake difficulties. It is anticipated that >40% of people with dry eye have sleep disorders.[20] Magno et al[21] 2021 found that poor sleep quality was much more prevalent almost 44.9% of those with highly symptomatic dry eye. Sleep deprivation may leads to challenge for students and results in lesser academic scores, impaired learning.[22]

A Korean study[23] reveals individuals having a sleeping length lesser than 5 h were found to have 20% increased chances of suffering from dry eye in comparison to those people with more than 6 h of sleep duration.

Overall digital device use has been found increased on mass level in population during new digital world which impacts health directly or indirectly. It may cause dry eye problems, sleep deprivation,unhealthy life style,obesity,enhanced junk food consumption,increased sugar intake and obeviously computer vision syndrome.

CONCLUSION

Our study depicts increased screen time use has an ill effect on health like dry eye and sleep deprivation which may pose global burden to community.it is strongly recommended to digital device users that preventive measure should be taken on priorty like use of computer glasses,eye lubricating drops and proper sleep specially.

Conflict of interest none.

REFERENCES

1. E-Marketer. Digital set to take majority share in UK time spent with media in 2016. 2016. https://www. emarketer. com/ Article/ Digital- Set- Take- Majority- Share- UK- Time- Spent- with- Media- 2016/1013039 (accessed 10 Mar 2017).
2. The Vision Council. Eyes overexposed: The digital device dilemma: digital eye strain report. 2016. https://www. thevisioncouncil. org/ content/ digital- eye- strain (accessed 10 Mar 2018).
3. Dain SJ, McCARTHY AK, Chan-Ling T. Symptoms in VDU Operators. Optometry and Vision Science 1988;65:162–7.
4. Costanza MA. Visual and ocular symptoms related to the use of video display terminals. J BehavOptom1994;5:31–6.
5. Hirota M, Uozato H, Kawamorita T, Shibata Y, Yamamoto S. Effect of incomplete blinking on tear film stability. Optom Vis Sci 2013;90:650–7.
6. McDonald M, Patel DA, Keith MS, Snedecor SJ. Economic and humanistic burden of dry eye disease in europe, North America, and Asia: a systematic literature review. Ocul Surf 2016;14(2):144–67.
7. Augner C. Associations of subjective sleep quality with depression score, anxiety, physical symptoms and sleep onset latency in students. Cent Eur J Publ Health 2011;19(2):115–7.
8. Chen X, Gelaye B, Williams MA. Sleep characteristics and health-related quality of life among a national sample of American young adults: assessment of possible health disparities. Qual Life Res 2014;23(2):613–25.
9. Gupta PC,RanaM,RattiM,DuggalM,AgrawalA,Khurana S et al.Association of screen time,quality of sleep and dry eye in college going women of northern india.Indian J Ophthalmol2022;70:51-8.
10. V, I., J, S., & O, C. (2018). A survey on sleep assessment methods.PeerJ, 6(5). https://doi.org/10.7717/PEERJ.4849.
11. Ngo W, Situ P, Keir N, Korb D, Blackie C, Simpson T. Psychometric properties and validation of the standard patient evaluation of eye dryness questionnaire. Cornea 2013;32:1204–10.
12. Mohammed F,SomasundaranS,PoothattaJ.Digital eye strainamong undergraduate medical students during the COVID 19 pandemic:A cross sectional survey. Kerala J Ophthalmol2021;33:284-90.
13. Abudawood GA, Ashi HM, Almarzouki NK. Computer vision syndrome among undergraduate medical students in King Abdulaziz University, Jeddah, Saudi Arabia. J Ophthalmol2020;2020:1‑7.
14. Sanodiya I, Kujur A, Sirohi S, Khatri AK. A cross sectional overview of digital eye strain: a growing health concern in this digital age in central India (Madhya Pradesh). Int J Community Med Public Health 2019;6:4828.
15. Iqbal M, El‑Massry A, Elagouz M, Elzembely H. Computer vision syndrome survey among the medical students in Sohag University Hospital, Egypt. Ophthalmol Res 2018;8:1‑8.
16. Logaraj M, Madhupriya V, Hegde S. Computer vision syndrome and associated factors among medical and engineering students in chennai. Ann Med Health Sci Res 2014;4:179‑85.
17. Agarwal S, Goel D, Sharma A. Evaluation of the Factors which Contribute to the Ocular Complaints in Computer Users. J Clin Diagn Res 2013;7:331‑5.
18. Moon J, Choi SH, Yoon CH, Kim MK. Gut dysbiosis is prevailing in Sjögren's syndrome and is related to dry eye severity. PLoS One 2020;15:e0229029.
19. Hale L, Kirschen GW, LeBourgeois MK, Gradisar M, Garrison MM, Montgomery‑Downs H, et al. Youth screen media habits and sleep: Sleep‑friendly screen behavior recommendations for clinicians, educators, and parents. Child AdolescPsychiatr Clin N Am 2018;27:229–45.
20. Kawashima M, Uchino M, Yokoi N, Uchino Y, Dogru M, Komuro A, et al. The association of sleep quality with dry eye disease: The Osaka study. Clin OphthalmolAuckl NZ 2016;10:1015–21.
21. MagnoMS,UtheimTP,SniederH,HammondCJ,VehofJ.The relationship between dry eye and sleep quality. The Occular Surface 20(2021);13-19.
22. Hershner SD, Chervin RD. Causes and consequences of sleepiness among college students. Nat Sci Sleep 2014;6:73–84.
23. Lee W, Lim S‑S, Won J‑U, Roh J, Lee J‑H, Seok H, etal. The association between sleep duration and dry eye syndrome among Korean adults. Sleep Med 2015;16:1327–31.

2419

International Journal of Academic Medicine and Pharmacy (www.academicmed.org)
ISSN (O): 2687-5365; ISSN (P): 2753-6556