Original Article

Adolescent Health and Screen Time during a Period of Compulsory Online Education : A Cross Sectional Study from Eastern India

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COVID pandemic had an impact on both physical and mental health of the adolescents. To slow down spread of pandemic, measures like social distancing, online education, lockdowns, etc were taken. Adolescents and young adults had decreased communication with peers and extended families. Their screen time including videogaming also increased due to virtual learning. This study was undertaken to assess and compare the screen-time, mental health, physical activities, sleep etc of adolescents when physical schools are closed for long durations among different age groups of adolescents and between males and females. This study was conducted on 78 adolescents aged 10-17 years who were attending the Paediatric Outpatient Department of a Government Hospital. It was conducted over 3 months during a period of compulsory online classes. However, there was no lockdown during this period. It was found that boys had increased physical activity duration in comparison to pre pandemic times (P-value 0.03509). The duration of playing videogames had significantly increased too for boys. Adolescents more than 13 years ie, in mid adolescence had higher screen time and more incidence of mood disturbances, depression or anxiety than the younger ones. However, there was no significant increase of stress factors due to their stay at home, or online education. Screen time and stress were significant factors for developing psychological changes among students. Most adolescents knew that watching screen excessively is bad though few tried to decrease screen-time. Duration of physical activity among students was not a significant factor for obesity or being overweight among students although, increase in sleeping time was significant factor. Most students' academic performance remained same or became better as reported by themselves. Most Adolescents have knowledge but need guidance and constant support for inculcating health promoting activities and habits like pursuing hobbies, exercise during periods of deviation from routine life.

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Adolescence is the period of rapid physical and psychological development starting from the onset of puberty to complete growth and development. All Adolescents pass through this transition phase of various physical, hormonal, psychological, behavioural and social developmental changes.

COVID-19 pandemic had an impact on both physical and mental health of the Adolescents[1]. In order to slow the spread of the pandemic, measures like social distancing, online education, restrictions during lockdowns, etc were taken. These had effect on the mental wellbeing of all[2]. Adolescents and young adults had decreased communication with peers and extended families and were at a higher risk of psychosocial and behavioral problems. This was especially because adolescents, often rely on their social connections to understand themselves well. Hence, they experience more intense reactions to these stressors[3]. In order to cope with stress, they resorted to video gaming and browsing internet, that in turn adversely affected their mental wellbeing. The screen time and internet browsing also increased due to virtual learning. Excess gaming was associated with depression and anxiety[4]. Gaming and internet browsing decreased the use of adaptive coping strategies like

Editor's Comment :

- Prolonged stay at home and studying online can have psychological impact on adolescents as well as increase their screentime.
- This impact is more as the age progresses to mid adolescence may manifest as anxiety, depression and mood disorders.
- Proper guidance and supervision especially by parents and teachers is essential.

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appropriate sleep, exercise, interacting with friends and relatives. Although many Adolescents used sleeping as a strategy to tide over this stressful period, most of them had inadequate sleep due to various reasons[5,6]. Poor sleep in turn had multiple adverse effects like depression, excessive daytime sleepiness and metabolic dysfunctions[7].

It has been studied that mental health illness like depression can also lead to serious physical health outcomes, such as the development of cardiovascular diseases[8]. Taking care of adolescent's health is essential to secure health,not only during later adulthood but of the future generation as well[9].

The responses of adolescents to a crisis situation like a pandemic depends upon whether they have been previously exposed to emergency situations, the Socio-economic circumstances of the family, physical and mental health issues and their cultural background[10,11]. Different studies have shown that crisis events negatively impact the psychological well-being of children and adolescents[12-14]. A recent study by Jiao, *et al* found that anxiety, depression, irritability, distraction and the fear that family members would contract the deadly disease were some of the most common problems of the pandemic[15].

This study has been conducted to assess the adolescents' knowledge, attitude and practice of watching screen especially almost after one and half years of pandemic. When adolescents had to attend compulsory online classes yet had freedom to play outside, their physical activity, duration of sleep and mental health status was evaluated. Very few studies have been conducted in this topic on Adolescents and online education. That is because this study as conducted in the unique period where students were undergoing compulsory online education. On the other hand they had the liberty to go outside their houses though in a restricted manner,as there was no lockdown in this period. This study shall bring out the unique characteristics of early adolescents and the mid Adolescence age especially in response to online education in a post pandemic situation. The response of girls and boys can also be evaluated during this situation. This study shall highlight the prospect of online education for adolescents in future.

Aims and Objectives

(1) To assess screen-time and physical activities of Adolescents when physical schools are closed for long durations.

(2) To assess the knowledge and attitude of adolescents towards screen-time.

(3) To compare the variation of screentime and physical activity among early and mid adolescents and between males and females.

(4) To screen the adolescent's mental health status and to evaluate factors contributing to adverse mental health outcomes during this study period.

(5) Relation between being obese/overweight and screen-time, sleep, exercise, other factors.

Materials and Methods

This study was conducted over 3 months ie, January, 2022 to March, 2022, covering 78 adolescents. In this study, adolescence is divided into early adolescence, between 10-13 years, mid adolescence between 14-17 years, late adolescents between 18-24 years. Only early and mid adolescents were included in this study.

This study was done during a period when the adolescents had to attend compulsory online classes. However, there was no lockdown for COVID during this period. Adolescents aged 10-17 years who were attending a Government Hospital in Howrah district, for consultation were interviewed with the help of a pre-designed, pre-tested, structured questionnaire. The adolescents were given consultation separately after Pediatric OPD maintaining appropriate privacy and confidentiality. This questionnaire covered demographic data, such as age, gender, address etc. Socio-economic status was assessed by taking into account the guardian's income, level of education and occupation of primary breadwinner. Weight and height was measured. Body Mass Index (BMI) was calculated. TV, videogame played online and time spent on internet were considered as screen time. Internet time mostly included online education other than internet browsing for entertainment purpose. Whether the adolescent was having stress due to friends, family, COVID and other diseases and other reasons was evaluated. Knowledge, attitude and practice of watching screen was assessed with various questions. Psychological problems were screened with the pre-tested questionnaire. Those who had symptoms of anxiety, sadness or gaming disorder were further evaluated for confirmation. For evaluating anxiety, GAD 7 anxiety questionnaire was used. A score more than 4 was noted as having anxiety. For evaluating depression, Becks depression Inventory was used. Scoring of 11-16 was classified as mild mood disturbances. More than 16 was categorised as depression. Internet gaming disorder as diagnosed with DSM V criteria. It is expected that adolescents should sleep 8-10 hours/day on a regular basis to promote optimal health. Sleeping hours more than 10 hours was excess and less than 8 was considered deficient

in this study. Physical activity in this study included mild and moderate physical activities. It included cycling, playing football, cricket, walking, running etc. Permission for study was taken from the institution. Verbal consent was taken from parents and adolescents. Both parents and children were explained regarding the questionnaire and the purpose of this study. Later both the parents and adolescents were given anticipatory guidance on healthy lifestyle. Those who were unwilling to participate, those adolescents who were ill, having pre existing neurobehavioral problems were excluded from the study. Data was analysed with the help of appropriate statistical methods.

Results

The study conducted with 78 Adolescents. There were 39 Boys and 39 Girls. 46(58.9%) were in early Adolescence and rest were in mid adolescence. 12.8% were overweight and 3.85% were obese in this study. 12.82% were involved in moderate physical activity out of 44 who were exercising regularly in this period. Rest were involved in physical activity with less than 1 hour duration or mild physical activity. In 42 students were not regularly involved in physical activity during pre-COVID times. Out of total 78 students increase in duration of physical activity from pre-pandemic period was 0.17±0.59 hours ie, 10.2 ± 35.4 minutes, which is significant with P value 0.0161 <0.05. For boys increase in duration of physical activity 0.19 ± 0.68 hours and for girls 0.14 ± 0.51 hours. Internet screen time was 3.03 ± 2.30 hours. Total screen time was 4.60 ± 2.98 hours in this study. 6.71% Adolescents had duration of sleep less than 7 hours and 14.10% had more than 10 hours. 15.38% had inadequate sleep duration of less than 8 hours in this study. However, mean duration of sleep was 8.32 ± 1.22 hours. 11.5% Adolescents complained of stress caused due to inability to communicate with friends. 11.5% had stress due to family conflicts. 42.3% complained that online education as very stressful. Although in 88.46% the academic performance remained same or better. 88.5% knew watching excess screen is bad but only 19.2% tried to decrease screen-time.

In Table 1, no significant difference was found with respect to stress, psychological changes and total screen time between boys and girls (P Value > 0.05). However duration of playing video games was significantly higher among boys.

In Table 2, no significant difference was found with respect to stress between early and mid adolescents (P value >0.05)

Psychological changes among mid Adolescents during the study period [17 (53.13%)] is significantly higher than of early adolescents [8 (17.39%)] with P value 0.0021 <0.05; Internet Screen time among students of ≥14 Years [4 (2.62)] is significantly higher than of ≤13 years [2 (3.1)] age.

In Table 3, it is shown that 46.15% students were on regular physical activity during pre-pandemic periodand during online schooling periods were 56.41%, which do not differ significantly (P value >0.05). Significant increase in duration of physical activity was noted during online schooling periods with no lockdown restrictions as compared to pre covidera(P value 0.0161<0.05). Significant increase in duration of physical activity is seen among boys during online schooling (P value 0.0351 <0.05), while for girls no significant increase is observed (P Value >0.05).

In this study it is found that, duration of physical activity among students is not a significant factor for obesity or over weight among students [P Value > 0.05)] . However, increase in sleeping time is significant factor for obesity or overweight (OR 1.75, 95% CI 1.07 - 2.98) with P value 0.0306.

There was no significant correlation between hours of sleep and exercise duration (P value 0.0473 approx value 0.05) and hours adolescents sleep and screen time (P value 0.1573) in this study.

Table 1 — *Showing Comparison of Knowledge Attitude Practice of screen time, stress, psychological changes and academic performance among adolescent Boys versus Girls*

	Boys (n=39)	Girls (n=39)	P Value
Screen Time (hours)			
TV Screen time	1.15±1.43, 1 (2)	0.83±1.07, 0.5 (1)	0.2957
Videogame Screen time	0.93±1.38, 0 (1)	0.22±0.54, 0 (0)	0.003*
Internet Screen time	2.86±2.23, 3.5 (3.3)	3.20±2.43, 3 (2.75)	0.622
Stress & Psychological Changes			
Stress level	22 (56.41%)	26 (66.67%)	0.485
Psychological changes	12 (30.77%)	13 (33.33%)	1
Changes in Academic Performance			
Academic performance score not-affected	33 (84.62%)	36 (92.31%)	0.481
Awareness on excess Screen time			
Knows excess screen time is bad	34 (87.18%)	35 (89.74%)	1
Tried to decrease screen time	9 (23.08%)	6 (15.38%)	0.566
Increase in Screen time			
TV and videogame Screen time increased	24 (61.54%)	18 (46.15%)	0.2561
TV, videogame and internet Screen time increased	35 (89.74%)	35 (89.74%)	1

Table 2 — *Showing comparison of Knowledge, Attitude and Practice of screen time, stress and psychological changes, academics of early and mid adolescents (Age 10-13 Years versus ≥14 years)*

	Age 10-13 Years (n=46)	Age ≥14 Years (n=32)	P Value
Screen Time (hours)			
TV Screen time	0.86±1.06, 0.5 (1)	1.19±1.51, 1 (2)	0.2902
Videogame Screen time	0.48±0.92, 0.5 (1)	0.70±1.33, 1 (2)	0.9806
Internet Screen time	2.30±1.79, 2 (3.1)	4.08±2.59, 4 (2.62)	0.0011*
Stress & Psychological Changes			
Stress level High	24 (52.17%)	24 (75.00%)	0.0716
Psychological changes	8 (17.39%)	17 (53.13%)	0.0021*
Changes in Academic Performance during COVID			
Academic Performance Score not-affected	43 (93.48%)	26 (81.25%)	0.1492
Knowledge and attitude on excess Screen time			
Knows excess screen time is bad	39 (84.78%)	30 (93.75%)	0.2947
Tried to decrease Screen time	9 (19.57%)	6 (18.75%)	1

*P Value <0.05

Table 3 — *Showing Adolescents's Physical activity during Pre-pandemic period and after more than a year of pandemic and among Boys versus Girls*

	Pre-pandemic	>1 year of pandemic	P Value
Adolescents doing regular physical activity (n = 78)	36 (46.15%)	44 (56.41%)	0.0614
Physical activity, Outdoor games Duration (hours) (n=78)	0.48 ± 0.72	0.65 ± 0.93	0.0161*
Physical activity, Outdoor games duration (hours)			
Boys (n = 39)	0.55±0.87, 0 (1)	0.74±1.05, 0.5 (1)	0.0351*
Girls (n = 39)	0.41±0.56, 0 (0.75)	0.55±0.82, 0.5 (1)	0.0597

* P Value <0.05

Stress and Psychological Changes :

Psychological changes are observed among 32.05% students with mild mood disturbances (8.97%), anxiety (16.67%), depression (11.5%) and internet gaming disorder (3.85%). TV, internet gaming and internet Screen-time is significant factor for developing psychological changes among students (OR 1.19, 95% C.I. 1.01 - 1.43) with P value 0.0353 < 0.05;. Stress is also a significant factor for developing psychological changes (OR 29, 95% C.I. 5.49-537.33) with P value 0.00145<0.05. However, no significant relation has been found between screen time and stress among students (P value > 0.05) in this study . It is also observed that, development of psychological changes among students under stress [24 (50.00%)] is significantly higher than students with no stress [1 (3.33%)] (P value 5.182e-05 < 0.05).

Statistical Tools Used :

Categorical variables are expressed as No (%), while continuous variables are expressed as Mean ± SD, Median (Inter Quartile Range). Statistical tools used were Wilcoxon signed test (test for paired observation), Wilcoxon rank sum test, McNemar's test, Pearson's Chi-square test and logistic regression. P Value <0.05 considered significant; Statistical package used R version 3.5.3.

Discussion

Mental Health :

The prevalence of anxiety and depression among adolescents in this study was 16.67% and 11.5% respectively, of mild mood disturbances was 8.97% and internet gaming disorder was detected in 3.85%. Slightly lower rates were found in a study by Meherali S, *et al*[15]. This correlates with a review by Shanbehzadeh S, *et al*, where common mental health problems were anxiety (range 6.5% to 63%), depression (4% to 31%) and post-traumatic stress disorder (12.1% to 46.9%). However, depression among adolescents in this study was lesser than general population[17]. In another study byJiaqiXiong, *et al*, symptoms of anxiety (6.33% to 50.9%), depression (14.6% to 48.3%), post-traumatic stress disorder (7% to 53.8%), psychological distress (34.43% to 38%) and stress (8.1% to 81.9%) have been reported in the general population during the COVID-19 pandemic in different countries[18]. In this study there was no significant difference of stress level or psychological changes between boys and girls,where as in general population female gender is a risk factor[18]. Psychological changes like anxiety, depression, etc in students with stress is significantly higher than students without stress ,as also found in another study[19].

Sleep :

Sleep affects physical, mental and emotional development of the adolescents and it has a potential impact on their academic performance[20]. Adolescents should sleep 8-10 hours/day on a regular basis to promote optimal health. Consistent sleep habits such as regular bedtime, wake-up time, and similar sleep schedules on weekends and weekdays help in better sleep outcomes. 15.38% adolescents had inadequate sleep duration in this study whereas in a study by Mathew G, *et al* sleep duration was found to be

inadequate in more 60% of the children[21]. The pooled prevalence of any sleep disturbance in children during the pandemic was 54% in another study by Sharma M, *et al*[22], which is more than this study (20.81%). In a study by Moitra P, *et al* more than half (52.5%) of the adolescent participants had poor sleep quality during COVID pandemic[23].

Physical Activity :

In a study by Moitra P, *et al*,only 12% engaged in moderate to vigorous physical activity[23]. This is similar to this study where exercise or physical activity more than 1 hour is 12%. Satija A, *et al* in a study found that Adolescents who are unfit are more likely to be deprived, female even in non-deprived families, have obesity in the family and have academic non achievement[24]. In this study significant increase in duration of physical activity observed for all, especially for boys but, for girls no significant increase in duration of physical activity was noted.

Screen Time :

In this study, internet gaming disorder was found in 3.85% adolescents. Problematic gaming behaviour is associated with adverse effect on mental health like depression, anxiety, obsessive-compulsive disorder and somatisation[25]. The prevalence of internet addiction was found to be 24.4% in a study by Warburton WA, *et al*, which was higher than this study[26]. It has been found that adolescents having problems with impulse control and unmet needs in everyday life may be more vulnerable to internet gaming disorder. While treating and counselling the adolescents, focussing on risk factor had proven to be beneficial[23]. In a study by Moitra P, *et al* 65.4% adolescents used social networking sites for at least 2-3 hours/day, and for 70.7% adolescents screen time had taken up the majority of their leisure time. A higher screen-time was associated with lower physical activity and increased sleep[23]. Screen time spent was a significant factor for developing psychological problems in this study. Although hours spent on watching screen was not significant factor for developing stress problems. No significance has been found between screen time and sleep duration in this study. Post pandemic internet and total screen-time is significantly higher among students in mid adolescence than early adolescence in this study. This could be partly due to the increased duration of online classes in higher standards.

In a systematic review by Oosterhoff B, *et al* potential negative effect of the pandemic on adolescent mental health was highlighted. The practice of social distancing due to the COVID-19 pandemic seem to be difficult for adolescents to process, which results in poor mental health outcomes[27]. The Adolescents lack the ability to process difficult circumstances, like the pandemic . This may be due to their negative coping skills. This puts them at risk for depression, stress and trauma[28]. The adolescents need to be taught proper life education by health care professionals, teachers and parents. The lack of positive coping skills among adolescents is not uncommon. They must be provided with the skills to cope in order to make them resilient and mentally well during periods of crises. The teaching and practice of positive coping skills can lead to mentally well adolescents, who can easily cope with rapid changes. Social support was another major factor for their wellbeing. Adolescents had experienced low to moderate social support during the pandemic, which contributed to increases in anxiety and depression[29]. Hence, it is essential that support should be provided to adolescents at home in these critical situations. Studies have shown that the strengthening of social support leads to positive mental health outcomes[29]. Another important requirement for adolescents is social connectedness, which they reported to be less during online education. For most of adolescents their smartphones were “necessary” and “connecting” although they reported high distractibility due to this[30]. Compulsory online education and exposure to excess screen has been a concern as there was both isolation from peers and relatives increased dependance on technology during the pandemic[31]. Proper guidance and supervision regarding use of social media and internet is essential for adolescents and young adults.

Limitations of this study were reporting was done by recall method by adolescents only. This was a small study having limited number of participants. Further studies can be done comparing physical schools and online schools, to explore the positive and negative aspects of online education. Online education can open prospects of distant education. Another limitation was that complete data of the other members of the family especially for calculating total per capita income per month was not recorded. Hence, this data couldnot be interpreted with Kuppusamy scale. Hence statistical analysis was not done with this data.

Conclusion

The present study brought forth the adolescents’ screen time viewing, physical activity levels, stress and mental health problems more than 1 year after a pandemic especially when there was no lockdown due to COVID and they were studying online. Boys had increased physical activity duration while pursuing

online education, though their duration of playing internet games had increased too. Adolescent more than 13 years ie, in mid adolescents showed more tendency for watching screen and reported more incidence of mood disturbances, depression or anxiety in the study period. However, there was no significant increase of stress factor due to their stay at home, or online education. Most adolescents knew that watching screen excessively is bad though few tried to decrease screen-time. Most students' academic performance remained same or became better as reported by themselves. Parents should support adolescents for ensuring a control on the screen usage, especially by being role models regarding physical activity and screen-time. Parents, teachers, Pediatricians and healthcare workers should work on early identification of anxiety and depression symptoms in adolescents[32]. Mobile applications and games to promote healthy lifestyle and tracker of early symptoms of mental health problems can be utilized for benefit of the adolescents and young adults.

Recommendation / Implications

Adolescents more than 13 years old are more vulnerable to increased screen-time and psychological effects of depression, mood disturbances or anxiety than the younger ones especially when physical schools are closed. Most adolescents have knowledge but need guidance and constant support for health promoting activities and habits like pursuing hobbies, physical activity during periods of deviation from routine life.

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Conflict of Interest : None

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