


The Effects of the COVID-19 Confinement on Screen Time, Headaches, Stress and Sleep Disorders among Adolescents: A Cross Sectional Study

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Abstract

Background: Headache is a common symptom affecting children and adolescents. The medical literature over the last three decades reveals a variable prevalence and triggers in different countries, regions, circumstances and times. This study aims to assess the prevalence, frequency and quality of headaches in the Lebanese adolescent population under the COVID-19 confinement and study its triggers and relationship to screen time, self-reported anxiety, and sleep.

Methods: A cross sectional design was used to collect two survey results by snowball distribution using social media targeting adolescents aged 15 to 17 years of age. The first survey included 13 questions with a single best answer about screen time, feeling anxious, sleep time, schedule and consistency, and headaches. The second survey included 3 questions about the quality of the headaches, anxiety and its triggers.

Results: Among 433 responders to the first survey, the prevalence of headaches, especially pressure points and band-like pressure was higher than any previously reported among adolescents in the literature, reaching 93.4%. Screen time was also higher than any previous reports with 95.6% spending 9 hours or more on screen while 64% of adolescents spending at least 12 hours a day on screen. In addition, the majority (82%) don't have consistent sleep habits and 41.8% consider themselves anxious. School was considered the main source of stress by 82.8% of the responders. The frequency of headache correlated significantly with increased screen time, self-reported anxiety and inconsistent sleep habits.

Conclusions: Headaches among adolescents are associated with increased screen use, sleep disorders, and self-reported anxiety. It is one of the primary somatization symptoms in this group expressing their extreme stress under the current economic, political, and health crisis. The present trends are likely to have major long term implications on adolescents' health and academic achievements and should alarm educators and health officials to intervene in this situation.

Keywords

adolescents, headaches, screen time, stress, Covid-19, confinement, sleep disorders

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Introduction

The evolution of the Social Media over the past 10 years has been unparalleled in the human history of social proliferation as a behavioral and biologic factor especially influencing our youth. The progression of digital media and its tools have changed the social fabric around our adolescents and not unexpectedly, resulted in new behaviors, stressors and ailments that need thorough investigation.¹ During the past two years, the COVID-19 pandemic dominated our life and gave the digital tools another leap into adolescent's daily activities with the online teaching and confinements.^{1,2}

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Over the past three decades, over seventy studies looked at headaches in children and adolescents, their types, triggers, and associations spanning many countries, regions and time periods. The reported findings are significant for their tremendous variations and inconsistencies.³⁻⁷

We looked at the last 30 years, one decade at a time, and found profound geographical variations, unexplainable by one simple factor. Between 1990 and 1999, before the age of social media the reported prevalence of headaches among children and adolescents varied between 21% and 89%. Wide differences are noticeable among the studies from different countries.⁸⁻¹¹ Between 2000 and 2009, where children and adolescents started to have mainly games and smart phones, there were reports of 20-91% headache prevalence among children and adolescents.^{12,13} In a meta-analysis of studies done before 2010, Abou-Arafah et al reported that about 60% of children and adolescents complain of headaches with females in this category being 50% more prone than males.⁷

In the past 10 years, we noted similar variations again. There has been reports of wide variations in prevalence of headaches such as one report of 12.9% among children aged 11 to 15 from Denmark published in 2018 and 88% among Norwegian children aged 12 to 18 in 2015.^{14,15}

Several studies looked at the triggers and associations of headaches and a few recurrent themes were found to include screen exposure time, economic strains, living with a single parent, disabilities, sleep disturbances, physical inactivity, eating irregularly, smoking, caffeine use, anxiety and depression.¹⁴⁻¹⁸ Daily restrictions of different activities and quality of life were reported to be reduced in 42% of young people with headaches.¹⁰⁻¹⁴ The frequency of headaches correlate also with older age and female gender especially after puberty in a ratio of 1.5:1.^{19,20}

As to the types of headaches encountered, Genizi et al studying children and adolescents aged 6 to 18 showed a prevalence of 44% for migraine and 47.7% for tension type headache (TTH). Yet Tonini et al found 45% of teenagers have migraine while 27% have TTH between age 17 and 20 years.^{23,24} Norwegian adolescents aged 12-18 years reported an overall headache prevalence of 88%, migraine was 23%, probable migraine 13% and TTH 58%. In 2017, a Jordanian study of 16-18 year old subjects reported a headache frequency of 66%, among those 19.0% were classified as TTH, 8.8% as migraine, and 39% undifferentiated headaches. In Croatia, adolescents reported a prevalence of migraine of 12.8%, and TTH of 38.3%.¹⁹⁻²¹

Several studies documented a clear relationship between screen time and the incidence of headaches in children and adolescents. With more time on screen, migraine type headache was found to increase by 20% to 37% in one cross sectional study.¹⁵ In addition, screen time was found to correlate with sleep deprivation²⁵ especially with using screen in the hour before bed resulting in sleep disturbances.²⁵⁻²⁸ In addition to screens, the perceived triggers and associations of

headaches include school, smoking and lower socioeconomic classes, and depression.²⁸⁻³¹ In Brazil, 80.6% of adolescents aged 14 to 19 years using computers and videogames reported having headaches, including 17.9% TTH, 19.3% migraine, and 43.4% undifferentiated headache. Screen use was associated with a 20% more headaches especially migraines.³²

Screen exposure has also been shown to accentuate sleep disorders in children and adolescents, including the ability to fall asleep, sleep through the night, sleep deeply and wake up rested next morning. It was shown that adolescents are more likely to be affected and lose daytime concentration the longer time they spent on the screens and especially when used up to their sleeping hour. Sleep disturbances may result additionally, in physical, cognitive and psychological issues.³³⁻³⁶

The presence of digital devices in the adolescents' bedrooms was associated with delayed bedtime, inconsistent sleep patterns, and psychological preoccupations. Using screen in the hour before sleep was also a significant factor in a Norwegian cross-sectional study of 9846 adolescents, resulting in difficulty falling asleep and nocturnal awakenings.²⁵ In other study populations, 20.1 to 43.3% of adolescents who reported mobile phone-related nocturnal awakenings, also reported more exhaustibility and daytime tiredness.^{25,37,38} The consequences of sleep disturbances, include a higher risk of sedentary lifestyle, depression, nighttime eating, and obesity in adolescents.^{33-36,39} Sleep disturbances are more pronounced with the use of night time media, nocturnal sleep interruptions by messages and notifications and especially when screens are used up to the sleep time.^{27,37,39}

Because this assessment was never done in Lebanon, we launched this study to find out the prevalence and patterns of headaches among adolescents and their relationship to sleep disturbances and stress under the current confinement and the changing social, economic, health and educational systems.

Methods

This is a cross-sectional study using two anonymous multiple choice questionnaires, conducted across all districts of Lebanon in January and February of 2021.

The minimum sample size was calculated as 384 using the equation $[Z^2 \times p \times q] / E^2$. The level of confidence of (1.96) was used, which translates into a confidence interval of 95%, p is the expected prevalence or proportion (50%), with a margin of error of 5%. After accounting for 10% non-response and incomplete data, we added a safety margin and set the sample size to a minimum of 422. The estimated population was 50 000 students in this age group. The sample selection aim was to represent schools in different areas in Lebanon.

The two questionnaires were designed by the authors after an initial literature review and discussion with the eleventh grade students of the international program at SABIS educational system, Adma, Lebanon. The first questionnaire consisted of 13 single-choice-questions and the second was only made of 3 questions of multiple-answer type. The questions were sent through the social media by snowballing between subjects and their contacts to cover the different areas of Lebanon. The questions were self-administered over the Google Forms application in English language. Participants included in the study were aged 15 to 17 years consenting to complete this study.

The first survey included 13 questions concerning screen time during weekdays including online teaching, feeling anxious, earphone/ headphone use, sleep time and consistency, sleep schedule, time delay between screen exposure and sleep, feeling of anxiety and headache description : frequency, timing, duration, localization and triggers. History of head trauma was also reported. The second survey included 3 questions with multiple-answers to choose all that applies. Those questions probed the quality of the headache pain, description of anxiety and its triggers.

To diagnose headache types, the questionnaire reflected simple descriptions about the different types of headaches to assess the presence of TTH as band like around the head or point pressure or migraine headaches (MH) according to the criteria of the International Classification of Headache Society.²²

Statistical Analysis

The data statistical analysis was made using the Statistical Package for Social Sciences software (SPSS), version 27.0. All variables were numeric or nominal and were represented as percentages. Spearman's correlation coefficient and the Chi-Square test were used to compare variables. Results with a P value of $<.05$ were considered statistically significant. Logistic regression models were used to test any association between the variables, and any confounding factors.

Results

An overwhelming 95.6% of adolescents spend 9 or more hours per day on screen during weekdays, and about 82% use their screens up to the time they fall asleep while 78.7% report using their smart phones more than the previous year (Tables 1 and 2).

73.2% report having headaches at least few times per month. About 10% of headaches are one sided while over 83% of all headaches are described as head band or point pressures. In the second questionnaire, the majority (62%) reported feeling headaches with nausea, vomiting, photo or phonophobia (Tables 1 and 2).

The subjects' opinion on the triggers of headaches are: spending too much time on screen (17.9%), lack of enough

sleep (23.3%), stress (22.1%), or random reasons (36%). 77.8% of the headaches last between 10 minutes and several hours, and about 40% have it for days with less than a week without headaches. Only 8.4% reported having head trauma as children (Table 1).

The frequency of headaches increased with increased self-reported anxiety, less sleeping hours, and duration of headaches ($P < .001$ for all). More frequent tension and point pressure type headaches corresponded and correlated with more screen time ($P = .01$), the frequency of headaches ($P = .003$), inconsistent sleep schedule ($P = .017$), and longer period of headaches ($P = .017$) (Tables 3 and 4).

More screen time was associated with more frequent headaches ($P = .01$), and sleep deprivation ($P = .0017$). 13.2% of adolescents reported sleeping less than 5 hours while the majority (65.4%) spend 6 to 7 hours asleep. 82.2% reported having an inconsistent or fluctuating sleep pattern. The sleep schedule inconsistency increased with screen time ($P = .003$), the frequency of headaches ($P < .001$), using the phone more than previous year ($P = .026$), using earphones ($P = .037$), and having self-reported anxiety ($P = .036$). We found a significant correlation between the consistency of sleep schedule and the time delay between the last screen exposure and bed time ($P = .046$).

The majority (>70%) of stress feelings occur among those spending 9 or more hours per day on screen and those having headaches. While 75.7% consider themselves anxious or having an inconsistent mood, anxiety among adolescents is mostly felt as nervousness (87.5%), additionally more than half also felt sadness and chest pressure. The most commonly reported triggers of stress are school (83%), being overwhelmed with things to do (69%) or with emotions (63%) (Table 2).

Discussion

In addition to their education, entertainment, shopping, communications, news, and much more, the online schooling during the COVID-19 crisis amplified the screen utilities resulting in a typical teenager spending most of their waking day on a certain screen whether it is television, computer, tablet, a smartphone or a laptop. In the meantime, the world has been living exceptional political, economic and existential turmoils that are assuredly sensed by adolescents and inflicting their lives gravely.

This study revealed the significant findings that during the current confinement an unusually high 95.6% of adolescents spend 9 or more hours per day on screen during weekdays, and most use some form of screens up to the time they fall asleep. The majority (94%) report having headaches at least few times per month. Primary headaches account for the majority of headache types including 83.3% feeling band and pressure like pain. The triggers of headaches come as no surprise: too much screen time (17.9%), lack of sleep (23.3%), and stress (22.1%).

Table 1. The First Survey's Answers Listed as Percentages of the Subjects in bold. It Included 13 Questions About Headache, Sleep, Stress and Screen Time.

Questions	Options					
1 How frequently do you have headaches n = 433	13.9% Daily	35.1% Few per week	24.2% Few per month	26.8% very rarely		
2 Do you have headaches usually n = 433	18% At the top	39% Around the head	26% One pressure point	10% On one side	7% Other	
3 Do your headaches usually come when n = 429	17.9% Spend more time on screen	23.3% Don't sleep enough	36.6% At random times for no reason	22.1% Are stressed/anxious		
4 How long do your headaches usually last n = 428	22.2% Couple of minutes	23.1% 10-20 minutes	24.5% Almost an hour	23.1% Several hours	7% All day	
5 When you get a headache, does it n = 427	58% Come for few minutes then disappear	23% Frequent for few days then disappears	10% Come and go but does not disappear for longer than a week	9% Other patterns		
6 Did you get hit on your head during childhood N = 428	8.4% Yes	45.6% Rarely	46% No			
7 How many hours do you sleep on average on weekdays n = 433	13.2% Less than 5 hours	65.4% 6-7 hours	18.7% 8-9 hours	2.7% More than 9 hours		
8 How many hours a day do you spend on screen n = 432	4.4% 8 hours or less	30.8% 9-11 hours	40.7% 12-13 hours	24.1% 14 or more hours		
9 Have you been using your phone recently more than the previous year n = 431	7% No	78.7% Yes	14.4% Not by a considerable amount			
10 Do you use earphones / headphones a lot n = 429	39.9% Yes	24.9% No	35.2% Sometimes			
11 What is the time difference between using your phone and sleep n = 431	2.3% Multiple hours	2.6% One hour	14.2% Half an hour	81.9% Right before sleep		
12 Do you consider yourself an anxious/stressed person n = 431	41.8% Yes	24.4% No	33.9% My mood is inconsistent			
13 Is your sleep schedule consistent n = 428	51.4% No	17.8% Yes	30.8% It is usually but fluctuates at times			

Headaches were shown to correlate with excessive use of electronic devices and screen time. In the literature, migraine headaches were more likely to be associated with the screen time as opposed to TTH but some of those reports may be influenced by the classifications used.^{22,31,40,41} The majority of the subjects surveyed (69%) had associated nausea, vomiting, photo or phonophobia. However, occasional association of nausea and vomiting with head pressures and tension headaches is not unusual.

Adolescents with migraine and TTH are more likely to have learning disabilities, estimated as 2.7 times higher than in patients with migraine alone.³⁸ Students with history of headaches were also found to have lower quality of life and academic performance.^{40,41} We did not look

into those consequences of headaches and their associations. It is hard to define the cause and effect relationship in this sequence but screen use may be a cause of eye, neck and back strains and headaches but may also be an escape from the daily pressures of an adolescent life.

Excess screen time is associated with more frequent headaches, sleep deprivation and anxiety. In our study, 13.2% of adolescents report sleeping less than 5 hours with 82.2% having an inconsistent or fluctuating sleep pattern. As expected, sleep disturbances correlate with anxiety ($P = .036$).

Adolescents are an integral part of the society who are currently living the disastrous effects of the COVID-19 pandemic and the failing economy in an environment of confinement, uncertainty and fear. It is likely that this

Table 2. The Tabulated Answers of the Second Survey Which Included Three Multiple-Answer-Questions (all That Applies).

Questions	Options
How does stress feel like to you? n = 64	57% Pressure in the heart 88.4% Nervousness 50.9% sadness 16% Nervousness and Sadness and pressure in the heart 28.6% Nervousness pressure in the heart 23.8% All three
What makes you stressed? n = 64	82.7% School 61.9% Too much to do 28.8% Home/ Family 15.2% School and too much to do 9.5% School and emotions 5.3% Emotion and Home/Family 3% Too much to do and Home/Family 32.7% School, Too much to do and emotions 12% All four
How do headaches feel to you? N = 62	36.7% Pressure like 29% Comes with nausea but no vomiting 7.8% Comes with nausea and vomiting 35.1% Comes with photo/ phonophobia 20% Pressure and Photo/ phonophobia 19% Pressure and nausea without vomiting 1.6% Photo/ Phonophobia, nausea but no vomiting 7% Pressure, photo/ phonophobia, and nausea but no vomiting 4.8% Pressure with nausea and vomiting 5.3% Emotion and Home/Family

Table 3. Correlations Between Variables as Measured Using Regression Analysis. Spearman's rho and P Values are Listed. Statistically Significant Correlations are Marked in Bold.

	How many hours a day do you spend looking at a screen? (including 7 hours of online school)	How frequently do you have headaches?	Have you been using your phone recently more than you did last year or before?	Is your sleep schedule consistent?	Do you use earphones/Headphones a lot?	Did you get hit on the head much during your childhood	Do you consider yourself an anxious/stressed person?	What is the time difference between the last time you use your phone and the time you sleep usually last	how long do your headaches usually last
How many hours do you sleep on average? (weekdays)	Spearman's rho P-value	-0.22 <.001	-0.082 .088	0.369 <.001	-0.056 .243	0.061 .205	-0.265 <.001	0.03 .49	-0.09 .053
How many hours a day do you spend looking at a screen? (including 7 hours of online school)	Spearman's rho P-value	0.032 .508	0.143 .003	-0.141 .003	0.201 .001	0.043 .370	0.082 .089	-0.23 .001	-0.08 .102
How frequently do you have headaches? Have you been using your phone recently more than last year?	Spearman's rho P-value	0.032 .508	0.072 .138	-0.065 .177	-0.02 .714	-0.094 .053	0.346 <.001	0.001 .977	0.292 <.00
Is your sleep schedule consistent? Do you use earphones/headphones a lot?	Spearman's rho P-value	-0.141 .003	-0.107 .138	-0.107 .026	-0.10 .599	-0.057 .187	-0.102 .098	0.097 .057	0.028 .340
Did you get hit on the head much during your childhood Do you consider yourself an anxious/	Spearman's rho P-value	0.043 .370	-0.064 .187	-0.057 .243	-0.10 .029	-0.034 .482	-0.034 .482	-0.09 .064	-0.15 .002
Do you consider yourself an anxious/	Spearman's rho P-value	0.082 .089	0.080 .098	-0.102 .036	-0.01 .813	-0.034 .482	0.016 .736	0.231 <.00	0.231 <.00

(continued)

Table 3. Continued.

	How many hours a day do you spend looking at a screen? (including 7 hours of online school)	How frequently do you have headaches?	Have you been using your phone recently more than you did last year or the year before?	Is your sleep schedule consistent?	Do you use earphones/Headphones a lot?	did you get hit on the head much during your childhood	Do you consider yourself an anxious/stressed person?	What is the time difference between the last time you use your phone and the time you sleep usually last
stressed person?								
What is the time between sleep and your phone use								
	Spearman's rho	0.001	-0.092	0.097	0.071	-0.090	0.016	-0.04
	P-value	<.001	.057	.046	.143	.064	.736	.466

Table 4. Correlation (*P* Values) Between Headaches and Screen Time. Statistically Significant Correlations are Marked in Bold.

	How many hours a day do you spend looking at a screen? (including 7 hours of online school)	How frequently do you have headaches?	Have you been using your phone recently more than you did last year or the year before?	Is your sleep schedule consistent?	Do you use earphones/headphones a lot?	did you get hit on the head much during your childhood	Do you consider yourself an anxious/stressed person?	What is the time difference between the last time you use your phone and the time you sleep	how long do your headaches usually last
Do you usually feel headaches 5 categories	0.59	0.003	0.43	0.017	0.235	0.43	0.19	0.236	0.017
Do you usually feel headaches 3 categories	0.644	0.014	0.601	0.147	0.38	0.238	0.292	0.655	0.004

environment along with the excess screen time accentuated by the online teaching are resulting in sleep deprivation and a high prevalence of tension headaches. Many of these subjects might be suffering from mental illnesses as well. The strains of long hours of screen, anxiety and sleep disturbances are feeding one another to create this high stress, anxious adolescent population. The prevalence of migraines in our survey is close to the highest reported worldwide but the tension and pressure like headaches are much higher than previously reported reaching 83.3%, reflecting a society, living on edge under unprecedented pressures.^{42–44}

Sleeping habits and consistency, we found, are also linked to headaches likely in a bi-directional association. This association is likely a cause of poor concentration and fatigue during daytime. In terms of sleep quality, the presence of headaches is associated with reports of sleep inconsistencies expressed as restless sleep and nocturnal awakenings especially for those keeping their phones at bed side and receiving night messages and notifications.

Not to ignore the organic causes of headaches, adolescents who are on the brink of adulthood are clearly not only worried about entering a new phase but also bear, silently, a lot of the societal pressure even when adults feel adolescents are living in their own world. The pressure of confinement and the economic crisis, have brought down the somatization threshold to reveal new level of headaches, pushing adolescents to use escape mechanisms levels like more screen time and causing secondarily more sleep disturbances.^{45,46}

There were several limitations to our study including not looking at the effects of the confinement and increased screen time on other health issues like day fatigue, diminished productivity, obesity, reduced academic performance, depression and poor health habits in general or differences between genders. The questionnaires we used were not standardized and validated and the population considered reflects mainly adolescents living in Mount Lebanon, speaking English and having access to social media. Although our population may represent a majority of the Lebanese adolescents, there are no doubts that this representation is incomplete.

The variations of the prevalence of headaches over the years and in different countries, negate a simple explanation of the prevalence of headaches in different populations. Single causations like excess screen exposure cannot account for all these variations but suggest a more complex picture that possibly reflects the sum of stressors and tensions in an adolescent life. It is difficult to classify headaches in this group of subjects but the presence of associated nausea, vomiting, photo or phonophobia (69% of the subjects) is likely compatible with migraine. However, occasional association of nausea, photophobia and phonophobia with dull head pressures may also be encountered with tension headaches. It is therefore difficult in many cases to distinguish between the two types which may coexist in many situations.^{10–12}

The abundance of data on headaches in adolescents and its correlations with sleep, stress, economic strain, and

confinement point to the fact that headaches are a common neurosensory somatization symptom among adolescents.

Conclusions

This study shows a very high incidence of headaches among adolescents under exceptional circumstances. The data proves a clear relationship exists between the frequency and quality of headaches and screen time, self-reported anxiety and sleep disturbances among adolescents. The current degree of stress due to COVID-19 confinement, the political and economic pressures and online schooling added up to result in an unprecedented prevalence of headaches and stress among adolescents. Primary headaches in children and adolescents are most commonly due to tension but no study documented the high levels we detected and related it to the current levels of screen time, probably pushing one of the extremes of human tolerance.

Headaches have many consequences including missed school days, repeat school grades, association with mental illnesses, etc.. As a consequence, the whole educational path can be negatively affected by headaches in childhood and adolescence. It is of utmost importance to screen and monitor the frequency of headaches in elementary and high school students and understand their root causes in order to address those issues and associated health and educational anomalies.

Sleep deprivation and headaches are likely to result from less sleeping hours and screen exposure and subsequently having to compensate with erratic naps. There is a clear relationship between sleep problems and screen time and that was reported previously reflecting on different health aspects.^{42–44}

In the past few years the economic, political, and societal pressures in Lebanon were exceptional and led to a civil revolution in October 2019. Not long after, the COVID-19 pandemic added the pressure of confinement to create a perfect stormy environment for somatoform and somatosensory disorders like headaches. It appears that headaches, which have clear organic causes, were brought on by a lower somatosensory threshold.

We recommend that pediatricians and educators take into consideration headaches as a significant symptom expressing the level of stress among adolescents and inflicting heavily their wellbeing. It is of prime importance to inquire about headaches and try to understand the causes and effects on the adolescents' daily life including sleep, anxiety, exercise, productivity and health in general leading to the development of an adult citizen capable of maintaining a balanced, healthy life.

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Ethical Approval

This is a cross sectional study.


Informed Consent

This study included surveys completed only by consenting subjects.

Trial Registration

This was not a registered trial as a cross sectional study.

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