The Pharma Innovation Journal 2023; 12(1): 551-556

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(1): 551-556
© 2023 TPI
www.thepharmajournal.com
Received: 01-10-2022
Accepted: 05-11-2022

Dabhi Maya
Department of Family Resource Management, ASPEE College of Nutrition and Community Science, Sardarkrushinagar Dantiwada Agricultural University, Dantiwada, Gujarat, India

Surabhi Singh
Department of Family Resource Management, ASPEE College of Nutrition and Community Science, Sardarkrushinagar Dantiwada Agricultural University, Dantiwada, Gujarat, India

Thakkar Neha
Department of Family Resource Management, ASPEE College of Nutrition and Community Science, Sardarkrushinagar Dantiwada Agricultural University, Dantiwada, Gujarat, India

Corresponding Author:
Dabhi Maya
Department of Family Resource Management, ASPEE College of Nutrition and Community Science, Sardarkrushinagar Dantiwada Agricultural University, Dantiwada, Gujarat, India

Prevalence of visual problems and associated ergonomic factors among students

Dabhi Maya, Surabhi Singh and Thakkar Neha

Abstract
India turned out to be the country with world's second largest internet using population. Electronic gadgets have been playing a vital role in our daily life. It is very hard for us to imagine one day without computers and mobile phones. Present study was conducted in Sardarkrushinagar Dantiwada Agricultural University at Sardarkrushinagar campus and aimed to assess the visual health problems along with associated ergonomic risk factors amongst students. A representative sample of 150 university students was selected randomly from Sardarkrushinagar Dantiwada Agricultural University. Demographic profile of students, duration of digital screen exposure, posture, lighting, types of gadget used by students, viewing distance and resolution of screen were selected as independent variables, whereas, visual health problems of students as dependent variables. An interview schedule was formed which comprised questions related to demographic profile and prevalence of visual problems amongst university students. Data was collected through personal interview technique. Statistical analysis was done by calculating percentage, frequency and correlation coefficient.

Keywords: Prevalence of visual problems, associated ergonomic factors, among students

Introduction
Sen *et al.* (2020) [22] stated that Reports of International Telecommunication Union (ITU) World Telecommunication database shows the percentage of global population using internet have risen from 0.049% in 1990 to 48.90% in 2017. After the outbreak of the COVID-19 pandemic in 2020, the mobile and laptops have become an integral part of student life as the educational institutions were closed and the students had to do online classes.
The students not only use electronic gadgets for attending their online classes and studying but also use these devices for various entertainment purposes. Owing to these activities, the exposure of the students to these gadgets are becoming long and it is having a significant impact upon the health of the students (Chakraborty and Sen, 2021) [3].
Jamaludin *et al.* (2020) [18] found that 48.10% students were spending time more than 6 hours on electronic gadgets and the remaining 51.90% students spending time less than 6 hours on electronic gadgets. Venugopal *et al.* (2021) [19] concluded that the average time spent on gadgets increased from 4.75 hrs/day before lockdown to 11.36 hrs/day during lockdown among participants.
In another study, it was found that 95.50% of subjects were using smartphones, 61.50% of subjects were using laptop/computer. 58.00% were spending time with gadgets less than 4 hours while 6.50% were spending more than 10 hours. The study revealed health problems of participants as headache (30.00%), migraine (1.00%), depression (7.00%) and other problems like backache, weakness, joint pain and others (Marskole, 2022) [16].
Eye related symptoms were reported as the most common health problems among VDT users (Thomson *et al.* 1998) [25]. Various symptoms such as eyestrain, tired eyes, headache, blurred vision, irritation, burning sensation, redness, double vision, neck pain and backache were reported which might be caused by combination of individual visual problems, poor workplace conditions and improper work habits (Cole *et al*., 1996) [5].
Venkatesh *et al.* (2016) [26] studied the prevalence of vision related problems. It was found that there was an association between duration of computer use and visual symptoms. Symptoms were more in people who did not use anti-glare glasses.
Eye strain and visual fatigue (89%), headache (81%), neck and back pain (77%) were the most severe and frequently reported symptoms among the participants in the study conducted by Rampersad *et al.* (2013) [17]. It was concluded that the computer workstations were not ergonomically designed and users were not aware that they were not adhering to ergonomic

requirements for computer use. Irawaty *et al*. (2021) [9] found that 82.7% of respondents complained of having more than five symptoms and as many as 98.5% had CVS, 90.6% of respondents complained about fatigue eyes, followed by 80.5% complained about eye strain symptoms, and 80.5% complained about headaches, 42.9% of respondents have a lack of knowledge about CVS, and only 15.4% of respondents have a good level of knowledge about CVS.

Above cited studies throws light on various visual problems occurred due to excessive use of computer or electronic gadgets. Continuous use of gadgets may lead to many visual problems to them. Though, ergonomic interventions may prevent the visual stress to some extent. The present study was conducted to know the prevalence of visual problems and associated ergonomic factors amongst students of SDAU campus.

Research methodology

A list of students enrolled in Sardarkrushinagar Dantiwada Agricultural University was obtained from the office. Simple random sampling method was used for selecting SDAU students at Sardarkrushinagar Campus. Total one fifty students were selected. Interview schedule was prepared to collect data.

Result and Discussion

Prevalence of visual problems amongst university students

Table 1: Distribution of respondents according to electronic gadgets used by them

(n=150)

Sr. No.	Electronic gadget	*f*	%
1.	Computer + Laptop + Tablet + Mobile	14	09.3
2.	Computer + Laptop + Mobile	54	36.0
3.	Computer + Mobile	02	01.3
4.	Laptop + Tablet + Mobile	08	05.3
5.	Laptop + Mobile	70	46.7
6.	Mobile	02	01.3
	Total	150	100.0

The Table 1 shows that maximum 46.7 percent respondents were using laptop and mobile followed by 36.0 percent using computer, laptop and mobile. A few (9.3%) were using computer, laptop, tablet and mobile all four gadgets. The findings are pointer to the fact that laptop and mobile were the most popular gadgets amongst students. Out of 150 respondents, two students (1.3%) were using only mobile not any other gadget.

Table 2: Purpose of using computer

(n=150)

Sr. No.	Purpose of using	Types of gadgets: Computer	
		f	%
1	Preparing assignments	26	17.3
2	Study	60	40.0
3	Searching research material	15	10.0
4	Recreational activity	05	03.3
5	Social networking	05	03.3
6	Not using	80	53.3

f= Frequency % = Percentage n = Sample size * Multiple responses

Table 2 indicates that maximum 40.0 percent of the respondents used computer for study, while more than half (53.3%) respondents were not using computer. Some of the students were using computer for other purposes also such as preparing assignments (17.3%), searching research materials (10.0%), recreational activities (3.3%) and social networking (3.3%).

Table 3: Purpose of using laptop

(n=150)

Sr. No.	Purpose of using	Types of gadgets: Laptop	
		f	%
1	Preparing assignments	129	86.0
2	Study	134	89.3
3	Searching research material	088	58.6
4	Recreational activity	042	28.0
5	Social networking	040	26.6
6	Not using	004	02.7

f= Frequency % = Percentage n = Sample size * Multiple responses

The Table 3 shows that maximum (89.3%) respondents used laptop for study followed by 86.0 percent respondents who used laptop for preparing assignments. 58.6 percent respondents used laptop for searching research material followed by recreational activity and social networking i.e., 28.0 and 26.6 percent respectively. In nutshell, major purposes for using laptop by students were assignment preparation and study.

Table 4: Purpose of using tablet

(n=150)

Sr. No.	Purpose of using	Types of gadgets: Tablet	
		f	%
1.	Preparing assignments	09	06.0
2.	Study	16	10.6
3.	Searching research material	06	04.0
4.	Recreational activity	07	04.6
5.	Social networking	01	07.0
6.	Not using	128	85.3

f= Frequency % = Percentage n = Sample size * Multiple responses

The Table 4 shows that tablet was not used by majority of the respondents (85.3%). Rest of the respondents used it for several purposes such as study, preparation of assignments, searching research materials and recreational activities.

Table 5: Purpose of using mobile

(n=150)

Sr. No.	Purpose of using	Types of gadgets: Mobile	
		f	%
1	Preparing assignments	41	27.3
2	Study	67	44.6
3	Searching research material	67	44.6
4	Recreational activity	50	33.3
5	Social networking	144	96.0

f= Frequency % = Percentage n = Sample size * Multiple responses

The Table 5 shows that all the respondents were using mobile. Social networking was cited as the major purpose for using mobile by greater part of the respondents (96.0%). Though, 44.6 percent respondents used mobile for study and searching research material followed by 27.3 and 33.3 percent respondents for preparing assignment and recreational activity respectively.

Table 6: Distribution of respondents according to the frequency of using electronic gadget

(n=150)

Gadget	Daily		Weekly		Occasionally		Anytime the need arises	
	f	%	*f*	%	*f*	%	*f*	%
Computer	01	07.0	24	16.0	18	12.0	27	18.0
Laptop	89	59.3	27	18.0	04	02.7	26	17.3
Tablet	04	02.7	03	02.0	12	08.0	04	02.7
Mobile	149	99.3	00	00.0	00	00.0	01	07.0
Total	150	100.0	150	100.0	150	100.0	150	100.0

It can be inferred from Table 6 that maximum 18.0 percent respondents used computer at the time when need arises followed by occasionally (16.0%) and minimum (7%) respondents used it daily. About sixty percent respondents used laptop daily followed by weekly (18.0%) and at the time of need (17.3%). As far as tablet is concerned, eight percent respondents used it occasionally, a very few respondents (2.7%) each used it daily and at the time of need. All the respondents except one used mobile daily. It is evident from analysis of data that mobile was the most popular electronic gadget amongst students which was used on daily basis. Another popular and frequently used gadget was laptop. Tablet was found the least popular electronic gadget amongst students.

Table 7: Distribution of respondents on the basis of hours/day of using computer/laptop

(n=150)

Sr. No.	Use of computer/laptop per day	*f*	%
1.	Less than one hour	19	12.7
2.	1-3 hrs	48	32.0
3.	3-5 hrs	36	24.0
4.	5-7 hrs	39	26.0
5.	More than 7 hrs	08	05.3
	Total	150	100.0

The Table 7 illustrates that maximum (32.0%) percent respondents were using computer or laptop for 1-3 hours in a day followed by 5-7 hours per day (26.0%), 3-5 hours per day (24.0%) and less than one hour (12.7%). It is imperative to note here that about five percent respondents were using laptop or computer for more than 7 hours per day. It can be inferred from the data that half of the respondents were using computer or laptop for more than three hours per day.

Table 8: Eye fatigue while using computer/laptop

(n=150)

Sr. No.	Eye fatigue while using computer/laptop	*f*	%
2	After less than one hour	11	7.30
3	After one to two hours	34	22.7
4	After two to three hours	38	25.3
5	After three to four hours	51	34.0
6	After more than four hours	16	10.7
	Total	150	100.0

It is depicted in the Table 8 that maximum (34.0%) respondents started feeling eye fatigue after 3-4 hours of using computer or laptop followed by 25.3 percent who used to feel eye fatigue after two to three hours. About twenty three percent respondents reported that they felt eye fatigue just after one to two hours while using computer or laptop. Looking to the extreme, 7.30 percent felt eye fatigue in less than one hour of using computer or laptop and 10.7 percent felt eye fatigue after using these gadgets more than four hours.

Table 9: Visual problems faced by students while using computer/laptop

(n=150)

Visual problems	Always		Frequently		Sometimes		No	
	f	%	*f*	%	*f*	%	*f*	%
Headache	19	12.7	17	11.3	72	48.0	042	28.0
Blurred vision	03	02.0	12	08.0	25	16.7	110	73.3
Tiredness of eye	10	06.7	27	18.0	61	40.7	052	34.7
Watering of eyes	07	04.7	10	06.7	35	23.3	098	65.3
Redness of eyes	02	01.3	08	05.3	17	11.3	123	82.0
Dry eye/discomfort	02	01.3	07	04.7	51	34.0	090	60.0
Double vision	02	01.3	03	02.0	19	12.7	126	84.0
Wear spectacles	24	16.0	02	01.3	09	06.0	115	76.7
Difficulty focusing for near vision	00	00.0	04	02.7	31	20.7	115	76.7
Heavy eyelids	03	02.0	07	04.7	46	30.7	094	62.7
Excessive blinking	00	00.0	04	02.7	16	10.7	130	86.7
Itching eyes	00	00.0	07	04.7	27	18.0	116	77.3
Irritation in eyes	06	04.0	05	03.3	34	22.7	105	70.0

Analysis of data presented in Table 9 shows that headache was the most common visual problem reported by respondents followed by tiredness of eyes. Forty eight percent respondents faced headache problem sometimes, while 11.3 percent respondents faced it frequently. Two percent respondents reported blurred vision problem always, eight percent faced it frequently and about seventeen percent faced it sometimes while 73.3 percent respondents never faced it. Tiredness of eyes was sometimes reported by more than forty percent respondents and frequently by 18.0 percent respondents. Dry eye, heavy eyelids, irritation in eyes and difficulty in focusing near vision were the problems reported sometimes by 34.0 percent, 30.7 percent, 22.7 percent and 20.7 percent respondents respectively. About 16.0 percent respondents were having spectacles also. Another study supports the findings that eye strain and headaches may result from long hours of work per day at the computer and often occur toward the front of the head and typically occur toward the end of the day (Anshel, 2005) [2]. Kokab and Khan (2012) [12] also reported that the increased usage of computers have led to variety of ocular symptoms which includes eye strain, tired eyes, irritation, redness, blurred vision and diplopia, collectively referred to as Computer Vision Syndrome.

Table 10: Ways adopted to prevent eye strain during or after using electronic device

(n=150)

Sr. No.	Ways to prevent eye strain	*f*	%
1.	Rest pause	35	23.3
2.	20-20-20 rule	01	00.7
3.	Closing eyes for few minutes	54	36.0
4.	Wash your eyes	115	76.6
5.	Using screen guard	01	00.7
6.	Decreasing brightness of the device	33	22.0
7.	Wear UV light spectacles	01	00.7

It was found that maximum (76.6%) respondents used to wash their eyes to prevent eye strain. Thirty six percent respondents stated that they used to close their eyes for few minutes, about 23.3 percent took rest pauses and 22.0 percent decreased the brightness of their electronic device. Hence, students were adopting different ways so that they could prevent eye strain.

Table 11: Difficulty in reading activities on the monitor due to visual fatigue

(n=150)

Sr. No.	Difficulty in reading activities	*f*	%
1.	Always	53	35.4
2.	No	45	30.0
3.	Sometimes	52	34.7
	Total	150	100.0

The Table 11 shows that about 35.4 percent respondents had difficulty in reading activities on monitor due to visual fatigue and almost same proportion of respondents stated that they sometimes faced difficulty. Thirty percent did not face difficulty in reading on monitor.

Table 12: Handling visual difficulty by the students

(n=150)

Sr. No.	Handling visual difficulty	*f*	%
1.	Increase natural lighting	27	18.0
2.	Increase artificial lighting	28	18.7
3.	Reduction of viewing distance	18	12.0
4.	Suspension of activities	32	21.3
	Total	150	100.0

Table 12 shows that 21.3 percent respondents stopped the activities due to visual difficulty, 18.7 percent increased artificial lighting, 18.0 percent increased natural lighting and 12.0 percent reduced the viewing distance. The results are pointer to the fact that respondents espoused several ways to cope up with visual difficulty.

Table 13: Details about lighting while using computer/laptop

(n=150)

Sr. No.	Lighting	Yes		No		Sometimes	
		f	%	*f*	%	*f*	%
1.	Proper lighting at the working place while using a computer/Laptop	131	87.3	05	03.3	14	09.3
2.	Glare or light sensitivity while working at the computer monitor	73	48.6	36	24.0	41	27.3
3.	The screen faces window which results in glare when using computer	49	32.6	48	32.0	53	35.3

Data presented in Table 13 reveals that there was proper lighting at the working place of 87.3 percent of respondents while using a computer/laptop. Almost half of the respondents also admitted that they used to feel glare or light sensitivity while working at the computer. About thirty three percent respondents stated that their computer screen faced window which resulted glare and almost same proportion of respondents denied about it. The aspects of lighting can cause visual discomfort and eyestrain due to too little light, too much light, too much variation in illuminance between and across working surfaces, reflections, shadows and flicker (Hemphala *et al*., 2021) [8].

Table 14: Type of lighting used during work

(n=150)

Sr. No.	Lighting conditions	*f*	%
1.	Natural lighting	64	42.7
2.	Both natural and artificial lighting	79	52.7
3.	Artificial direct lighting	05	03.3
4.	Artificial indirect lighting	01	00.7
5.	Darkness	01	00.7
	Total	150	100.0

It is apparent from the data given in Table 14 that almost fifty three percent respondents were using the natural and artificial, followed by 42.7 percent respondents who were using only natural lighting. A few (3.3%) respondents were using artificial direct lighting, 0.7 percent respondents were using artificial indirect lighting, 0.7 percent respondents were working in darkness. Good lighting conditions could improve productivity, while in contrast; inappropriate lighting conditions may cause discomfort, decreased task performance, feelings of fatigue and even health problems (Lin, 2008) [14].

Table 15: Assessment of the comfortable of viewing distance from the computer/laptop screen

(n=40)

Sr. No.	Viewing distance (cm)	Most Comfortable		Moderate Comfortable		Least Comfortable	
		f	%	*f*	%	*f*	%
1.	50	16	40.0	16	40.0	08	20.0
2.	55	19	47.5	19	47.5	02	05.0
3.	60	14	35.0	16	40.0	10	25.0
4.	65	09	22.5	03	07.5	28	70.0

Comfort level of respondents at different viewing distance from the computer or laptop screen and was analyzed by reporting responses of forty respondents. The distance of 50 cm and 55 cm were found the most comfortable by majority of the respondents (87.5%). Hence, a range of 50-55 cm is standardized for viewing distance from computer or laptop screen. Jaschinski-Kruza (1990) [10] reported that participants preferred the display at 70 cm, compared with 50 cm. They preferred the longer viewing distance even if it required them to change viewing distance to view the reference document. On the contrary and in line with the present findings, Chiemeke *et al*., (2007) [4] concluded that viewing distance from the screen has been suggested to be about 50-70 cm, when the accommodation and vergence are at physiological resting state.

Table 16: Assessment of comfortable illumination level at working place during using computer or laptop

(n=40)

Sr. No.	Illumination level (Lux)	Most Comfortable		Moderate Comfortable		Least Comfortable	
		f	%	*f*	%	*f*	%
1.	More than 400	06	15.0	18	45.0	16	40.0
2.	300-400	15	37.5	10	25.0	02	05.0
3.	200-300	09	22.5	04	10.0	01	02.5
4.	Less than 200	10	25.0	09	22.5	21	52.5

Illumination level at the working place was measured and standardized. Fifteen percent respondents were most comfortable with illumination level of more than 400 lux, 45.0 percent were moderately comfortable and 40.0 percent were least comfortable. At an illumination level of 300-400 lux, 37.5 percent respondents were most comfortable, 25.0 percent were moderately comfortable and only 5 percent were least comfortable. It was found that 22.5 percent respondents were most comfortable with 200- 300 lux illumination level, 10.0 percent were moderately comfortable and 2.5 percent respondents were least comfortable. Surprisingly, 25.0 percent respondents were most comfortable with less than 200 lux illumination level, 22.5 percent were moderately comfortable and more than half, i.e. 52.5 percent respondents were least comfortable.

Around 300-400 illumination level was found the most comfortable range for maximum respondents and least comfortable by minimum respondents. Hence, this can be standardized as the illumination level while working at the computer or laptop.

Table 17: Sitting eye height of students

(n=40)

Dimension	Mean	5th percentile	95th percentile
Sitting eye height	113.63	103.05	123.85

During measurement of viewing distance and illumination level, the keyboard height from the floor was 80 cm. Sitting eye height of respondents was also measured and mean was 113.63 cm, 5th percentile was 103.05 cm and 95th percentile was 123.85cm.

Association of dependent and independent variables

Table 18: Correlation of visual problems and ergonomic factors

(n=150)

Sr. No.	Independent variables	Dependent Variable (Visual Problems)
1.	Working hours with computer or laptop	0.137
2.	Brightness of the screen	-0.099
3.	Viewing distance from screen while using computer/laptop	-0.003
5.	Level of Top of the computer/laptop	0.225**
6.	Use of anti-glare filter on the screen	0.036
7.	Use of adjustable screen	-0.004

*Correlation is significant at the 0.01 level (2- tailed)

The correlation between dependent and independent variables was analyzed. A highly significant positive correlation was found between visual problems and level of top of the computer or laptop. It refers that more visual problems occurs if level of top of the computer or laptop is above horizontal eye level. There was no significant relationship between visual problems and other independent variables such as working hours with computer or laptop, brightness, viewing distance, use of anti-glare filter and adjustable screen.

Table 19: Correlation of visual problems and frequency of using gadget by respondents

(n=150)

Sr. No.	Visual problems	Computer	Laptop	Tablet	Mobile
1.	Headache	.097	.218**	-.067	.008
2.	Blurred vision	.082	-.158	.046	.044
3.	Tiredness of eye	.043	.113	-.142	.089
4.	Watering of eyes	.032	-.031	.010	.051
5.	Redness of eyes	.101	-.074	.003	.035
6.	Dry eye/discomfort	.002	.100	.226**	.060
7.	Double vision	.024	-.014	-.013	.032
8.	Difficulty focusing for near vision	.091	-.016	.077	.043
9.	Heavy eyelids	.144	.153	.007	.055
10.	Excessive blinking	.156	-.091	-.042	.030
11.	Itching eyes	.000	-.147	.197*	.041
12.	Irritating eyes	.027	-.070	.021	.043

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

Data in Table 19 shows that the headache was positively and highly significantly correlated with more use of laptop. Dry eye/discomfort and itching of eyes were also positively significantly correlated with more use of tablet. Rest of the visual problems were not found significantly correlated with frequency of using any gadget.

Conclusion

The present study gave an insight about various electronic gadgets used by university students and prevalence of visual problems. The results of study have brought into notice various visual problems of university students while using electronic gadget. There is a need to create awareness amongst university students about proper lighting, viewing distance and proper posture while using electronic gadgets so that they can be prevented from visual problems. The standardized illumination level and viewing distance of using computer or laptop can be used by the students during use of electronic gadgets.

References

1. Agarwal S, Goel D, Sharma A. Evaluation of the factors which contribute to the ocular complaints in computer users. Journal of Clinical and Diagnostic Research. 2013;7(2):331-335.
2. Anshel J. Visual ergonomics handbook. New York: Taylor & Francis, CRC Press, USA; c2005.
3. Chakraborty S, Sen S. Impact of Over-utilisation of Electronic Gadget on Student Health: An Appraisal, International Journal of Research in Engineering and Science. 2021;9(6):52-58.
4. Chiemeke S, Akhahowa A, Ajayi O. Evaluation of vision-related problems amongst computer users: A case study of University of Benin Nigeria. Proceedings of the World Congress on Engineering. News wood Limited; c2007. p. 1-5.
5. Cole BL, Maddocks JD, Sharpe K. Effect of VDUs on the eyes-report of a six-year epidemiological study, Optom Visual Science. 1996;73:512-528.
6. David R, Willms K, Anshel J, Jaschinski W, Sheedy J. The Effects of Visual Display Distance on Eye Accommodation, Head Posture, and Vision and Neck Symptoms, Human Factors the Journal of the Human Factors and Ergonomics Society, c2007, 49(5).
7. Gowrisankaran, Sheedy James E. Computer Vision Syndrome: A Review. IOS Press Content Library. 2014;52:303-314.
8. Hemphala H, Haiden M, Lindberg P, Nilen P. Visual Symptoms and Risk Assessment using Visual Ergonomics Risk Assessment Method, Proceeding of the 21st congress of the international ergonomics association. 2021;220:729-735.
9. Irawaty E, Rasyid M, Tirtasari S, Novendy, Lontoh. A Descriptive Study about Students' Symptoms and Knowledge of Computer Vision Syndrome, Muhammadiyah Medical Journal, c2021, 2(2).
10. Jaschinski-Kruza W. On the preferred viewing distances to screen and document at VDU workplaces. Ergonomics. 1990;33:1055-1063.
11. Jennifer ES. Influence of Electronic Gadgets Excessive use on Academic Performance and Family Interaction among Adolescents, Unpublished Dissertation, Dr. M.G. Research Medical University; c2012. p. 01-83.
12. Kokab S, Khan M. Computer vision syndrome: a short review, Journal of Evolution of Medical and Dental

Sciences. 2012;1(6):12-23.
13. Lee DH. Women's creation of camera phone culture. Fibreculture Journal. 2005;6:1-11.
14. Lin CJ, Feng WY, Chao CJ, Tseng FY. Effects of VDT workstation lighting conditions on operator visual workload. India Health. 2008;46(2):105-11.
15. Lu Han L, Zhang H, Xiang Z, Shang J, Anjani S, Song Y, *et al*. Desktop lighting for comfortable use of a computer screen. Work. 2021;68:S209-S221. Doi: 10.3233/WOR-208018.
16. Marskole P, Yadav R, Sethia S, Parmar S, Bhagora R, Parihar L. A study on assessment of effects of electronic gadgets on mental and physical health among medical students in Central India, International Journal of Community Medicine and Public Health. 2022;9(1):124-129.
17. Rampersad N, Mashige KP, Oduntan OA. A study of ergonomic factors leading to computer vision syndrome among computer users Ergonomics SA. 2013;25(1):1010-2728.
18. Othman N, Suhaidi Bin Kelana MK, Jamaludin TS. The Impact of Electronic Gadget Uses with Academic Performance among Secondary School Students, International Islamic University Malaysia Kuantan, c2020, 2(2).
19. Pachiyappan T, Kumar KV, Mark P, Venugopal R, Jilumudi D, Palanisamy B. Effects of Excessive Usage of Electronic Gadgets during COVID-19 Lockdown on Health of College Students: An Online Cross-Sectional Study, Asian Journal of Pharmaceutical Research and Health Care. 2021;13(2):1399-2104251.
20. Rangaswamy R. A Textbook of Agricultural Statistics, New Age International Publishers; c2010.
21. Roberts J, Yaya L, Manolis C. The invisible addiction: Cell-phone activities and addiction among male and female college students. Journal Behav Addict. 2014;3(4):254-65.
22. Sen S, Chatterjee S, Das A. Problems of Online Education System in South Bengal During the Covid-19 Pandemic: An Appraisal, IOSR Journal of Humanities and Social Science. 2020;25(10):07-20.
23. Shantakumari N, Eldeeb R, Sreedharan J, Gopal K. Computer use and Vision Related Problems Among University Students in Ajman, United Arab Emirate. Annals of medical and health sciences research, c2014, 4(2).
24. Straker LM, Smith AJ, Bear N, O'Sullivan PB, De Klerk NH. Neck/shoulder pain, habitual spinal posture and computer use in adolescents: the importance of gender. Ergonomics. 2011;54:539.
25. Thomson WD. Eye problems and visual display terminals-the facts and fallacies. Ophthalmic Physiology Opt. 1998;18:111-119.
26. Venkatesh Girish, Shashikala Kulkarni, Mannava, Rajarathnam. A Study of Computer Vision Syndrome at the Workplace-Prevalence and Causative Factors, International Journal of Contemporary Medical Research, 2016, 3(8).