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Research Article

EFFECT OF INCREASED SCREEN TIME IN UNDERGRADUATE STUDENTS DURING COVID-19 PANDEMIC-A SURVEY-BASED STUDY

Dwajani S[1], Lavanya Ravi[2], Abhishek Ram S[2] and Praveena A.S[3]

[1]Pharmacology / Senior Research Associate, Central Research Lab
[2]Rajarajeswari Medical College and Hospital, Kambipura, Mysore Road, Bangalore, Kamataka, India
[3]DoS in Statistics, University of Mysore, Manasagangotri, Mysore-570006

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ABSTRACT

Objective: The objective of the study is to analyse the effects of increased screen time on undergraduates on various aspects like sleep, mental health, health and well-being of a person during lock-down for COVID-19 pandemic.

Method: A questionnaire-based survey was conducted through google forms which included questions regarding screen time, mental health (depression, anxiety, mood swings), sleep pattern, time spent on academic activities, etc. Respondents included 440 undergraduate students aged between 18-24 years.

Results: We analysed the data using test for proportions and were able to obtain significant results. Chi-square test was used to find associations between two variables. Cluster analysis was done to find significant clusters and the results are reported later along with the Dendrogram.

Conclusion: There is a significant effect of increased screen time during the lockdown on undergraduates on aspects of mental health, sleep pattern, overall well-being and academic activities. There is a strong association between screen time and depression.

INTRODUCTION

Globally, COVID-19 pandemic has changed lives of people. Buses, flights, schools, colleges, many social events, work and other activities were put to halt. With no choice, people were asked to stay at home. Schools and colleges were continued online. In this situation, the students were made to stay home for months together with minimal real social interactions. This has led to growing concerns of physical and mental well-being of students. With very little activities to do at home, most of us have turned to devices such as TV, laptops and mostly our mobile phones. It is important to realise how the screen time has increased over a period of time in this pandemic. Social isolation and increased screen time bring concerns about depression. Depression is one of the most common mental disorder and more than 264 million people of all ages were affected[1]. World Health Organization has projected that depression will be leading cause of disease burden by the year 2030[2]. Depression can lead to suicide. It is sad to know that people lose lives by suicides more than homicides all around the world[3]. Several individuals killing themselves in this pandemic has sent shocking waves. In times as hard as this, studies on mental health and well-being is very essential.

A study on Indian university students revealed that 37.7%, 13.1% and 2.4% of the students suffered from moderate, sever and extremely severe depression respectively[4]. Depression and anxiety are among the leading causes of burden of disease in youth. Epidemiological data of U.S. Department of Health and Human Services show that 5 to 9% of adolescents are clinically depressed, while 21% to 50% report depressed mood (1999). The use of electronic devices is a popular sedentary activity in western society, particularly among youth. In Canada and the U.S., youth spend an average of 7 to 8 hours per day engaging in sedentary screen-based activities.[5] Excessive screen time (e.g., more than 2–3 hours exposure to electronic media including television, computers, and mobile electronic devices) can affect the developing brain which has important consequences for cognitive, motor development, learning, memory, emotional regulation and overall health. Learning and memory may directly affect academic performance in children, adolescents, and young adults due to excessive screen time. [6]

Corresponding author:* **Dwajani S
Pharmacology / Senior Research Associate, Central Research Lab

In this lock-down, due to global COVID-19 pandemic, it has become inevitable for all of us to shut our doors and stay inside. We have been in our houses for more than two months. This has had a deleterious effect on us in many ways. We spend a significant amount of time on mobile phones, television and laptops without realising the harm they are causing. Hence, we aimed to study and analyse the effects of increased screen-time in undergraduate students during Covid-19 lockdown. Possible associations between longer hours of screen time and depression/mood swings, pattern of screen time usage, sleep patterns, time spent on academic activities are studied.

METHODOLOGY

The data was collected in google forms using responses from contacts through Whats App, Instagram, E-mail. The data was collected using snowball sampling. We had a total sample size of 440 undergraduate students between age group of 18 to 24 who pursue various programs including MBBS, engineering, BSc etc. Students took part in the study from 15 March 2020 to 31 Mar 2020. Respondents who are 18 and above and willing to participate in the study were enrolled. Consent was taken through an electronic consent form.

The procedure involved an online questionnaire that included several questions related to sleep pattern, screen time and emotional behaviour, time spent on academic activities of undergraduates during the lockdown and pre lockdown. This online questionnaire was shared via social platforms to reach several undergraduate students pursuing different programs. The responses from this survey were analysed. It was a self-designed questionnaire.

RESULTS

Total of 440 students participated in the study, among which 55.45% of the respondents were females and 44.54% males.82.72% agreed that they were using phone way too much during the lockdown.63.63% experienced hazardous effects of phones (teary eyes, burning eyes, headache, blurred vision).70% have felt depressed during the lockdown.

The data was studied using z-test for two proportions. A z-test for two proportions is a hypothesis test that attempts to make a claim about the population proportion P1 and P2. The null hypothesis is a statement about the population parameter which indicates no effect, and the alternative hypothesis is the complementary hypothesis to the null hypothesis.[7]

We find that the null hypothesis P1=P2 is rejected at 1% level of significance against the alternative hypothesis P1>P2 since the p-value is less than 0.01, for the following pairs of proportions (P1, P2).[Table1]

Table 1 Statistically significant results of proportion test

Sl.no	P1	P2
1.	Proportion of undergraduate students going to bed after 12 am during the lockdown (60.2%, n=265) [Graph 1]	Proportion of undergraduate students going to bed after 12 am before the lockdown (33.6%, n=148)
	There is enough evidence that the population proportion of undergraduate students going to bed after 12 am during the lockdown is greater than the proportion of those going to bed before the lockdown. This means that undergraduate students went to bed later than usual during the lockdown	
2.	Proportion of undergraduate students waking up after 8 am during lockdown (63.4%, n=279) [Graph 2]	Proportion of undergraduates waking up after 8 am before lockdown. (14%, n=62)
	There is enough evidence that population proportion of undergraduate students waking up after 8 am during lockdown is greater than the proportion of those waking up at the same time before lockdown. This means people woke up later than normal because of lockdown	
3.	Proportion of undergraduate students who have agreed that their screen time has increased during lockdown. (82.7%, n=364) [Graph 3]	Proportion of undergraduate students who have disagreed that their screen time has increased during lockdown. (3.1%, n=14)
	There is enough evidence that the population proportion of undergraduate students who have agreed that their screen time has increased during lockdown is greater than the proportion of those who disagreed	
4.	Proportion of undergraduate students using screen for more than 5 hours during lockdown. (76.5%, n=337) [Graph 4]	Proportion of undergraduate students using screen for more than 5 hours before lockdown. (20.6%, n=91)
	There is enough evidence that population proportion of undergraduate students using screen for more than 5 hours during lockdown is greater than the proportion of those using screen for more than 5 hours before lockdown. This means that undergraduate students are using more screen during lockdown than earlier.	
5.	Proportion of undergraduate students who studied for more than 2 hours before the lockdown. (82.7%, n=364)	Proportion of undergraduate students who study for more than more than 2 hour during the lockdown. (69.5%, n=306)
	There is enough evidence that the population proportion of undergraduate students who studied for more than 2 hours before the lockdown is greater than the proportion of those who study for more than 2 hours during the lockdown.	
6.	Proportion of undergraduate students using screened devices for academic purposes more than 2 hours during lockdown. (38.1%, n=168)	Proportion of undergraduate students using screened devices for academic purposes for 2 hours before lockdown. (19.7%, n=87)
	There is enough evidence that the population proportion of undergraduate students using screened devices for academic purposes more than 2 hours during lockdown is greater than the proportion of those using screened devices for more than 2 hours before lockdown.	
7.	Proportion of undergraduate students experiencing hazardous effects of phones (headache, burning eyes etc). (63.4, n=279)	Proportion of undergraduate students who do not experience hazardous effects of phones (headache, burning eyes etc). (36.5%, n=161)
	There is enough evidence that the population proportion of undergraduate students experiencing hazardous effects of phones (headache, burning eyes etc) is greater than the proportion of those who do not experience any.	
8.	Proportion of undergraduate students feeling stressed as compared to before lockdown. (79.7%, n=351)	Proportion of undergraduate students who do not feel stressed as compared to before lockdown. (20.2%, n=89)
	There is enough evidence that the population proportion of undergraduate students feeling stressed during the lockdown as compared to before the lockdown is greater than the proportion of those who did not feel stressed during the lockdown.	
9.	Proportion of undergraduate students feeling anxious or nervous as compared to before lockdown. (62.9%, n=277)	Proportion of undergraduate students who do not feel anxious or nervous as compared to before lockdown. (37%, n=163)
	There is enough evidence that the population proportion of undergraduate students felling anxious or nervous during the lockdown as compared to before lockdown is greater than the proportion of those who did not feel anxious or nervous during the lockdown.	
10.	Proportion of undergraduate students who lose 'track of time' by using screened devices. (81.1%, n=357)	Proportion of undergraduate students who do not lose 'track of time' by using screened devices. (18.8%, n=83)
	There is enough evidence that the population proportion of undergraduate students who lost 'track of time' by using screened	

	devices is greater than the proportion of those who do not lose track of time.	
11.	Proportion of undergraduate students feelling depressed as compared to before lockdown. (69.7, n=307)	Proportion of undergraduate students who do not feel depressed as compared to before lockdown. (30.2%, n=133)
	There is enough evidence that the population proportion of undergraduate students feeling depressed during the lockdown, as compared to before lockdown is greater than the proportion of those who do not feel depressed during the lockdown.	
12.	Proportion of undergraduate students who have experienced mood swings during lockdown. (72.9%, n=321)	Proportion of undergraduate students who do not experience mood swings during lockdown. (27%, n=119)
	There is enough evidence that the population proportion of undergraduate students who have experienced mood swings during lockdown is greater than the proportion of those who did not experience mood swings during lockdown.	

A chi-square test was performed using chi-square calculator[8], to examine the association between the attributes A and B and the following table gives the significant results. Chi-square test for independence is a test used for categorical attributes in order to assess the degree of association between the two attributes[9]. Null hypothesis is that the two attributes are independent[Table 2].

Table 2 Results of Chi-square test showing association between attributes A and B

A	B	Chi-square with Yates correction	p-value
Using screen time for at least 5 hours during the lockdown.	Feeling depressed at least once in a week during the lockdown	11.3137	0.000769
Using screen time for at least 5 hours during the lockdown	Feeling stressed at least once during the lockdown	4.6166	0.031664
Using screen time for at least 5 hours during the lockdown	Experiencing hazardous effect of screen time such as eye pain, teary eyes, headache, blurry eyes.	11.8389	0.00058

R version 3.6.3 was used to perform cluster analysis. Since variables are measured on different scales, data is standardized using medians. Cluster analysis is performed for all 440 individuals and results are given. Ward's minimum-variance hierarchical clustering method was performed using an agglomerative (bottom-up) approach and a dendrogram was generated (Fig 1). The dendrogram generated was used to estimate the number of likely clusters within the studied population and six distinct clusters were identified of size 86, 62, 51, 56, 77 and 108 respectively. Once clusters were formed, there was no inter-cluster switching. This estimate was pre specified in k-means cluster analysis that was used as the principal clustering technique. K-means clustering method was used by taking the centroids as seeds of the clusters obtained. To compare the differences between clusters, analysis of variance using one-way ANOVA is used wherever normality assumption is satisfied and Kruskal-Wallis test for other continuous variables and chi-square test for categorical variables is used. The results are all statistically significant as the p-values are less than 0.001.[Table 3]

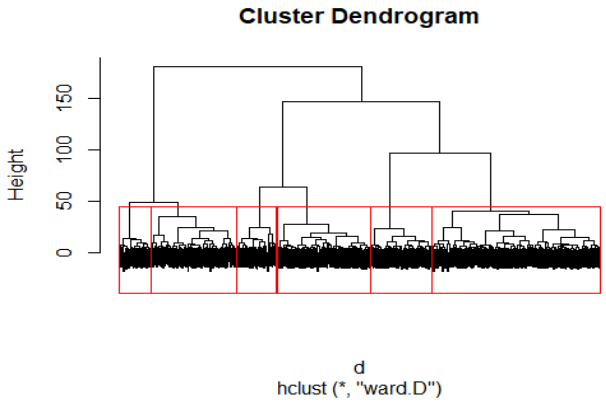


Fig 1 Dendrogram for Ward's minimum-variance hierarchical clustering method

Clusters differ significantly with respect to all variables except age.

Cluster 1 (size = 86) is the second largest cluster. Highest percentage of students use phone and other screened devices too much during the lockdown. Highest percentage of students who belong to this cluster observed mood swings during the lockdown almost everyday. They felt anxious/nervous during the lockdown.

Cluster 2 (size = 62). Most of the students belonging to this cluster use less phone and other screened devices during the lockdown, some of them even use the screened devices less than an hour a day during the lockdown.

Cluster 3 (size = 51) is the smallest cluster among the six clusters. Highest number of students use phones and other screened devices more than 9 hours a day during the lockdown and more than 6 hours a day before lockdown. Most of the students of this cluster use the screened devices for academic purposes more than six hours a day before the lockdown as well as during the lockdown.

Cluster 4 (size = 56). Students who belong to this cluster go to sleep only after 12 am. Highest percentage of students sleep after 5 am during the lockdown and between 2 am to 3 am before lockdown, also they wake up late as compared to other clusters. Highest percentage of students use screened devices after they go to bed, before they fall asleep.

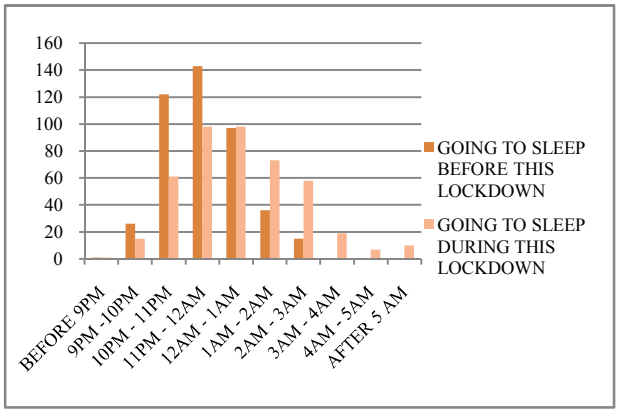
Cluster 5 (size = 77). Students who belong to this cluster go to sleep early as compared to other clusters, during the lockdown as well as before lockdown, also they wake up early in the morning, during the lockdown. Only a few students who belong to this cluster use screened devices less than one hour a day during the lockdown. Highest number of students never use screened devices after going to bed, before they fall asleep. Highest number of students belonging to this cluster never observed mood swings, never felt sad/depressed, never lost track of time by using the screened devices, never felt anxious/nervous and never felt stressed.

Cluster 6 (size = 108) is the largest cluster among the six clusters. Highest percentage of students who belong to this cluster used to wake up early in the morning before lockdown. Most of them woke up between 6am to 8am during and before the lockdown. None of them used screened devices more than six hours a day before lockdown.

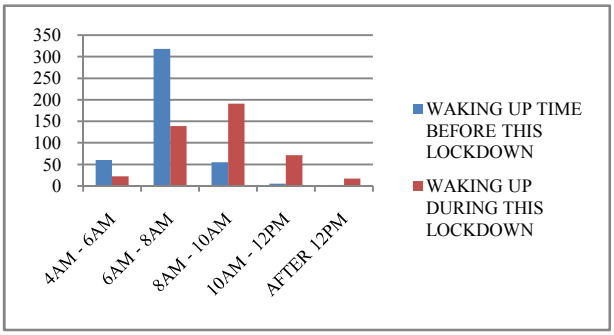
Table 3 Analysis of variance (Kruskal-Wallis test) and Chi-square analysis between clusters

Questionnaire	Options provided for eah question	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	p-value
Total students in each cluster [n]		86	62	51	56	77	108	--
Mean age		20.28	20.18	20.53	19.61	20.31	20.6	0.035
DURING THIS LOCKDOWN, what time do you usually go to sleep?	Before 9 pm	0	0	0	0	1.30	0	
	9 pm-10 pm	0	1.61	0	0	10.39	5.56	
	10 pm-11pm	2.33	12.9	7.84	0	25.97	25.0	
	11pm-12am	1.16	27.42	19.61	0	32.47	41.67	
	12am-1am	16.28	29.04	27.45	5.36	27.27	25.93	
	1am-2am	38.37	19.35	17.65	26.79	2.6	1.85	<0.001
	2am-3am	32.56	9.68	15.69	28.57	0	0	
	3am-4am	6.98	0	5.88	17.86	0	0	
	4am-5am	1.16	0	3.92	7.14	0	0	
	After 5 am	1.16	0	1.96	14.29	0	0	
BEFORE THIS LOCKDOWN, what time would you usually go to sleep?	Before 9pm	0	0	0	0	1.30	0	
	9pm -10pm	0	1.61	3.92	0	18.18	8.33	
	10 pm-11pm	18.6	33.87	23.53	1.79	29.87	45.37	
	11pm-12am	33.72	24.19	39.22	25.0	32.47	37.04	
	12am-1am	33.72	29.03	27.45	30.36	11.69	9.26	
	1am-2am	9.30	11.29	3.92	25.0	6.49	0	<0.001
	2am-3am	4.65	0	1.96	17.86	0	0	
DURING THIS LOCKDOWN, what time do you usually wake up?	4am-6am	1.16	3.23	3.92	0	15.58	4.63	
	6am-8am	6.98	43.55	19.61	10.71	42.86	52.78	
	8am-10am	51.16	46.77	54.9	39.29	38.96	35.19	<0.001
	10am-12pm	31.4	6.45	19.61	35.71	2.6	7.41	
	After 12pm	9.3	0	1.96	14.29	0	0	
BEFORE THIS LOCKDOWN, what time would you usually wake up?	4am-6am	9.3	14.52	11.76	8.93	16.88	17.59	
	6am-8am	72.09	72.58	72.55	62.5	72.73	76.85	
	8am-10am	15.12	12.9	15.69	23.21	10.39	4.63	
	10am-12pm	2.33	0	0	5.36	0	0.93	<0.001
	After 12pm	1.16	0	0	0	0	0	
Do you think you are using phone and other screened devices way too much DURING THIS LOCKDOWN?	Strongly disagree	0	3.23	1.96	1.79	0	0	
	Disagree	0	3.23	3.92	3.57	5.19	0	
	Neutral	2.33	24.19	9.8	21.43	23.38	9.26	
	Agree	31.4	54.84	35.29	33.93	51.95	55.56	
	Strongly agree	66.28	14.52	49.02	39.29	19.48	35.19	
How long do you think, you are using your phone and other screened devices DURING THIS LOCKDOWN?	< 1 hour a day	0	1.61	0	0	0	0	
	1-2 hours	2.33	3.23	3.92	0	3.90	5.56	<0.001
	3-4 hours	4.65	37.10	5.88	7.14	33.77	25.0	
	5-6 hours	25.58	16.13	19.61	26.79	44.16	36.11	
	7-8 hours	44.19	38.71	29.41	41.07	11.69	21.3	
	9-10 hours	23.26	3.23	41.18	25.0	6.49	12.04	
On any typical day, how long do you think you used your phone and other screened devices *BEFORE* THIS LOCKDOWN?	< 1 hour a day	0	3.23	5.88	0	9.09	4.63	
	1 to 2 hours	29.07	43.55	17.65	16.07	31.17	46.3	
	3 to 4 hours	51.16	40.32	43.14	44.64	42.86	36.11	<0.001
	5 to 6 hours	17.44	8.06	9.8	26.79	12.99	12.96	
	>6 hours	2.33	4.84	23.53	12.5	3.90	0	
Do you use your phone in the night after you go to bed?	Never	1.16	24.19	15.69	3.57	27.27	16.67	
If yes, how long do you use your phone and other screened devices in the bed before you fall asleep?	< 1 hour	15.12	40.32	23.53	10.71	42.86	41.67	
	1 to 2 hours	51.16	33.87	39.22	48.21	29.87	38.89	
	3 to 4 hours	25.58	1.61	17.65	26.79	0	1.85	<0.001
	5 to 6 hours	4.65	0	1.96	3.57	0	0.93	
	>6 hours	2.33	0	1.96	7.14	0	0	
How long do you think you spend time on studying and doing other academic activities (Assignments, Presentations, etc) / work and related activities DURING THIS LOCKDOWN?	15 minutes	0	0	0	0	0	0.93	
	< 1 hour	45.35	0	0	33.93	38.96	37.04	
	1 to 2 hours	1.16	0	0	1.79	1.3	0	
	2 to 3 hours	50.0	0	5.88	57.14	59.74	58.33	<0.001
	3 to 4 hours	1.16	0	1.96	0	0	0	
	4 to 5 hours	2.33	46.77	37.25	7.14	0	3.7	
	5 to 6 hours	0	30.65	29.41	0	0	0	
	>6 hours	0	20.97	23.53	0	0	0	
	I am doing an internship	0	0	1.96	0	0	0	
	6 am to 9 pm	0	1.61	0	0	0	0	
How long do you think you spent time on studying and doing other academic activities (Assignments, Presentations, etc) / work and related activities BEFORE THIS LOCKDOWN?	Not a student	0	0	0	0	0	0.93	
	<1 hour a day	19.77	6.45	7.84	23.21	27.27	14.81	
	2 to 3 hours	31.4	20.97	11.76	35.71	32.47	37.04	
	3 to 4 hours	30.23	25.81	25.49	30.36	32.47	34.26	<0.001
	5 to 6 hours	11.63	27.42	27.45	8.93	7.79	6.48	
	>6 hours	6.98	19.35	27.45	1.79	0	6.48	

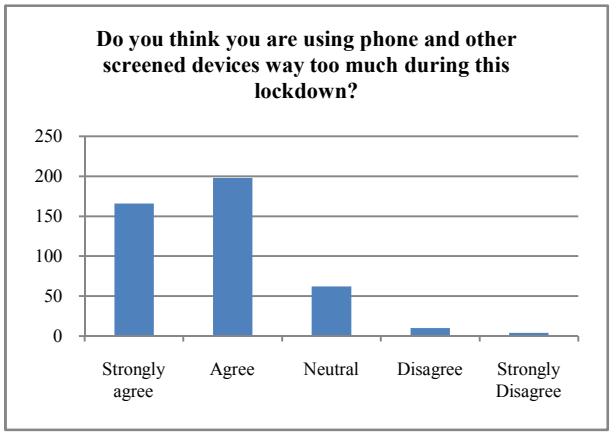
How long do you think you are using your phone and other devices for your college or work or study related activities DURING THIS LOCKDOWN?	<1 hour a day	25.58	11.29	1.96	16.07	22.08	11.11	<0.001
	1 to 2 hours	43.02	17.74	11.76	42.86	46.75	52.78	
	3 to 4 hours	20.93	45.16	21.57	28.57	24.68	25.93	
	5 to 6 hours	8.14	20.97	27.45	5.36	3.9	7.41	
	>6 hours	2.33	4.84	37.25	7.14	2.6	2.78	
How long do you think you used phone and other screened devices for college or work or study related activities *BEFORE* THIS LOCKDOWN?	<1 hour a day	40.7	35.48	15.69	46.43	50.65	58.33	<0.001
	1 to 2 hours	37.21	46.77	35.29	37.5	36.36	29.63	
	3 to 4 hours	18.6	12.9	15.69	8.93	9.09	8.33	
	5 to 6 hours	3.49	4.84	13.73	3.57	3.9	3.7	
	>6 hours	0	0	19.61	3.57	0	0	
Have you been feeling stressed out or strained easily (as compared to before the LOCKDOWN)?	Never	1.16	38.71	3.92	37.5	48.05	3.7	<0.001
	Less than once a week	4.65	35.48	9.8	41.07	38.96	25.0	
	Few times a week	46.51	25.81	58.82	17.86	12.99	50.0	
	Almost everyday	47.67	0	27.45	3.57	0	21.3	
Have you been feeling anxious / nervous lately ?(as compared to before LOCKDOWN)	Never	4.65	51.61	9.8	67.86	87.01	15.74	<0.001
	Less than once a week	17.44	27.42	25.49	17.86	11.69	28.7	
	Few times a week	50.0	17.74	45.1	14.29	1.3	45.37	
	Almost everyday	27.91	3.23	19.61	0	0	10.19	
Have you ever " lost sense / track of time" by using phone and screened devices (by binge watching and other activities)?	Never	4.65	32.26	5.88	30.36	44.16	4.63	<0.001
	Few times	22.09	46.77	49.02	37.5	48.05	39.81	
	Many times	37.21	17.74	15.69	23.21	7.79	41.67	
	Yes, all the time	36.05	3.23	29.41	8.93	0	13.89	
Do u feel sad or depressed often (as compared to before the LOCKDOWN)?	Never	0	56.45	5.88	55.36	75.32	5.56	<0.001
	Less than once a week	15.12	25.81	19.61	25.0	18.18	27.78	
	Sometimes a week	45.35	12.9	60.78	19.64	6.49	50.93	
	Almost everyday	39.53	4.84	13.73	0	0	15.74	
		0	0	0	0	0	0	
Have you observed mood swings in yourself during LOCKDOWN (change in emotions between extremes of sadness and happiness)?	Never	2.33	59.68	11.76	51.79	54.55	2.78	<0.001
	Less than once a week	9.3	24.19	9.8	30.36	35.97	20.37	
	Sometimes a week	45.35	16.13	54.9	16.07	16.88	52.78	
	Almost everyday	43.02	0	23.53	1.79	2.6	24.07	
Have you been feeling irritated or annoyed quite often (as compared to before lockdown)?	Never	0	41.94	1.96	42.86	41.56	0.93	<0.001
	Less than once a week	5.81	35.48	19.61	33.93	33.77	12.96	
	Few times a week	48.84	22.58	58.82	23.21	20.78	69.44	
	Sometimes a week	45.35	0	19.61	0	3.90	16.67	



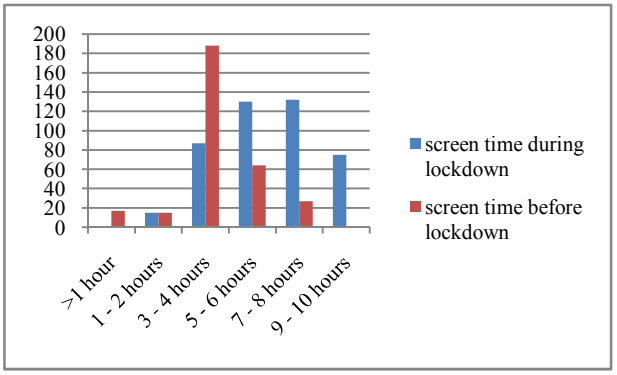
Graph 1 Sleep timings of undergraduates before and during the lockdown



Graph 2 Time at which undergraduates wake up during and before lockdown.



Graph 3 Opinion of undergraduates on using phone and screened devices



Graph 4 Number of undergraduates using phone and other screened devices for more than 5 hours

DISCUSSION

In a study conducted by Jayanti P Acharya *et al*.[11], the aim was to study the detrimental health effects of mobile phones on college going students. The most common symptom was headache followed by irritability.47.4% students responded to have experienced lack of concentration. 38.5% said that they got anxious while using their mobile phones.19.3% of students mentioned that continuous use of cell phone over a period of time resulted in some degree of difficulty in hearing.13.8% complained to have pain in the thumb finger due to the over use of mobile phone. In our study, it was established that 59% undergraduates were irritated or annoyed quite often during the lockdown. Furthermore, 81.1% undergraduates have responded to have lost track of time by using screened devices. In our study we have considered several early signs and symptoms of depression, anxiety and also, we have studied the sleep wake routine of individuals in this pandemic. While the above study conducted by Jayanti P Acharya *et al*., was conducted before the pandemic on any usual day, our study considers the effect of increased screen time during the lockdown when the students are always home. Both were questionnaire-based studies.

In a study conducted by Charles Chukwuemeka Okika and Agboola Bukola Blessing[12], the objective was to study the impact of screen time among university students and their awareness and adoption of screen time usage according to the guidelines.90% of the students were found to use their mobile phones between 4-16 hours daily. Four out of five students had significant mental and physical distress, panic, confusion and extreme isolation when forced to unplug from any of the screen devices for an entire day. 74 % of the students were found to stay up late in the night or eat while doing their screen activities. 78% of the students had admitted to have suffered stiffness of the neck or painful and tingling sensation of their wrists and fingers directly related to their usage screen devices. In our study, 76.5% undergraduates were found to use screened devices for 5-10 hours. 63.4% of undergraduates have responded that they experience some form of physical distress like headache, burning eyes, watery eyes, pain in the eye.54.7% were found to use phone and other screened devices for 1-6 hours just before sleeping at night. This can be taken as a major parameter for the delayed sleep of the undergraduates. We also found that 69.7% of the students were depressed at least once a week during the lockdown.

In a study conducted by Danijela Maras *et al*.[13], the study aimed to establish an association between screen time and depression and anxiety among the Canadian youth. This study examined how sedentary screen-based activities may relate to symptoms of depression and anxiety in youth. The data suggested that duration of sedentary screen time was associated with more severe symptoms of depression and anxiety in a large population of Canadian adolescents. This suggested that screen time may be an important risk factor of psychiatric disorders among the youth. Hence the study also suggested that the physicians should be aware of the screen time of those youths who come to them for treatment of depression. While this study mainly focuses on screen time and depression, our study considers several other effects of screen time on sleep wake cycle, time spent on studies and other useful activities by comparing before and during the pandemic. In addition, we have used proportion test and have proven how several important effects are true for the whole population. Chi square and cluster analysis have helped strengthen our study.

The results of our study have concluded that there is a strong association between screen time and depression. This result is in line with the results of a study conducted by Elroy Boers et.al[14], which establishes that a one-hour increase in social media use was associated with increase in the severity of depression symptoms over 4 years on a 0.64-unit scale(from 0 to 28). Though this study was conducted over four years on adolescents, our study aims at analysing the mental health of undergraduates during the lockdown period as this is the time when they are more prone for long screen time.

In a study conducted by Nicola Cellini *et.al*[15], the aim was to study the effect of lockdown on young adults aged 18-35. It was found that one fourth (24.2%) of the entire sample reported moderate to extremely severe symptoms of depression, 32.6% of the sample reported moderate to extremely severe symptoms of anxiety, and 50.12% of the sample reported moderate to extremely severe symptoms of stress. The study also established that on average, bedtime was delayed by ~41 min in both workers and students. The restrictions had an even stronger effect on wake time, in particular in workers, who started to wake up about 1 hr and 13 min later than usual, whereas students delayed their wake time by ~45 min. These results were similar to the results of our study which established that the sleep wake pattern of the undergraduates was disturbed (sleeping late and waking up later than usual). Our study also considers the amount of time spent on screened devices for college activities. While this study takes into account ages 18-35, our study is more confined to the undergraduates who find it very difficult to cope up with stress and depression.

CONCLUSION

Increased screen time has markedly affected the sleep pattern, mental health, productivity, overall health and well-being of undergraduates during this lockdown. Increased screen time has a direct correlation with depression and stress. Moreover, effects such as teary eyes, headache, blurring of vision is also attributed to increased usage of screened devices. Hence, this study emphasises the need to restrict screen time and brings to lime light the hazardous effect it has brought on undergraduates during the lockdown.

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