Public Health and Preventive Medicine
Vol. 7, No. 2, 2021, pp. 19-29
http://www.aiscience.org/journal/phpm
ISSN: 2381-778X (Print); ISSN: 2381-7798 (Online)

A Cross Sectional Study on Gadget Dependency Among Undergraduate Medical Students and Its Effect on Health

Ng Enyi Charissa*, Prasila a/p Balakrishnan, Harish a/l Elang Gopalan, Caleb Su Kar Hong, Ashwene a/p Chandrakumar

Faculty of Medicine, Manipal University College Malaysia (MUCM), Manipal Academy of Higher Education (MAHE), Melaka, Malaysia

Abstract

Gadget is defined as a transportable electronic device and has various effects due to its dependency among the undergraduates. The degree of dependence plays an important role which endangers the health and lifestyle of the students indirectly affecting both quantity and quality of being a doctor among the medical students. This study was conducted to assess the gadget dependency among medical students and its effect on health. This was a cross sectional study conducted from June 2021 to July 2021 in Manipal University College Malaysia (MUCM). An electronic survey through Google forms was distributed to the students from MBBS Sem 1 to Sem 10 and a total of 156 responses were collected. The questionnaire consisted of 3 parts including sociodemographic data, 12 questions regarding the perceived social support among the students, 27 questions on the use of the technological gadgets, gadgets dependency among participants, the effect on health of the participants and the safety measures while using gadgets. To analyse the data, statistical tests (Unpaired t test, ANOVA, correlation and simple logistic regression) were done by using Epi Info version 7.2. Findings revealed that 63.46% from 156 participants had more than 6 hours of time on gadgets. Study was the main purpose for students using gadgets (96.8%) followed by entertainment purposes (95.51%) and communication purposes (92.3%). Among 156 participants, 66.67% of them had high perceived social support. There was significant association between age, ethnicity and academic semester with gadget dependency. This study showed there was a negative, little if any correlation between perceived social support and gadget dependency. 74.4% of participants agreed that survival is difficult without technology gadgets and 83.3% of the participants agreed that IT education is mandatory for higher education. Nearly 54.5% of the participants had defective vision, 58.4% experienced physical discomfort and 59.6% felt ill and tired after long use of gadgets. Overall, the gadget dependency among students in MUCM was high but the effect on health was not significant.

Keywords

Gadget, Dependency, Effect, Health, Medical Student, Cross Sectional Study, Malaysia

Received: August 5, 2021 / Accepted: August 24, 2021 / Published online: August 30, 2021

1. Introduction

In our modern era, technological gadgets play a major role in human's life especially for undergraduates due to its monstrous evolution over time. It seems to be that the gadget usage among the undergraduates fails to meet their basic need for them instead being an addiction for their pleasure. The degree of dependence plays an important role which endangers the health and lifestyle of the students indirectly affecting both quantity and quality of being a doctor among the medical students. [1] Gadget is defined as a transportable electronic device and has various effects due to its dependency

* Corresponding author
E-mail address: charissa7234@hotmail.com (Ng E. Charissa)

among the undergraduates. Among gadgets, smartphone, tablet, laptop, gaming console, MP3 players are considered to be popular among the youngsters. Addiction is defined as an urge which is accompanied by loss of control that causes lower emotional intelligence indirectly affecting both academic and professional performance. [2] Globally, the rate of people owning more than one gadget has increased among the people, especially aged 18 to 29 years on average in America. [3] In Malaysia, even primary school students seem to be addicted and dependent on their mini mobile gadgets. [4] According to the survey of CommScope (2018) in Malaysia, it stated that "GENERATION Z" is reported to be the most technology-intimate and connectivity-dependent demographic in history. It also reported that 63 percent of participants had high level dependency on handsets within the demographic with the claiming that they would find living without their smartphones "extremely difficult". Generation Z defined as those who were born late nineties onwards currently accounting for 33% of the population in 2020. [17] Especially during COVID-19 lockdown period, the usage of gadgets had also increased and this is shown in previous study. [11]

Gadgets with internet access have changed our lives in a variety of ways, causing a fundamental shift in our reliance on technology to execute important tasks in our daily lives. A study by Kaiser Family Foundation reported that there has been a huge increase in ownership of gadgets among 8-18 years old: from 39% to 66% for cell phones and from 18% to 76% for iPods. [13] Just to name a few we have access to an enormous amount of information, such as Google Maps for directions, YouTube videos for learning how to cook, sing, draw, and learn science. We also have health monitoring apps for smartphones that remind users to walk, run, bike, and check their blood pressure on a regular basis. We'll also be able to share daily life or exceptional occasions with thousands of people in real time and allow them to experience it with us all in just a few minutes. These statements are proved by the study conducted by Bruner & Kumar which indicates that under- graduates in Malaysia are the users of active social networking sites and it has become part of their daily activities. [14] Further more young people want technology to add value to their lifestyles, satisfy their social and leisure needs and reinforce their group identity. [3] From a study on the length of looking at the gadget screen conducted by the University of Western Australia, it was found that 45% of 8-year-old children and 80% of 16-year-old students spent more than two hours playing gadget in a day. [16] While the information era and technology revolution have had their benefits, they have also produced an unquenchable thirst for information. It is now normal to expect information to be provided on demand at any time and from any location. From a study done in Delhi, the gadget dependency was found to be high (22.4%) among the medical college students of Delhi. [17] There are many factors associated with gadget dependency, which are loneliness, antisocial values, lower emotional intelligence and depression and there is a relationship between these factors and gadget dependency. [2] Moreover, current fixtures of youth culture according to UNICEF, 2011 such as social network sites, online games, video-sharing sites and gadgets, such as iPods and mobile phones do also have an association with gadget dependency. [10] In the study 'Assessment of gadgets addiction and its impact on health among undergraduates', there was an association between the factor age, gender, ethnicity and gadget dependency in which age of 21-24 years, gender male and Indian ethnicity had the highest percentage. [2] Moreover, in this study too there was an association between socioeconomic status and gadget dependency and it was found that the highest percentage belonged to class I socioeconomic status. [2] Moreover, in the study of Exploring the Relationship of Personality, Loneliness, and Online Social Support with Internet Addiction and Procrastination, it was found that there was an association between Perceived Social Support and gadget dependency and the variance was 28% which indicates a strong association. [9] Furthermore, in the study Gadget Dependency among Medical College Students in Delhi, there was an association between academic level and gadget dependency where clinical year students had a higher percentage. [3]

Will gadget dependency affect health? From the previous study, prolonged use of electronic gadgets causes 'computer vision syndrome' which manifests as eye strain, dryness, irritation, burning sensation, redness, blurred vision, and double vision. [18] Results of a number of studies showed that mobile phone radiation causes changes in gene regulation, auditory and visual problems, headache, neck pain and strain injury, memory loss, and fatigue. [19] [28] Kumar AK in his study also described that the majority 90.5% of the study participants were found to be using smart-phones, among them 57.5% had problems related to vision, 39% had hearing problems and 20% had reduced physical activity. [2] Another study also showed that using MP3 player for long periods of time may cause hearing problems. [27] A study conducted by Khan proved problems such as headache and concentration problems, difficulty in logical reasoning, memory impairment, and fatigue in individuals using gadgets excessively. [21] For physical discomfort, according to the data from the previous study, nearly 78% of the respondents whose time period of using gadgets is above 6 hours were having headaches and pain on a regular basis. [20] A study of 'Assessment of gadgets addiction and its impact on health among undergraduates' found that 61% from 200 participants had difficulty in day-to-day work performance, 12% had disturbed sleep and 10.5% had concentrating or thinking problems. [2] Another study also revealed that 40% of the respondents using the gadgets for more than 6 hours were having problems in logical thinking. [20] For

effect on mental health, the conclusion of 'most of the users using the gadgets for more than 6 hours are anxious and nervous' were made from the previous study. [20] It was also proved by the study by Revathi with a highly significant value for the problems associated with feeling of sadness or depression after using a gadget continuously for long hours. [1] It was shown in previous studies that maladaptive mobile phone and Internet use or gadget addiction was strongly associated with depression and anxiety. [12] [26]

We have decided to focus on this study as gadgets have become an essential part in our life in which human beings all around the world are dependent on them. Therefore, we have decided to carry out this study to know the gadget dependency and its effects on health. This study will also assess the risk factors towards gadget dependency which can be related to the study of time expend on gadgets. [5] The difference between our study and the previous study that has been conducted is that we will be able to know the predominant risk factors which lead to gadget dependency and this was not included in the previous study. Will lack of social support lead to gadget dependency? This was one of our main concerns in this study. Our main research hypothesis is that gadget dependency will cause physical and mental health problems.

The general objective is to know about how serious gadgets dependency among medical students in MUCM and the effect that will be caused by it. Coming out next is the specific objectives, firstly is to assess the gadget dependency among medical students in MUCM. Secondly, we want to determine the factors associated with gadgets dependency among medical students in MUCM. Thirdly, is to identify the uses of gadgets among medical students in MUCM. Last but not least, we need to determine the effect of gadgets dependency on health and lifestyle among medical students in MUCM.

2. Methodology

2.1. Study Design, Setting, Time, Population

A cross sectional study was conducted from June 2021 to July 2021 in Manipal University College Malaysia (MUCM). MUCM is a private institute which consists of two campuses; one is based in Muar, Johor and the other campus in Bukit Baru, Malacca. This institution offers 3 medical courses which are Foundation in Science (FIS), Bachelor of Medicine and Bachelor of Surgery (MBBS), and Bachelor of Dental Surgery (BDS). For our study, we included students from the MBBS course which comprises around 1300 students from Semester 1 to Semester 10.

2.2. Sample Size

According to a previous study that was carried out among the youth population in MGM campus, Aurangabad, India, they found that 69% said that social relationships are ruined by social networking sites. [5] We used Microsoft Excel Sample Size calculator with our population size (N) approximately 1300 of the total medical students in MUCM. The study estimate is 69% with precision error of 7%. With this we calculated our minimum sample size is 154. By considering the non-response rate of 10%, the total sample size calculated was 172 using equation:

$$n\ final = n\ calculated/\ (1\text{-}non\ response\ rate)$$

$$= 154/\ (1\text{-}0.1)$$

2.3. Sampling

All of them are medical students from Manipal University College Malaysia. Participants were selected using non-probability sampling which is snowball sampling. The inclusion criteria for this research is medical students from Manipal University College Malaysia of both genders irrespective of age and the exclusion criteria consists of participants who were not willing to be a part of this study and participants who have not given informed consent.

2.4. Data Collection

A well-structured questionnaire was used in this study. The questionnaires were distributed as an electronic survey which was Google forms to the students from MBBS Sem 1 to Sem 10. The questionnaire consisted of 3 parts. The first part contained the sociodemographic data (Age, Gender, Ethnicity, Nationality, Academic Semester and Household Income).

For the second part, there were 12 questions regarding the perceived social support among the students. The Multidimensional Scale of Perceived Social Support (MSPSS), a self-administered questionnaire was used in the second part. [6] It consisted of three subscales, which included Friends (FR), Family (FA) and Significant Others (SO) subscale, and had a good internal consistency with reported alpha coefficients of 0.89, 0.88 and 0.92 and a total variance of 80.51% in the previous study. [7] The 12 items were measured on a 7-point Likert scale from 1 'Very Strongly Disagree' to 7 'Very Strongly Agree'. A mean scale score ranging from 1 to 2.9 could be considered low support, a score of 3 to 5 could be considered moderate support, a score from 5.1 to 7 could be considered high support. [6]

The third part consisted of four sections which contained closed-ended questions regarding the use of the technological gadgets, gadgets dependency among participants, the effect on health of the participants and the safety measures while using gadgets.

Section A of the questionnaire consisted of questions regarding the usage of gadgets. Number and type of gadgets used, time

spent on gadgets and services and purpose of usage on gadgets were enquired. The time spent on gadgets by the participants was asked with provided options like 1-2 hrs, 2-4 hrs, 4-6 hrs and >6 hrs which the use of the gadgets for more than 6 hours was regarded as addictive use by the participants. [5]

In Section B of this questionnaire, 7 questions were asked about the dependency on gadgets among MUCM students. The questions included aspects of survival without gadgets, necessity of IT education in higher education, improvement of life by using gadgets, relationship and safety problems with the usage of gadgets. [5] For the aspect of improvement of life, questions such as 'technology is the best source of entertainment', 'music makes work easier' and 'technology makes youth smarter' were asked. For relationship and safety problems, questions including 'relationship is ruined by social networking' and 'unaware of surroundings while using gadgets' were enquired. All questions were measured on a 5-point Likert scale, from 1 'Strongly Disagree' to 5 'Strongly Agree'. [5] Total score of the gadget dependency was calculated. Higher scores indicated more gadget dependency among the students.

Section C and section D of the questionnaire asked about the effect on health and safety measures while using gadgets. [5] Section C consisted of 11 yes-or-no questions regarding the present physical health status, mental health status and change in social behaviour. For the physical health status, questions such as defective vision, hearing difficulty, breathing difficulty, alter in bladder and bowel habits, feeling of ill and tired were enquired. For mental health status, feelings of sadness or depression, anxiousness or stress were asked. For the aspect of change in social behaviour, questions such as difficulty in speaking coherently, difficulty in performing day-to-day activities and difficulty in logical reasoning and thinking were asked. There were 4 questions about the safety measures included in Section D in which 2 questions for example usage of gadgets while driving or charging were asked with provided options such as Never, Rare, Quite often and Always. The latter two questions in Section D included questions about the knowledge of the radiation value of gadgets and opinion on the effect of radiation to cause cancer were yes-or-no questions.

2.5. Data Processing & Data Analysis

The data collected from the distributed questionnaires was processed with Microsoft Excel 2016. Epi Info version 7.2 was used to analyse the data. For sociodemographic data (age, gender, ethnicity, nationality, academic semester and socioeconomic status), frequency, percentage, mean, standard deviation, minimum and maximum value were calculated and tabulated. For perceived social support, frequency and percentage of each category (Low, Moderate, High) were calculated and the subscale of friends (FR), family (FA) and significant other (SO) were calculated for mean and standard deviation. Total score of gadget dependency which ranged from 7 to 35 was calculated for mean and standard deviation. Frequency and percentage of effect on health and lifestyle and also the safety measures were calculated and tabulated. For association between sociodemographic data and gadget dependency among students, mean, mean difference along with 95% CI and p-value were calculated using the statistical tests shown in Table 1. For association between perceived social support and gadget dependency, Pearson's correlation with 95% CI and p-value were calculated. For association between gadget dependency and effect on health and lifestyle, Odds Ratio with 95% CI and p-value was calculated and tabulated. The level of significance was 0.05.

Table 1. Statistical tests for assessing the association between independent and dependent variables.

Independent variables	Dependent variables	Statistical tests
Age <22 years >=22 years	Gadget dependency Total score	Unpaired T test
Gender Male Female	Gadget dependency	Unpaired T test
Ethnicity Malay Chinese Indian Others	Gadget dependency	ANOVA
Nationality Malaysian International students	Gadget dependency	Unpaired T test
Academic semester Pre-clinical year Clinical year	Gadget dependency	Unpaired T test
Socioeconomic status < RM4360 > RM 4360- RM9619 > RM 9619	Gadget dependency	ANOVA
Perceived social support 1-2.9 (Low) 3-5 (Moderate) 5.1-7 (High)	Gadget dependency	Correlation
Gadget dependency	Effect on health	Simple logistic regression

2.6. Ethical Consideration

An informed consent form with all the important and relevant details of the study was given to the participants through google form. The participants were given the option of agree and disagree to participate in this study, and none were forced into participation in this research. The participants' information was kept confidential and used only for the purpose of a particular research. Their anonymity and privacy as well as any health issues of participants were well maintained. This research was approved by the Research Ethics Committee, Faculty of Medicine, Manipal University College Malaysia.

3. Results

Table 2. Frequency and percentage of Demographic characteristics (n=156).

Variables		Frequency (n)	Percentage (%)
Age	<22	48	30.77
	>=22	108	69.23
	Mean (SD)	21.9 (1.4)	
	Min-Max	19-25	
Gender	Male	64	41.03
	Female	92	58.97
Ethnicity	Chinese	62	39.74
	Indian	61	39.10
	Malay	10	6.41
	Others	23	14.74
Academic Semester	Preclinical Year	51	32.69
	Clinical Year	105	67.31
Nationality	Malaysian	144	92.31
	International Students	12	7.69
Socioeconomic status	<Rm4360	41	26.28
	Rm4360-Rm9619	62	39.74
	>Rm9619	53	33.97

In Table 2, of those who responded 108 students were in the age group of >=22. The mean was 21.9 years of age among the total of 156 participants. Besides that, most of the responses were noted to be females (58.97%) leaving a total of 64 responses to be that of male (41.03%). In terms of ethnicity, the highest response group came from Chinese community (39.7%). The Indian community (39.1%) was the second highest ethnicity that responded to our study followed by the Malay community (6.41%). A large proportion of the participants were from the clinical year (67.31%) followed by preclinical year (32.69%). Since our college has large numbers of foreigners as well, it was important for us to see the impact of nationality on the participant's awareness of our study. A total of 144 students were Malaysians (92.31%) and 12 students were international students (7.69%). At last, we also included the socioeconomic status of students in which 41 students were below RM 4360 (26.28%), 62 students were between the range of RM 4360 to RM 9619 (39.74) and 53 students with more than RM 9619 (33.97%).

In Table 3, we included the frequency and percentage of the gadget usage among the students. Most of the students spend more than 6 hours on gadget usage (63.46%), followed by 4-6 hours (26.92%), 2-4 hours (7.69%) and very few students spend 1-2 hours (1.92%) daily. Majority of the students own 3 gadgets (41.02%) followed by 2 gadgets (39.10%) and few students own more than 3 gadgets (19.9%). Since our research topic is about gadget dependency, we were assigned to find the purpose of gadget usage among the students. Majority of the students around 151 used their gadget for study purposes (96.8%) followed by 149 students using it for entertainment purposes (95.51%) and 144 students using it for communication purposes (92.3%). We also included the type of gadgets used by students in our questionnaire. Phone is the most common gadget used by the majority of the students (98.71%), followed by laptop (94.23%), tablet (59.6%), Gaming console (7.69%), MP3 players (1.92%) and others (7.05%). Finally, we also included the services of gadgets among students. Large proportion of services of gadgets among students were shown to be Internet (98.72%), followed by Music/Video (94.23%), Social Networking (91.03%), Messaging (87.18%), Calling (77.56%) and lastly for Gaming (51.28%).

Table 3. Frequency and percentage of Gadget usage (n=156).

Variables		Frequency (n)	Percentage (%)
Time	1-2 hrs	3	1.92
	2-4 hrs	12	7.69
	4-6 hrs	42	26.92
	> 6 hrs	99	63.46
Number	2 gadgets	61	39.10
	3 gadgets	64	41.02
	>3 gadgets	31	19.90
Purpose[a]	Study	151	96.80
	Communication	144	92.30
	Entertainment	149	95.51
Types of gadget[a]	Phone	154	98.71
	Laptop	147	94.23
	Tablet	93	59.60
	Gaming console	12	7.69
	MP3 Player	3	1.92
	Others	11	7.05
Services[a]	Calling	121	77.56
	Internet	154	98.72
	Messaging	136	87.18
	Gaming	80	51.28
	Social Networking	142	91.03
	Music/Video	147	94.23

[a]Multiple answer questions

Table 4. Frequency and percentage of perceived social support and gadget dependency (n=156).

Variable	Frequency (%)
Perceived social support	
Low (1-2.9)	13 (8.33%)
Moderate (3-5)	39 (25%)
High (5.1-7)	104 (66.67%)
Total mean score (1-7)[a]	5.26 (1.4)
Friends (1-7)[a]	5.37 (1.4)
Significant other (1-7)[a]	5.12 (1.7)
Family (1-7)[a]	5.29 (1.5)
Gadget dependency	
Total score (7-35)[a]	24.72 (3.1)

[a]Mean (SD)

In Table 4, the frequency and percentage of perceived social support and gadget dependency was calculated. The frequency of perceived social support was 13 (8.33%) for low (1-2.9), 39 (25%) for moderate (3-5) and 104 (66.67%) for high (5.1-7). The total mean score was 5.26 (SD=1.4). The mean score for each social support subgroup (1-7) was calculated. The highest was friends subscale which was 5.37(SD=1.4), followed by family subscale which was 5.29(SD=1.5) and significant others subscale with 5.12(SD=1.7). The calculated mean score for gadget

dependency (7-35) was 24.72 (SD=3.1).

Table 5. Frequency and percentage of health issues after long use of technology gadgets (n=156).

Health Issues	Responses	Frequency	Percentage%
Do you have defective vision after long use of technology gadgets?	Yes	85	54.49
	No	71	45.51
Do you have hearing difficulty after long use of technology gadgets?	Yes	13	8.33
	No	143	91.67
Do you experience breathing difficulty after long use of technology gadgets?	Yes	7	4.49
	No	149	95.51
Do you feel difficulty in speaking coherently after long use of technology gadgets?	Yes	21	13.46
	No	135	86.54
Do you experience altering in bladder and bowel habits after long use of technology gadgets?	Yes	13	9.62
	No	141	90.38
Do you feel difficult in performing day-to-day activities after long use of technology gadgets?	Yes	46	29.49
	No	110	70.51
Do you feel difficult in logical reasoning and thinking after long use of technology gadgets?	Yes	30	19.23
	No	126	80.77
Do you ever experience physical discomfort after long use of technology gadgets?	Yes	88	58.41
	No	68	43.59
Do you ever experience feeling sad, melancholic or depressed after long use of technology gadgets?	Yes	53	33.97
	No	103	66.03
Do you feel anxious, stressed or nervous after long use of technology gadgets?	Yes	60	38.46
	No	96	61.54
Do you feel ill and tired after long use of technology gadgets?	Yes	93	59.62
	No	63	40.38

In table 5, for defective vision after long use of technology gadgets, 85 students had agreed and it accounted to 54.49%. 13 students had agreed for hearing difficulty after long use of technology gadgets after long use of technology gadgets and it accounted to 8.33%. 7 students had agreed for breathing difficulty after long use of technology gadgets after long use of technology gadgets and it accounted to 4.49%. 21 students had agreed for difficulty in speaking coherently after long use of technology gadgets after long use of technology gadgets and it accounted to 13.46%. 13 students had agreed for altering in bladder and bowel habits after long use of technology gadgets after long use of technology gadgets and it accounted to 9.62%. 46 students had agreed for difficulty in performing day-to-day activities after long use of technology gadgets after long use of technology gadgets and it accounted to 29.49%. 30 students had agreed for difficulty in logical reasoning and thinking after long use of technology gadgets after long use of technology gadgets and it accounted to 19.23%. 88 students had agreed for physical discomfort after long use of technology gadgets after long use of technology gadgets and it accounted to 58.41%. 53 students had agreed for experiencing feeling sad, melancholic or depressed after long use of technology gadgets after long use of technology gadgets and it accounted to 33.97%. 60 students had agreed to feel anxious, stressed or nervous after long use of technology gadgets after long use of technology gadgets and it accounted to 38.46%. 93 students had agreed to feeling ill and tired after long use of technology gadgets after long use of technology gadgets and it accounted to 59.62%.

Table 6. Frequency and percentage for safety measures adopted while using gadgets (n=156).

Safety Measures	Responses	Frequency	Percentage%
Do you use mobile devices while driving?	Never	67	42.95
	Rare	84	53.85
	Quite often	4	2.56
	Always	1	0.64
Do you use mobile devices while charging?	Never	11	7.05
	Rare	59	37.82
	Quite often	69	44.23
	Always	17	10.90
Are you aware of the SAR value of your mobile device?	Yes	81	51.92
	No	75	48.08
Can radiation cause cancer?	Yes	148	94.87
	No	8	5.13

The findings in table 6 shows the safety measures adopted while using gadgets. Among the findings collected, 42.95% of students had never, 53.85% of students had rarely, 2.56% of students had quite often and 0.64% of students had always adopted the usage of mobile devices while driving. 7.05% of students had never, 37.82% of students had rarely, 44.23% of students had quite often and 10.90% of students always had adapted the usage of mobile devices while charging. Moreover, 51.92% of students were aware and 48.08% were not aware of the SAR value of their mobile device. Furthermore, 94.87% were aware and 5.13% were not aware that radiation causes cancer.

Table 7. Frequency and percentage of Gadget dependency (n=156).

	Strongly agree/Agree N(%)	Neither N (%)	Strongly disagree/ Disagree N(%)
Is it difficult to survive without technological gadgets?	116 (74.4)	30 (19.2)	10 (6.3)
Is technology the best source of entertainment?	84 (53.8)	51 (32.7)	21 (13.5)
Are you unaware of your surroundings while using gadgets?	37 (23.8)	47 (30.1)	72 (46.1)
Does listening to music make work easier?	93 (59.6)	37 (23.7)	26 (16.7)
Are social relationships ruined by social networking sites?	53 (34)	72 (46.2)	31 (19.8)
Does technology make youth smarter	87 (55.7)	54 (34.6)	15 (9.7)
Is computer education mandatory for higher education?	130 (83.3)	20 (12.8)	6 (3.9)

In Table 7, 74.4% of participants agreed that survival is difficult without technological gadgets, 19.2% of students had a neutral opinion on this statement and 6.4% of students disagreed with that. For the statement 'technology is the best source of entertainment', 53.8% of participants agreed to that, 32.7% of participants were neutral to this and 13.5% of participants disagreed with that. The responses of 'Disagree' was the highest for the statement 'Unaware of surroundings while using gadgets' and it accounted for 46.1%, followed by 30.1% from participants who agreed and 23.8% for neutral responses. 59% of respondents agreed that listening to music makes work easier while 23.7% had a neutral response and 16.7% disagreed with this. The statement 'Social Relationships are ruined by social networking sites' had more responses from participants having a neutral response which was 46.2%, followed by 34% who agreed and 16.7% who did not agree. 55.7% of students agreed that technology makes youth smarter while 34.6% had neutral response and 9.7% disagreed with that. For the statement 'Computer education is mandatory for higher education', 83.3% of participants agreed to that, 12.8% had a neutral response and 3.9% disagreed with that.

Table 8. Association between demographic characteristics and gadget dependency.

Independent variables	Gadget dependency Mean (SD)	Mean difference (95% CI)	P-value
Age			
<22	23.9 (2.7)	-1.25 (-2.28, -0.22)	0.018
>=22	25.1 (3.1)		
Gender			
Female	24.7 (2.8)	-0.16 (-1.15, 0.82)	0.748
Male	24.8 (3.4)		
Ethnicity			
Chinese	25.3 (3.5)		
Indian	24.3 (2.8)	-	0.046
Malay	26.2 (2.5)		
Others	23.7 (2.1)		
Nationality	23.8 (1.9)	-0.96 (-2.77, 0.86)	0.298
International student Malaysian	24.8 (3.1)		
Academic Semester			
Clinical Year	25.1 (3.2)	1.21 (0.20, 2.23)	0.020
Pre-clinical year	23.9 (2.6)		
Socioeconomic status			
<RM4360	25.6 (3.4)	-	0.102
RM4360-RM9619	24.3 (2.7)		
>RM9619	24.5 (3.1)		

In Table 8, participants with age of >=22 years old had a mean of 1.25 points higher score for gadget dependency than participants with age of <22 years old. This is statistically significant because the 95% CI was -2.28 to -0.22 and p-value was 0.018. The mean difference of gadget dependency between female and male was not significant (95% CI -1.15 to 0.82 and p-value 0.748). There was not enough evidence to prove that male had higher gadget dependency than females. Among ethnicities, Malay had the highest mean of gadget dependency which was 26.2 and the other ethnicities except Chinese and Indian had the lowest mean of gadget dependency which was 23.7. The association between ethnicity and gadget dependency was statistically significant as the p-value was 0.046. International students had a mean of 0.96 points lower than Malaysian for gadget dependency but the data was not significant as 95% CI was -2.77 to 0.86 and p-value was 0.298. There was no significant difference for gadget dependency between international students and Malaysian. Participants who were in clinical year had significantly higher mean of gadget dependency than those in pre-clinical year with the 95% CI of 0.20 to 2.23 and p-value of 0.02. For socioeconomic status, participants with household income of RM 4360 to RM 9619 had the lowest mean of gadget dependency and those with household income of more than RM 9619 had the highest mean of gadget dependency but this data was not significant as the p-value was 0.102.

Table 9. Correlation between perceived social support and gadget dependency.

Independent variable	Dependent variable	Correlation coefficient (r)	P-value
Perceived Social Support	Gadget dependency	-0.141	0.075

In Table 9, there was a negative correlation between perceived social support and gadget dependency. The higher the perceived social support, the lower the gadget dependency among students in MUCM. The strength of correlation was little if any as the correlation coefficient was 0.1414. This was not statistically significant as the p-value was 0.075.

Table 10. Simple logistic regression analysis of association between gadget dependency and effect on health.

Physical health issue	Gadget Dependency Odds Ratio(95% CI)	P Value
Defective vision	1.01 (1.00, 1.02)	0.174
Hearing difficulty	0.91 (0.89, 0.93)	0.000
Breathing difficulty	0.88 (0.86, 0.91)	0.000
Difficulty in speaking coherently	0.93 (0.91, 0.95)	0.000
Alter in bladder and bowel habit	0.92 (0.90, 0.94)	0.000
Difficult in performing day-to-day activities	0.97 (0.95, 0.98)	0.000
Difficult in logical reasoning and thinking	0.94 (0.93, 0.96)	0.000
Physical discomforts	1.01 (1.00, 1.02)	0.102
Feeling sad, melancholic or depressed	0.97(0.96, 0.99)	0.000
Anxious, stressed or nervous	0.98(0.97, 0.99)	0.004
Feel of being ill and tired	1.02(1.00, 1.03)	0.017

In Table 10, the health issues such as detective vision (OR=1.01), physical discomforts (OR=1.01) as well as feeling of being ill and tired (OR=1.02) were having positive association with gadget dependency. Therefore students with higher gadgets dependency were more likely to have detective vision, physical discomfort and feeling of being ill and tired. The p value for detective vision and physical discomforts were 0.174 and 0.102 therefore there was no significant association. However the p value for feeling of being ill and tired was 0.017 therefore there was a significant association. Next, the odd ratio for hearing difficulty (0.89), breathing difficulty (0.88), difficulty in speaking coherently (0.93), alter in bladder and bowel habit (0.92), difficulty in performing day-to-day activities (0.97), difficult in logical reasoning and thinking (0.94), feeling sad, melancholic or depressed (0.97) as well as anxious, stressed or nervous (0.98) showed negative association with gadget dependency therefore higher gadget dependency were less likely to cause all these health issues. The p value for all the health issues mentioned above were 0.000 while 0.004 for health issue of feeling anxious, stressed or nervous therefore it is significant association.

4. Discussion

The general objective is to know about how serious gadgets depend among medical students in MUCM and the effect that will be caused by it. Coming out next is the specific objectives, firstly is to assess the gadget dependency among medical students in MUCM. Secondly, we want to determine the factors associated with gadgets dependency among medical students in MUCM. Thirdly, is to identify the uses of gadgets among medical students in MUCM. Last but not least, we need to determine the effect of gadgets dependency on health and lifestyle among medical students in MUCM.

We found that the majority of the students around 63.46% used the gadget for more than 6 hours and this was proved by a study conducted by Aravind Kumar which showed 48.5% of students used gadgets more than 7 hours per day. [2] Study done by Muduli also showed nearly 68% of the respondents used technological gadgets for more than 6 hours per day. [20] In previous study, the mean average of time spent on mobile phones by college boys and girls are 6.5 hours and 6.2 hours. [15] Another previous study also showed that the average time spent on gadgets increased from 4.75 hours to 11.36 hours during the COVID-19 lockdown period. [11] For the purposes, according to the results, the majority around 96.8% of students used their gadgets for study. 95.51% of the students used their gadget for entertainment purposes and 92.3% of students used their gadget for communication. From the previous study done by Revathi K Nair, there was a slight difference in which the main purpose of using gadgets was for entertainment with a result of 99%. However, the percentage for study purposes in the previous study was also high in which 88% of students used their gadgets for study, followed by 81% of the students used their gadgets for communication. [1]

The gadget dependency of the students could be seen in our study where 74.4% have agreed that it is difficult to survive without technology. From the study done by Dr. Mahavir, 63% of the participants agreed to this statement. [5] Elhai et al. showed that Gen Z users spent 16 hours per day on average using a gadget. [22] This meant that the users cannot live without their electronic gadget. We found that 53.8% had agreed that technology is the best source of entertainment and 59.6% said that listening to music makes their work easier. From the previous study, it was revealed that the use of gadgets at normal level may provide positive benefits but the

use of gadgets at an uncontrollable level is capable of disrupting the daily life of gadget users. [23] In our study, 34% had agreed that social relationships are ruined by social networking sites. The findings of study done by Mohd Mothar found teenagers as die-hard users of gadgets in social networking sites and these addictions have disrupted their psychological well-being. [24] Our study had also shown that 55.7% think that technology makes youth smarter and that 83.3% agreed that computer education is mandatory for higher education. The previous study asserted that the learning process for the students become more fun and conducive with the utilization of mobile devices such as laptops and tablet computers due to the user-interactivity and appealing visuals present in these learning tools. [25]

We found there was a significant association between age and gadget dependency in which it is highest in the age group of >=22 years old. In the previous study, it showed that age also affects gadget dependency in which the age of 21-24 years had the highest percentage. [2] Moreover, there was a significant association between ethnicity and gadget dependency and its higher in Chinese in our study whereas in the previous study it was higher among Indians. [2] Furthermore association between academic semester and gadget dependency also had a significant association in which clinical year students had the highest percentage. Hence, it relates to the previous study in which clinical students had the highest percentage in association with gadget dependency. [3]

In our study it has shown that there was no significant association between gender and gadget dependency. We also found that nationality did not have significant association with gadget dependency. It was shown in our study that socioeconomic status did not cause a significant change in gadget dependency. This result was also proved by the previous study done in India. [2] Furthermore, our study also showed that there was no significant association between perceived social support and gadget dependency.

Through our study, we found that gadget dependency did cause some effects on health from our study. Participants who were more gadget dependent were more likely to have defective vision after a long usage of gadgets. However, the association between gadget dependency and defective vision after long usage of gadgets was not significant. This result was also proved from the previous study done by Subha, where there was a significant positive, little if any correlation between duration of usage of gadgets and defective vision. [1] This was also mentioned in a previous study that prolonged use of electronic gadgets causes eye strain, dryness, irritation, burning sensation, redness, blurred vision, and double vision. [18] Next, students who scored high for gadget dependency were more likely to have physical discomfort after long usage of gadgets. However, the result was not significant. The previous study showed that there was a significant positive, little if any correlation between duration of usage of gadgets and physical discomfort. [1] There was a high perception of having physical discomfort such as hand strains when using gadgets in the previous study. [29] In addition to this, according to the data from another study, nearly 78% of the respondents whose time period of using gadgets is above 6 hours were having headaches and pain on a regular basis [20]. It has shown in our study that there was a significant positive association between gadget dependency and feeling of being ill and tired after long usage of gadgets. Students with higher gadget dependency were more likely to feel ill and tired. This result was also shown in previous study with a significant positive, little if any correlation between duration of usage of gadgets and feeling ill and tired. [1] It was shown in another study that excessive use of mobile phone may lead to fatigue. [21]

Our study found that there was a significant negative association of difficulty in hearing, breathing, speaking coherently, performing day-to-day activities, logical reasoning and thinking, alter in bladder and bowel habits, feeling sad, depressed and feeling anxious and nervous after long usage of gadgets with gadget dependency. In the previous study, there was a negative correlation of duration of usage of gadgets with difficulty in breathing and altered bladder and bowel habits. [1] It was also shown that emotional maturity including reasoning ability was greater for more gadget users in another study. [8] For other health issues, it was surprisingly shown that our study was not consistent with the previous study. One of the reasons could be there were other confounding factors affecting the health.

This study consists of several limitations. First and foremost, this research was conducted for medical students in a single private university at one point of time, so the results or outcomes may not be representative of the current problem in other medical universities in Malaysia. Since this is a cross-sectional design, the establishment of temporal relationships is not possible. Next, the sampling method used was non-probability sampling. Snowball sampling method was used hence more participants are our batchmates and few are from other batches. Adding to this limitation, as shown in table 2, the participants who are in clinical year are much higher than those who are in preclinical year. Age of equal or more than 22 also responded more than age of less than 22. The reason for the difference in academic semester and age of participants might be due to the difficulty in acquiring responses from senior or junior batches during lockdown period. The feeling of disinterest by the students after several researches done by the previous groups could be the cause for negligence in response. This will limit the generalizability factor for this study. Last but not least, the validity and

reliability of the questionnaire used for gadget dependency and effect on health was not yet confirmed so the results for the research might not be as significant as expected.

A multi universities population based study is therefore highly recommended for the study to confirm the association between the gadgets dependency among undergraduate medical students and its effect on health. A larger number of sample size is recommended to increase the generalizability of the research. To get a more concise and precise results, a clinically modified questionnaire should be used to assess the gadget dependency and the effect on health. Further research should be done to confirm the findings and more work is needed to explore the correlation of gadget dependency and its effect on health. Based on our study, we found that most of the students have higher gadget dependency. To reduce the gadget dependency among students and reduce the incidence of health issues that were caused by it, few recommendations are suggested. For example, the student council can organize more extracurricular activities which involve sports or campaigns to improve the health of students and reduce gadget usage of the students. Extracurricular clubs should be formed so that students might spend less time on using gadgets. To reduce the impact on health, students are recommended to exercise and have a break after using gadgets for a long time.

5. Conclusion

In summary, students in MUCM had a high gadget dependency with a mean score of 24.72 out of 35. The factors which showed significant association with gadget dependency were age, ethnicity and academic semester. 66.67% of participants had high perceived social support and it showed a negative correlation with gadget dependency. Nearly 63.5% from the students used gadget for more than 6 hours. The main purpose of usage of gadgets by the students in MUCM was for study, followed by entertainment and communication. Gadget dependency did cause few health issues such as defective vision, experiencing physical discomfort and feeling ill and tired. Individuals need to be aware of the effect of prolonged usage on gadgets and practice to reduce the incidence of having health issues with usage of gadgets.

Acknowledgements

The author would firstly like to thank all the volunteers for participating in the research. We also truly appreciated Dean of Manipal University College Malaysia (MUCM) and Head of Department for Community Medicine MUCM, Professor Dr Adinegara Lufti Abas, our lecturers Professor Dr Htoo Htoo Kyaw Soe, Associate Professor Dr Sujata Khobragade and Assistant Professor Dr Mila Nu Nu Htay from the Department of Community Medicine, MUCM Muar Campus for their patience and guidance for us throughout the conduct of the research. Last but not least, we would like to thank the Research Ethics Committee, Faculty of Medicine, MUCM, Malaysia for their approval and support of the study.

References

[1] Revathi KS, Nair S, Achuthan A. Influence of technological gadgets on health and lifestyle of medico. Natl J Physiol Pharm Pharmacol 2020; 10 (03): 201-205. doi: 10.5455/njppp.2020.10.12377201908012020

[2] Kumar, Aravind K.; Sherkhane, Mayur S. Assessment of gadgets addiction and its impact on health among undergraduates. International Journal Of Community Medicine And Public Health. August 2018; 5 (8): 3624-3628. Available at: https://www.ijcmph.com/index.php/ijcmph/article/view/3305.

[3] Gupta N, Krishnamurthy V, Majhi J, Gupta S. Gadget Dependency among Medical College Students in Delhi. Ind J Comm Health, 25 (4); 362 – 366.

[4] Mun WF, Li LM, Fernandez PR. Mobile Phone-the Must–have Gadget of the 21st Century: Identifying Trends and impact on Human Relationships. The Journal of the South East Asia Research Centre for Communication and Humanities. 2011; 3 (2): 39-53.

[5] Dr. Mahavir P. N., Dr. Sameer N. Study of Impact and Dependency of Electrical Gadgets on Health and Lifestyle - A Comparative Study Among Youth Population in MGM Campus, Aurangabad. IJSR. 2007 May; 6 (5): 2174-2178.

[6] Zimet GD, Dahlem NW, Zimet SG, Farley GK. The Multidimensional Scale of Perceived Social Support. Journal of Personality Assessment 1988;52: 30-41

[7] Talwar P, Mohd Fadzil AR. Perceived Social Support among University Students in Malaysia: A Reliability Study. MPJ Online Early. MJP-02-04-13. Retrieved from https://mjpsychiatry.org/index.php/mjp/article/viewFile/226/177

[8] Mamatha SL, Pooja A H., Dr. Vijayalaxmi A A. Impact of gadgets on emotional maturity, reasoning ability of college students. International Journal of Applied Research 2016; 2 (3): 749-755

[9] Anam-ul-Malik, Nasreen Rafiq. Exploring the Relationship of Personality, Loneliness, and Online Social Support with Internet Addiction and Procrastination. Pakistan Journal of Psychological Research. 2016; 31 (1): 93-117.

[10] Simuforosa M. The impact of modern technology on the educational attainment of adolescents. Int J Edu Res. 2013; 1 (9): 1-8.

[11] 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 May 20; 13 (2): 139-45.

[12] Tayana P., Alejandro L. Avoidance or boredom: Negative mental health outcomes associated with use of Information and Communication Technologies depend on users' motivations. Computers in Human Behavior. May 2016; 58: 249-258.

[13] Generation M2: Media in the Lives of 8 to 18 year olds (2010). Retrieved from www.kff.org/entmedia/mh012010pkg.cfm

[14] Bruner, G. C., & Kumar, A. Gadget Lovers. Journal of the Academy of Marketing Science. 2007; 35: 329-339. https://doi.org/10.1007/s11747-007-0051-3

[15] Ganganahalli P, Tondare MB, Durgawale PM. Use of electronic gadgets among medical students in western Maharashtra, india. Int J Health Sci Res. 2014; 4 (9): 26-30.

[16] Carroll J, Howard S, Vetere F, Peck J and Murphy J (2002). Just what do the youth of today want? Technology appropriation by young people. Hawaii International Conference on System Sciences. 5. 131b. 10.1109/HICSS.2002.994089.

[17] Abdul Rashid, Mas & Othman, Azman. Technology intimacy: the extend of Malaysian generation Z dependency on technology. COMRAP 2018.

[18] Wimalasundera S. Computer vision syndrome. Galle Medical Journal, 2009, 11 (1): 25-29.

[19] Zhao TY, Zou SP, Knapp PE. Exposure to cell phone radiation up-regulates apoptosis genes in primary cultures of neurons and astrocytes. Neurosci Lett 2007; 412: 34–38.

[20] Muduli J R. Addiction to technological gadgets and its impact on health and lifestyle: A study on college students, 2014.

[21] Khan MM. Adverse effects of excessive mobile phone use. Int J Occup Med Environ Health. 2008; 21 (4): 289-93. doi: 10.2478/v10001-008-0028-6. PMID: 19228576

[22] Elhai, J. D., Levine, J. C., Dvorak, R. D., & Hall, B. J. Non-Social Features of Smartphone Use Are Most Related to Depression, Anxiety and Problematic Smart- phone Use. Computers in Human Behavior. 2017; 69: 75-82. https://doi.org/10.1016/j.chb.2016.12.023

[23] Teong, K. V., & Ang, M. C. H. Internet Use and Addiction among Students in Malaysian Public Universities in East Malaysia: Some Empirical Evidence. Journal of Management Research, 2016. 8: 31-47. https://doi.org/10.5296/jmr.v8i2.9092

[24] Mohd Mothar, N. M., Abu Hassan, M. B., Hassan, M. S., & Osman, M. N. The Importance of Smartphone's Usage among Malaysian Undergraduates. Journal of Hu- manities and Social Science, 2013. 14: 112-118. https://doi.org/10.9790/1959-143112118

[25] Clegg, S. R. & Bailey, J. R. International Encyclopedia of Organization Studies. Thousand Oaks: Sage Publications. 2008.

[26] Surat, S., Govindaraj, Y., Ramli, S. and Yusop, Y. An Educational Study on Gadget Addiction and Mental Health among Gen Z. *Creative Education*, 2021. 12:1469-1484. doi: 10.4236/ce.2021.127112.

[27] Monika Sharma. Addiction of youth towards gadgets. Elixir Human Res. Mgmt. 42A (2012) 6568-6572.

[28] Sarla, Gurmeet. Excessive use of electronic gadgets: Health effects. The Egyptian Journal of Internal Medicine. 2020; 31(10).4103/ejim.ejim_56_19.

[29] Abu-Shanab, Emad & Haddad, Eman. The Influence of Smart Phones on Human Health and Behavior: Jordanians' Perceptions. International Journal of Computer Networks and Applications. 2015; 2 (2): 52-62.