

Original research article

Cross-sectional Study of Perception on Mobile Phone Health Hazard and Behavioral Risk among Undergraduate Medical Students

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ABSTRACT

There is major concern about the hazards that electromagnetic waves emitted by mobile phones may pose to human health. We aimed to assess the perception of undergraduate medical students regarding mobile phone health hazards and behavioral risk, side effects that mobile phone hazards cause, behaviors affected due to mobile phone hazards, and whether mobile phone hazards may affect classroom habits. A cross-sectional study was conducted among pre-clinical and clinical year MBBS students in a private medical university in Malaysia. An online questionnaire was distributed and a total of 120 responses were collected. Epi info V7.0 was used to analyze the data. Findings revealed our participants perceived mobile phone usage could contribute to occurrence of fatigue, sleep disturbances, headache, and loss of mental attention. As for behavior risk associated with mobile phone usage, our participants thought that there were high behavioral risks such as to sleep all night with a turned-on mobile phone resting on the bedside and to stop a conversation to answer the mobile phone. With regards to side effects, the result reveals sleep disturbances as the side effects after mobile phone usage, concentration problems

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and blurred vision are experienced by the most. The results of how mobile phone hazards affect classroom habits shows that participants use mobile phone internet less than 7 hours a day, receive or send text messages during class but do not play games nor make or receive calls in class. In summary, the perceived mobile phone hazards among MBBS students were 62%. This study reveals the presence of a higher percentage of perceived mobile phone hazards among undergraduate medical students.

INTRODUCTION

A mobile phone, also known as cellular phone, cell phone or hand phone is a portable telephone that enables us to make and receive calls over radio frequency links while the user is moving within a telephone service range. The radio frequency link establishes connections to the switching systems of the mobile phone operator, which can provide access to the public switched telephone network (PSTN) [1]. Mobile phones enable two-way communications by providing some technical functions, such as voice and messaging services [2]. When calls are made, voices which are sound energy are converted into radiofrequency waves also known as electromagnetic energy [3]. There is major concern about the hazards that electromagnetic waves emitted by mobile phones may pose to human health. Mobile phones are increasingly used throughout the world within a very short period of time [4]. The mobile phone industry has been one of the fastest growing industries recently. Since the existence of mobile phones, it has gained increasing popularity for the ease and convenience of communication. There has always been a counter argument and much more research over the more frequent use of mobile phones and its short term and long-term health effects. Social scientists have pointed out that overuse or addiction to mobile phones may affect social and psychological well-being and health in people of all age groups [5]. While some of these often-seen consequences are critical like malignancy, others that cause definite morbidity are both physical and mental. On 31 May 2011, the World Health Organization confirmed that the usage of mobile phones indeed represents a health menace and has also classified mobile phone radiation as a carcinogenic hazard, possibly carcinogenic to humans [6].

In a study of common health effects of mobile phone in medical students in India where both sexes between age of 17-23 years were included revealed that headache was the commonest side effect experienced by the students, followed by irritability, lack of concentration, anxiety, eye strain, lack of sleep, exhaustion, and body ache [7]. On the other hand, a study related symptoms due to mobile phone use and school electromagnetic field levels shows that high numbers and duration of calls per day will cause more headache, dizziness, depressive symptoms, throat dryness, difficulty to concentrate, and sleep disturbances. The same symptoms were also experienced by those who send and receive more than 200 messages per day. In the same study, several behaviors such as carrying mobile phones on themselves, keeping their mobile phones switched on and making calls during charging were associated with increased experience of symptoms [8]. Besides, an article titled 'Health Hazards of Mobile phones' reveals that radiation produced by the mobile phone can cause changes in sperm count and mobility. Head is also exposed to

much of the radiation which will increase the risk of brain tumor if exposed for more than 10 years. Some non-specific symptoms such as neurasthenic and vegetative symptoms (concentration difficulties, palpitation, digestive disturbances), psychological problems (ringtone anxiety) also have been described [9].

From the aspect of risky behavior, in a study of mobile phone use while motorcycle riding and crashes, it is found that 64% of the participants have experienced/been injured in a crash/fall while riding. Another study regarding the effects of cell phone distraction on children injury risk, it is also found that safety of the child was also compromised when the child is distracted by cell phone and, at the same time, traffic attention was also decreased [10,11]. Using the phone while charging is one of the risky behaviors, as it might result in explosion causing facial and hand burn [12].

Research on mobile phone usage and its effect towards health has been carried out by the department of physiotherapy, GJUST in Haryana, India. One of the riskiest long-term effects is miscarriage, and for boys it will reduce the sperm count. This shows more couples will present with fertility problems and one of the causes in this era could be excessive usage of mobile phone. This study also shows that due to excessive emission of radiation (about 900-1800 HZ), there is a high chance for the individual to develop cancer especially on the side of the ear frequently used to answer the calls [13]. Furthermore, gadgets have now become one of the essential items among the school going children. Parents get them smartphones so that they will not feel lonely as the parents spend most of their time at work. However, parents are not aware about the side effects. A study on duration of gadget usage affecting eye fatigue in students aged 16-18 years old revealed that one of the most severely affected organs will be eyes. Students will experience eye fatigue due to excessive usage of hand phone. The reason could be because of excessive use of muscles that control eye movements. Eventually after some time, children will have blurry vision and tend to get spectacles on at a very early age [14,15]. Next, excessive phone usage also will bring a negative impact on academic performances. For instance, a study was done on how mobile phone usage affects academic performance. Students tend to get easily distracted while studying. As soon as they log into social media, they will get attracted to all the interesting news. Students will also get distracted easily if they turn on their phone during lecture classes. This can affect their concentration [16].

Since we are in this pandemic era, mobile phones have been an essential need for medical students to attend online classes. Besides, medical students need to face the gadgets throughout the day as they have a more hectic schedule. However, literature on perception about mobile phone health hazard among medical students is limited in Malaysia. Therefore, this study aimed to assess the perception of undergraduate medical students regarding mobile phone health hazards and behavioural risk. Besides that, the perception of medical students about behaviour affected due to mobile phone hazards is also assessed in this study.

METHODS

STUDY DESIGN AND STUDY POPULATION

A cross-sectional study was conducted in March 2021 in a private medical institution in Malaysia. This study aimed to determine the perception of mobile phone health hazard and behavioural risk and a total of 1300 MBBS students from the study university were selected as the study population.

SAMPLE SIZE

Sample size was calculated by using Epi info software (version 7.0) with the population size 1300, expected frequency 62% from a previous study [1], and precision error of 8.0%, a confidence level of 95%. While considering non-response of 30%, the final estimated sample size was 183.

SAMPLING METHOD

Purposive sampling was the sampling method that was used in this study. The inclusion criteria were the medical students in MBBS (clinical and preclinical) in the university and those who voluntarily agreed to participate. The exclusion criteria include those who failed to complete all the questions in the questionnaire and those whose consent was not given.

DATA COLLECTION

This questionnaire was developed by combining questions from previous research on mobile phone hazards [1]. This questionnaire consists of consent form and students need to give their consent before proceeding to the next part. Questionnaire is composed of two parts. First part focusing on demographic details (batch, gender, nationality, ethnicity, family income, number of mobile phone used currently, average messages, call duration, and the ear used to answer the phone). The second part of the questionnaire consists 30 questions focusing mainly on the perception on health hazards, side effects and classroom behaviour. As for the side effects and perception on health hazards, students were allowed to grade themselves according to severity and for classroom behaviour students need to choose 'yes' or 'no' based on their activity in the classroom. This questionnaire was referred from a previous study done by AIMST University regarding mobile phone hazardness towards medical students [1].

DATA ANALYSIS

Epi info V7.0 was used to statistically analyze the data. For quantitative data (age), the range, mean along with standard deviation and median along with interquartile range was calculated. For qualitative data (gender, ethnicity, nationality, and batch), frequency and percentage were calculated. Chi square was used to calculate odds ratio (OR) for association between the mobile phone hazards among medical students which includes demographic details, perception on health hazard, side effects, affects towards behavior in and outside the classroom. Level of significance was set at 0.05.

ETHICAL CONSIDERATION

The informed consent was signed by the participants before answering the research questions. This research was approved by the Research Ethics Committee, Faculty of Medicine of Manipal University College Malaysia.

RESULTS

A total of 136 students participated in this study. Among them, 77.21% were from the clinical years. Approximately one-third (34.56%) were male students. The details of the demographic characteristics were presented in the Table 1.

Table 1. Socio-demographic profile of the participants (n=136)

Variable	Frequency (%)
Batch	
Pre-clinical	31(22.79)
Clinical	105(77.21)
Age	
>22	63(46.32)
≤22	73(53.68)
Gender	
Male	47(34.56)
Female	89(65.44)
Nationality	
Malaysian	126(92.65)
Non-Malaysian	10(7.35)
Ethnicity	
Chinese	31(22.79)
Indian	74(54.41)
Malay	9(6.62)
Others	22(16.18)
Family income	
<RM 4360	18(13.24)
RM 4360-9619	66(48.53)
>RM 9619	52(38.24)
Number of phones	
≤1	124(91.18)

>1	12(8.82)
Number of call averages	
<5	97(71.32)
≥5	39(28.68)
Number of SMS average	
<50	112(82.35)
≥50	24(17.65)
Duration of call average	
<20min	81(59.56)
≥20min	55(40.44)
Ear used to answer phone	
call	19(13.97)
Left	89(65.44)
right	28(20.59)
Both	

Figure 1 represents the participants' mobile phone usage information. Approximately 60% of the participants utilized less than 20 minutes for phone calls, average number of SMS received or sent daily was less than 50 in the majority of the participants, approximately 70% had an average less than 5 times of calls received or dialed daily (Figure 1).

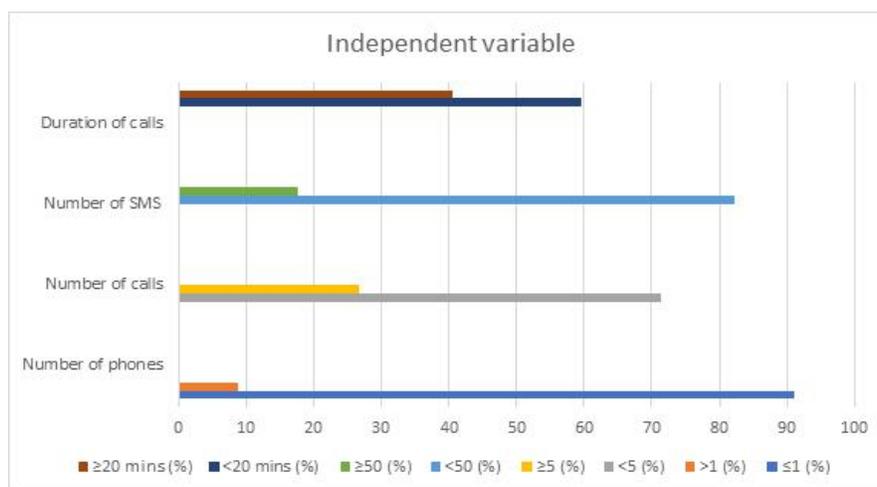


Figure 1. Mobile phone usage information among the participants

The result shows that among all the perceptions of health hazard, most of the participants (22.79%) thought that mobile phone usage could contribute to the occurrence of headache, followed by loss of mental attention (21.32%). It also showed the highest percentage of our participants (66.91%) felt that diarrhea and constipation was very unlikely caused by mobile phone usage (Table 2).

Table 2. Perception of health hazard on mobile phone usage (n=136)

Health hazard	Strongly disagree Frequency (%)	Disagree Frequency (%)	Slightly agree Frequency (%)	Agree Frequency (%)	Strongly agree Frequency (%)
Fatigue	10(7.35)	27(19.85)	42(30.88)	42(30.88)	15(11.03)
Sleep disturbance	5(3.68)	13(9.56)	20(14.71)	55(40.44)	43(31.62)
Dizziness	22(16.18)	35(25.74)	32.35(32.35)	17.65(17.65)	11(8.09)
Loss of mental attention	8(5.88)	25(18.38)	29(21.32)	45(33.09)	29(21.32)
Memory loss	30(22.06)	40(29.41)	36(26.47)	23(16.91)	7(5.15)
Headache	16(11.76)	16(11.76)	40(29.41)	33(24.26)	31(22.79)
Tachycardia	49(36.03)	48(35.29)	30(22.06)	6(4.41)	3(2.21)
Diarrhea	91(66.91)	23(16.91)	17(12.50)	3(2.21)	2(1.47)
Constipation	91(66.91)	24(17.65)	15(11.03)	4(2.94)	2(1.47)

Majority of participants (55.15%) experienced sleep disturbance as the side effect after mobile phone usage, followed by concentration problems (43.38%), and blurred vision (33.82%). Long term memory impairment was only experienced by 16.91% of our participants, which is the lowest percentage (Table 3).

Table 3. Perceived side effect of mobile phone (n=136)

Perceived side effect	Yes (%)	No (%)
Headache	33(26.26)	103(75.74)
Concentration problem	59(43.38)	77(56.62)
Long term memory impairment	23(16.91)	113(83.09)
Recent memory impairment	38(27.94)	98(72.06)
Sleep disturbance	75(55.15)	61(44.85)
Blurred vision	46(33.82)	90(66.18)

The results in Table 4 show median and mean of behavior risks associated with mobile phone hazards among the participants. The median score was highest for the item “To stop a conversation to answer the mobile phone” (Q1=4.0, Q3=5.0; standard deviation= 1.141) (Table 4).

Table 4. Behavioral risk associated with mobile phone hazards among the participants (n=136)

Variables	Q1	Median	Q3	Mean	SD
1) To make a mobile phone call which takes 20minutess	2.0	3.0	3.0	2.8	1.0598
2) To carry a turned-on mobile phone during the whole day	2.0	3.0	4.0	3.1	1.1486
3) To make a mobile phone call which takes an hour	2.5	3.0	4.0	3.3	1.0879
4) To sleep all night with a turned-on-mobile phone resting on the bed side table	3.0	4.0	4.5	3.5	1.1732
5) To make a mobile phone call on the bus	2.0	2.0	3.0	2.5	0.9259
6) Keeping your mobile phone open on the bus	2.0	3.0	3.0	2.7	0.9923
7) To make a mobile phone call in the public area (Metro, cafe)	2.0	3.0	3.0	2.7	1.0102
8) To leave a family lunch to answer the mobile phone	2.0	3.0	3.0	2.7	1.0549
9) To have one’s mobile phone ring in a public area	2.0	3.0	4.0	2.9	1.0041
10)To stop a conversation to answer the mobile phone	4.0	5.0	5.0	4.2	1.1416

Table 5 shows the result of how mobile hazards can lead to different classroom habits. Regarding usage hour of mobile data downloading/WIFI internet per day, 30.88 percent spent less than 7 hours and 69.12% spent more than 7 hours. 80.15% had their phones turned on during lectures and 19.85% had their mobile phones switched off during classes. When asked whether participants received or sent text messages during classes, 71.32% responded yes and 26.68% responded denied receiving or sending texts during classes (Table 5).

Table 5. Classroom habits of mobile phone usage among the participants (n=136)

Variables	Frequency (%)
1)How many hours do you use mobile data downloading/WiFi internet per day?	
▪ > 7 hours	42 (30.88)
▪ ≤ 7 hours	96 (69.12)
2) Is your phone turned on during lectures?	
▪ Yes	109 (80.15)
▪ No	27 (19.85)
3) Do you receive or send text messages during class?	
▪ Yes	97 (71.32)
▪ No	39 (26.68)
4) Do you play games during class?	
▪ Yes	20 (14.71)
▪ No	116 (85.29)
5) Do you make or receive calls in class?	
▪ Yes	28 (20.59)
▪ No	108 (79.41)

In Table 6, the results show there is no statistical significance between gender and perception of health hazard, except for sleep disturbance and diarrhoea, where P value was 0.003 and 0.013 respectively. Significant association between number of phones and perception of fatigue, P value is 0.034. Significant association between number of calls and perception of headache is seen with the P value of 0.011. There is no significant association between the number of SMS and all the perceptions of health hazards. Duration of calls and perception of fatigue shows significant association with the P value of 0.022 (Table 6).

Table 6. Association between demographic and perception of health hazard (n=136)

Fatigue						
Strongly disagree frequency(%)	Disagree frequency(%)	Slightly agree frequency(%)	Agree frequency(%)	Strongly agree frequency(%)	P value	

Gender	Male	7(14.89)	12(25.53)	13(27.66)	11(23.40)	4(8.51)	0.070
	femal e	(3.37)	15(16.85)	29(32.58)	31(34.83)	11(12.36)	
Numbe r of phone	≤1	10(8.06)	23(18.55)	39(31.45)	41(33.06)	11(8.87)	0.034
	>1	0	4(33.33)	3(25)	1(8.33)	4(33.33)	
Numbe r of calls	<5	10(10.31)	17(17.53)	29(29.90)	33(34.02)	8(8.25)	0.075
	≥5	0	10(25.64)	13(33.33)	9(23.08)	7(17.95)	
Numbe r of SMS	<50	10(8.93)	20(17.86)	36(32.14)	35(31.25)	11(9.82)	0.330
	≥50	0	7(29.17)	6(25)	7(29.17)	4(16.67)	
Durati on of calls in	<20m	10(13.35)	18(22.22)	26(32.10)	21(25.93)	6(7.41)	0.022
	≥20m in	0	9(16.36)	16(29.09)	21(38.18)	9(16.36)	
Sleep disturbance							
Gender	Male	4(8.51)	8(17.02)	10(21.28)	17(36.17)	8(17.02)	0.003
	femal e	1(1.12)	5(5.62)	10(11.24)	38(42.70)	35(39.33)	
Numbe r of phone	≤1	5(4.03)	12(9.68)	19(15.32)	48(38.71)	40(32.26)	0.719
	>1	0	1(8.33)	1(8.33)	7(58.33)	3(25)	
Numbe r of calls	<5	5(5.15)	8(8.25)	16(16.49)	42(43.30)	26(26.88)	0.164
	≥5	0	5(12.82)	4(10.26)	13(33.33)	17(43.59)	

Number of SMS	<50	4(3.57)	9(8.04)	19(16.96)	45(40.18)	35(31.25)	0.434
	≥50	1(4.17)	4(16.67)	1(4.17)	10(41.67)	8(33.33)	
Duration of calls	<20m	5(6.17)	9(11.11)	13(16.05)	30(37.04)	24(29.63)	0.2904
	≥20m	0	4(7.27)	7(12.73)	25(45.45)	19(34.55)	
Dizziness							
Gender	Male	9(19.15)	13(27.66)	17(36.17)	5(10.64)	3(6.38)	0.545
	female	13(14.61)	22(24.72)	27(30.34)	19(21.35)	8(8.99)	
Number of phone	≤1	18(14.52)	33(26.61)	41(33.06)	22(17.74)	10(8.06)	0.551
	>1	4(33.33)	2(16.67)	3(25)	2(16.67)	1(8.33)	
Number of calls	<5	16(16.49)	25(25.77)	33(34.02)	14(14.43)	9(9.28)	0.577
	≥5	6(15.38)	10(25.64)	11(28.21)	10(25.64)	2(5.13)	
Number of SMS	<50	17(15.18)	29(25.89)	36(32.14)	23(20.54)	7(6.25)	0.195
	≥50	5(20.83)	6(25.00)	8(33.33)	1(4.17)	4(16.67)	
Duration of calls	<20m	15(18.52)	18(22.22)	27(33.33)	14(17.28)	7(8.64)	0.774
	≥20m	7(12.73)	17(30.91)	17(30.91)	10(18.18)	4(7.27)	

Loss of mental attention

Gender	Male	6(12.77)	10(21.28)	10(21.28)	12(25.53)	9(19.15)	0.111
	femal e	2(2.25)	15(16.85)	19(21.35)	33(37.08)	20(22.47)	
Numbe r of phone	≤1	8(6.45)	21(16.94)	28(22.58)	41(33.06)	26(20.97)	0.478
	>1	0	4(33.33)	1(8.33)	4(33.33)	3(25.00)	
Numbe r of calls	<5	8(8.25)	20(20.62)	21(21.65)	27(27.84)	21(21.65)	0.136
	≥5	0	5(12.82)	8(20.51)	18(46.15)	8(20.51)	
Numbe r of SMS	<50	8(7.14)	22(19.64)	21(18.75)	35(31.25)	26(23.21)	0.203
	≥50	0	3(12.50)	8(33.33)	10(41.67)	3(12.50)	
Durati on of calls	<20m in	6(7.41)	13(16.05)	17(20.99)	29(35.80)	16(19.75)	0.722
	≥20m in	2(3.64)	12(21.82)	12(21.82)	16(29.09)	13(23.64)	
Memory loss							
Gender	Male	9(19.15)	16(34.04)	15(31.91)	3(6.38)	4(8.51)	0.096
	femal e	21(23.60)	24(26.97)	21(23.60)	20(22.47)	3(3.37)	
Numbe r of phone	≤1	25(20.16)	37(29.84)	33(26.61)	22(17.74)	7(5.65)	0.457
	>1	5(41.67)	3(25)	3(25)	1(8.33)	0	
Numbe r of calls	<5	21(21.65)	31(31.96)	25(25.77)	14(14.43)	6(6.19)	0.597
	≥5	9(23.08)	9(23.08)	11(28.21)	9(23.08)	1(2.56)	

Number of SMS	<50	24(21.43)	30(26.79)	30(26.79)	21(18.75)	7(6.25)	0.355
	≥50	6(25.00)	10(41.67)	6(25.00)	2(8.33)	0	
Duration of calls	<20m	17(20.99)	25(30.86)	22(27.16)	13(16.05)	4(4.74)	0.983
	≥20m	13(23.64)	15(27.27)	14(25.45)	10(18.18)	3(5.45)	
Headache							
Gender	Male	8(17.02)	9(19.15)	13(27.66)	11(23.40)	6(12.77)	0.082
	female	8(8.99)	7(7.87)	27(30.34)	22(24.72)	25(28.09)	
Number of phone	≤1	14(11.29)	14(11.29)	35(28.23)	31(25.00)	30(24.19)	0.604
	>1	2(16.67)	2(16.67)	5(41.67)	2(16.67)	1(8.33)	
Number of calls	<5	16(16.49)	11(11.34)	31(31.96)	23(23.71)	16(16.49)	0.011
	≥5	0	5(12.82)	9(23.08)	1(25.64)	15(38.46)	
Number of SMS	<50	14(12.50)	16(14.29)	29(25.89)	26(23.21)	27(24.11)	0.128
	≥50	2(8.33)	0	11(45.83)	7(29.17)	4(16.67)	
Duration of calls	<20m	9(11.11)	11(13.58)	23(28.40)	20(24.69)	18(22.22)	0.945
	≥20m	7(12.73)	5(9.09)	17(30.91)	13(23.64)	13(23.64)	

Tachycardia

Gender	Male	18(38.30)	16(34.04)	11(23.40)	1(2.13)	1(2.13)	0.903
	female	31(34.83)	32(35.96)	19(21.35)	5(5.62)	2(2.25)	
Number of phone	≤1	44(35.48)	43(34.68)	28(22.58)	6(4.48)	3(2.42)	0.859
	>1	5(41.67)	5(41.67)	2(16.67)	0	0	
Number of calls	<5	37(38.14)	33(34.02)	19(19.59)	6(6.19)	2(2.06)	0.412
	≥5	12(30.77)	15(38.46)	11(28.21)	0	1(2.56)	
Number of SMS	<50	39(34.82)	38(33.93)	26(23.21)	6(5.36)	3(2.68)	0.574
	≥50	10(41.67)	10(41.67)	4(16.67)	0	0	
Duration of calls	<20m	30(37.04)	29(35.80)	14(17.28)	6(7.41)	2(2.47)	0.179
	≥20m	19(34.55)	19(34.55)	16(29.09)	0	1(1.82)	
Diarrhea							
Gender	Male	24(51.06)	14(29.79)	8(17.02)	0	1(2.13)	0.013
	female	67(75.28)	9(10.11)	9(10.11)	3(3.37)	1(1.12)	
Number of phone	≤1	82(66.13)	21(16.94)	16(12.90)	3(2.42)	2(1.61)	0.939
	>1	9(75.00)	2(16.67)	1(8.33)	0	0	
Number of calls	<5	66(68.04)	14(14.43)	13(13.40)	3(3.09)	1(1.03)	0.531
	≥5	25(64.10)	9(23.08)	4(10.26)	0	1(2.56)	

Number of SMS	<50	77(68.75)	17(15.18)	14(12.50)	2(1.79)	2(1.79)	0.666
	≥50	14(58.33)	6(25.00)	3(12.50)	1(4.17)	0	
Duration of calls	<20m	53(65.43)	13(16.05)	12(14.81)	2(2.47)	1(1.23)	0.886
	≥20m	38(69.09)	10(18.18)	5(9.09)	1(1.82)	1(1.82)	
Constipation							
Gender	Male	28(59.57)	11(23.40)	7(14.89)	0	1(2.13)	0.265
	female	63(70.79)	13(14.61)	8(8.99)	4(4.49)	1(1.12)	
Number of phone	≤1	82(66.13)	23(18.55)	14(11.29)	3(2.42)	2(1.61)	0.670
	>1	9(75.00)	1(8.33)	1(8.33)	1(8.33)	0	
Number of calls	<5	66(68.04)	14(14.43)	14(14.43)	2(2.06)	1(1.03)	0.140
	≥5	25(64.10)	10(25.64)	1(2.56)	2(5.13)	1(2.56)	
Number of SMS	<50	75(66.96)	18(16.07)	14(12.50)	3(2.68)	2(1.79)	0.607
	≥50	16(66.67)	6(25.00)	1(4.17)	1(4.17)	0	
Duration of calls	<20m	57(70.37)	9(11.11)	12(14.81)	2(2.47)	1(1.23)	0.090
	≥20m	34(61.82)	15(27.27)	3(5.45)	2(3.64)	1(1.82)	

In Table 7, the results show the majority had no significant association between the side effect and number of phones except for having concentration problems.

Table 7. Association between number of phone and side effect among the participants (n=136)

Variables	≤1 phone	>1 phone	Odd ratio	Chi square	P-value
Headache					
yes frequency (%)	33 (26.61)	0	-	-	-
no frequency (%)	91 (73.39)	12(100)	-	-	-
Concentration problem			0.23 (0.058-0.87)	5.36	0.021
Yes	50(40.32)	9(75)			
No	74(59.68)	3(25)			
Long term memory impairment			2.37 (0.29-19.3)	0.69	0.41
Yes	22(17.74)	1(8.33)			
No	102(82.26)	11(91.67)			
Recent memory impairment			2.05 (0.43-9.8)	0.83	0.36
Yes	36(29.03)	2(16.67)			
No	88(70.97)	10(83.33)			
Sleep disturbance			0.87 (0.26-2.88)	0.054	0.82
Yes	68(54.84)	7(58.33)			
No	56(45.16)	5(41.67)			
Blurring of vision			0.48 (0.14-1.57)	1.54	0.21
Yes	40(32.26)	6(50)			

No 84(67.74) 6(50)

Table 8 shows mostly no significant association between the number of phone calls and the side effect except for a significant association between headache and the number of phone calls (P= 0.001).

Table 8. Association between number of phone calls and side effect among the participants (n=136)

Variables	less than 5 calls	more than 5 calls	Odd ratio	Chi square	P-value
Headache (yes/no)			6.80 (2.88-16.04)	21.72	0.001
Yes	13(13.40)	20(51.28)			
No	84(86.60)	19(48.72)			
Concentration problem (yes /no)			1.17 (0.55-2.47)	0.17	0.68
yes	41(42.27)	18(46.15)			
No	56(57.73)	21(53.85)			
Long term memory impairment (yes/no)	(57.73)		0.32 (0.19-1.15)	3.31	0.069
yes	20(20.62)	3(7.69)			
No	77(79.38)	36(92.31)			
Recent memory impairment (yes/no)			0.85 (0.37-1.97)	0.14	0.70
Yes	28(28.87)	10(25.64)			
no	69(71.13)	29(74.36)			
Sleep disturbance (yes/no)			1.68 (0.78-3.61)	1.77	0.18
yes	50(51.55)	25(64.10)			
No	47(48.45)	14(35.90)			
Blurring of vision (yes/no)			1.14 (0.52-2.48)	0.11	0.75

Yes	32(32.99)	14(35.90)
no	65(67.01)	25(64.10)

From table 9, we found that more male students compared to females used their phone during class hour to play games. This showed that there was significant association between gender and usage of mobile phone during class. But there were no significant association between gender and usage of mobile data/WIFI in class, phone turned on during class, usage of mobile phone to text message and receive calls in class (Table 9).

Table 9: Association between gender and classroom habits among the participants (n=136)

Classroom habits	Male n (%)	Female n (%)	Odds ratio (95%CI)	X ²	P value
How many hours do you use mobile data downloading/ WIFI internet per day?					
≤7 hours	29(30.85%)	65(69.15%)	0.595 (0.281-1.262)	1.850	0.174
>7 hours	18(42.86%)	24(57.14%)			
Is your phone turned on during lectures?					
Yes	38(34.6%)	71(65.4%)	1.07 (0.44-2.61)	0.023	0.881
No	9(33.33%)	18(66.67%)			
Do you receive or send text messages during class?					
Yes	34(35.05%)	63(64.95%)	1.08 (0.49-2.34)	0.036	0.849
No	13(33.33%)	26(66.67%)			

Do you play games during class?

Yes	11(55.00%)	9(45.00%)	2.71	4.33	0.037
No	36(31.03%)	80(68.97%)	(1.02-7.13)		

Do you make or receive calls in class?

Yes	14(50.00%)	14(50.00%)	2.27	3.71	0.054
No	33(30.56%)	75(69.44%)	(0.97-5.30)		

DISCUSSION

This study assessed the perception of mobile phone health hazards and behavioural risk among all the MBBS pre-clinical and clinical year students in a private medical university in Malaysia. With regards to side effects experienced by the participants, we have found the majority of our participants experienced sleep disturbance after mobile phone usage, followed by concentration problems and blurred vision. Long term and recent memory impairment was only experienced by few. According to a research done in another private medical university in Malaysia, most of their participants also strongly agree that they experienced sleep disturbance and loss of mental attention, only a few of the participants experienced memory loss after the usage of mobile phone [1].

In analysis of students' perception of health hazard on mobile phone usage, we found out that, majority of the participants thought mobile phone usage can contribute to occurrence of fatigue, sleep disturbance, headache, and loss of mental attention. Results also showed that many of the students felt that diarrhea and constipation is very unlikely caused by mobile phone usage. A similar result was also found in the study done in AIMST, Kedah, Malaysia, where most of their participants agreed that mobile phone usage can cause headache, loss of mental attention, and sleeping disturbances, whereas constipation and diarrhoea caused by mobile phone usage were disagreed by most of the participants [1]. While researching about behaviour risk associated with mobile phone usage, we found that students were neutral to the behavioral risk of mobile phone usage such as to make a mobile phone call which take 20 minutes, to carry a turned on mobile phone during the whole day, to make a mobile phone call which takes an hour, keeping their mobile phone switched on while on the bus, making phone calls in public areas, to leave family lunch to answer mobile phones and to have their phones ring in public areas. Students also think there is high behavioural risk of mobile phone usage such as to sleep all night with a turned on mobile phone resting on the bedside and to stop a conversation to answer mobile phone

calls. Students responded low to the behaviour risk of mobile phone usage such as making a mobile phone call on the bus. In a study done by medical students in Chennai, it shows that their students make calls lasting less than an hour, carry switched-on mobile phone during the day, and sleep at night with a switched-on phone resting on the bedside table [21].

In the study of association between mobile phone hazards with the side effects seen among the participants, it shows the students who had more than 5 phone calls a day are most likely to have headache as a side effect but majority of them did not suffer from concentration problem, long term memory impairment, recent memory impairment, sleep disturbance, blurring of vision. In the long run, these facts are also proven from a similar study done by medical students back in 2011 [1]. Beyond that, through our study we found that number of messages received in a day had no significant association with headache, concentration problem, long term memory impairment, recent memory impairment, sleep disturbance, and blurring of vision. Results also show that students did not suffer any side effects regardless of number of messages received. Most students who had more than 20 minutes of phone call experienced blurring of vision. However, having calls less than 20 minutes has no significant association with headache, concentration problem, long term memory impairment, recent memory impairment, sleep disturbance.

In analysis of how mobile phone hazards affects classroom habits, our study shows most participants use mobile phone internet less than 7 hours a day. We also found that mobile phones of most of the participants were switched on during classes. Our study also shows mobile phone hazards affect classroom habits where the majority receive or send text messages during class. Most participants do not play games nor make or receive calls in class. Results from a previous study done in Oman Medical College shows that the majority of participants use their mobile phones for less than 7 hours. Majority of their phones are also switched on. Most of the participants also receive or send text messages and do not play games during class or make or receive calls during classes. This shows a lot of similarities in all aspects of classroom habits between the study done by us and by researchers in Oman Medical College [22]. Analysis of gender and classroom habits shows most females will turn their phone on during the lecture class. Results from a study done in a medical university shows similar results where mobile phone usage among females are higher compared to males [1]. In another study done by Oman Medical College revealed the same thing where majority of students turn their phone on during class which can affect their level of attentiveness. On the other hand, majority of males use their phone to play games in class and similar result is obtained in the Oman Medical College research [22].

This study had a few limitations. Since the study was carried out in one private medical university in Malaysia, generalization of the findings might be limited. This study was carried out within a short duration of 5 weeks and is cross-sectional in nature, hence mobile phone use hazards over time were not able to be assessed.

From this study we are able to conclude that medical students have good perception and understanding on mobile phone hazards. For future research, we would like to recommend to focus study on mobile phone usage among committed medical students as we strongly

believe that this group of people tend to use for longer hour. Besides, association between mobile phone usage with students' academic performance could be explored.

CONCLUSION

The perception of mobile phone use hazards among MBBS students was 62%. This study discovered a higher percentage of perception of mobile phone hazards among undergraduate medical students. Mobile phones have added new dimensions after its invention. Future research should investigate the advantages and disadvantages of mobile phone usage, and the risk of using them while driving. Furthermore, the perception of usefulness of mobile phones are being considered for further studies.

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