

## Association of excessive smartphone use with sleep in students of a private medical college in Lahore, Pakistan

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**Objective:** To determine the association of excessive smartphone use with sleep duration with daytime sleepiness and fatigue.

**Methodology:** This cross-sectional study was conducted from November 2019 to January 2020 in Combined Military Hospital Lahore Medical College, Lahore, Pakistan. The sample consisted of 295 undergraduate medical students of both gender, selected by Convenience Sampling. Data were collected using a self-designed questionnaire documenting details of respondents' sleep and phone use. SPSS version 23 was used for data analysis.

**Results:** Sleep duration showed a statistically significant association with bedtime use of

smartphone ( $p=0.024$ ), but not with overall use of smartphone per day. Daytime sleepiness and fatigue showed a significant association with overall use of smartphone per day ( $p=0.001$ ), bedtime use of smartphone ( $p=0.009$ ), checking the phone during the night ( $p=0.013$ ) and with being disturbed by the phone during the night ( $p=0.024$ ).

**Conclusion:** Excessive smartphone usage at any time of the day is associated with daytime sleepiness and fatigue, however, sleep duration is only associated with bedtime usage of smartphones. (Rawal Med J 202;46:947-950).

**Keywords:** Daytime fatigue, daytime sleepiness, sleep duration, smartphone use.

### INTRODUCTION

A smartphone is "a cell phone that includes additional software functions".<sup>1</sup> Smartphone use has grown exponentially worldwide; even a developing country like Pakistan has 32.5 million users.<sup>2</sup> Notwithstanding advantages of instant connectivity, knowledge and entertainment, problematic use is associated with comorbidities as well as disturbed sleep.<sup>3</sup> Carskadon and Dement described sleep as a "reversible behavioral state of perceptual disengagement from and unresponsiveness to the environment".<sup>4</sup> Recommended ideal sleep duration is 7-9 hours, <7 hours being linked to detrimental health effects and inability to concentrate. It is unclear if >9 hours sleep is beneficial.<sup>5</sup> Some studies showed association of excessive smartphone use with both decreased sleep duration and poor sleep quality.<sup>6,7</sup>

Regional studies from India, China and Iran found associations between smartphone use and poor sleep quality.<sup>8-10</sup> A Turkish study found no association with sleep duration.<sup>11</sup> In Pakistan, we found limited work on the subject. A small review

showed increased smartphone usage associated with daytime sleepiness and poor sleep quality.<sup>12</sup> Another study from Karachi showed a positive correlation between smartphone addiction and disturbed sleep.<sup>13</sup> Bedtime is defined as "the time at which you usually get into your bed in order to sleep".<sup>14</sup> A recent Bangladeshi study showed use of bedtime social media associated strongly with poor sleep quality.<sup>15</sup> A university-based study in Pakistani Punjab also found an association of late-night smartphone use with poor sleep quality and disturbed cognitive function.<sup>16</sup> Another study from Rawalpindi/Islamabad found a similar association.<sup>17</sup> While most studies focused on association of smartphone use with sleep quality, there is less data on its association with daytime dysfunction, or with sleep duration; especially lacking is data on the association of bedtime smartphone use with sleep duration. Therefore, we decided to look at the association of excessive smartphone use, both overall and at bedtime, on sleep duration, and to see if it was related to daytime sleepiness and fatigue, in medical students in Lahore.

**METHODOLOGY**

This cross-sectional study was conducted from November 2019 to January 2020 in Combined Military Hospital Lahore Medical College after taking ethical approval from its' Institutional Review Board. Verbal consent was taken from study participants. This is an elite private medical college in the capital of Punjab. The population consisted of 750 undergraduate medical students, mostly a homogenous group that can afford expensive private medical education. Convenience Sampling was used to select a sample of 295 by WHO Sample Size Calculator. Current students irrespective of gender or age were eligible to participate. Anyone not using smartphones or having any disease impacting sleep was excluded.

Data were collected using a pilot-tested questionnaire, self-designed after looking at previous studies but keeping our own objectives in mind.<sup>18-20</sup> Community Medicine Specialists were consulted to ensure validity. Reliability was checked with Crohnbach Alpha (60%). It consisted of 8 closed-ended questions and one open-ended.

Demographic data was followed by questions regarding variables under study. Part-1 (Q1-5) measured smartphone use, specifically daily usage, bedtime use, checking phone and being disturbed by it during the night. Part-2 (Q6) measured sleep duration, and Part-3 (Q7) related to daytime sleepiness and fatigue. Recall regarding sleep habits and phone use was limited to the past month. Lastly, Part-4 (Q8-9) included knowledge of adverse effects of excessive smartphone use.

**Statistical Analysis:** The data were analyzed by using SPSS version 23. Frequencies, percentages, mean, and standard deviation were calculated, and associations tested through Chi Square Test.  $p < 0.05$  was considered statistically significant.

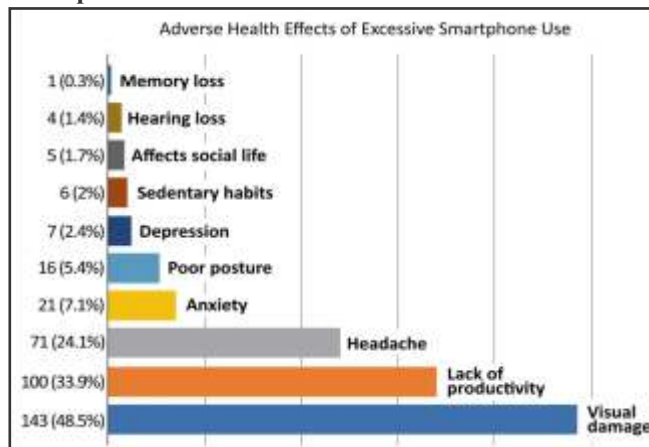
**RESULTS**

Mean age of students was  $20.24 \pm 1.501$  years. Unequal responses from different years of study were due to different academic schedules. Demographic details are shown in Table 1.

**Table 1. Demographic characteristics of study participants (n=295).**

	Frequency	Percentage
<b>Gender</b>		
Male	138	46.8
Female	157	53.2
<b>Age</b>		
17-20 years	172	58.3
21-23 years	120	40.7
24-27 years	3	1
<b>Year of study</b>		
Year 1	74	25.1
Year 2	101	34.2
Year 3	44	14.9
Year 4	76	25.8

**Fig. Responses on adverse health effects of excessive smartphone use.**



**Table 2. Association between smartphone use and sleep duration (n=295).**

Smartphone Usage	Sleep Duration Total hours of sleep daily, including naps (hours/day)	Sleep Duration			Total	P Value
		<7	7- <9	9 or >		
Total time spent daily using smartphone (hours/day)	<2	67	17	1	85	.100
	2- <4	59	25	10	94	
	4- <6	42	15	6	63	
	6 or >	36	10	7	53	
	Total	204	67	24	295	
Time spent using smartphone at bedtime (hours/day)	Nil or <1/2	95	33	3	131	.024
	1/2- <1	73	23	13	109	
	1 or >	36	11	8	55	
Total	204	67	24	295		
Checking phone during night	Not at all	46	15	5	66	.992
	Occasionally	108	36	14	158	
	Often	50	16	5	71	
Total	204	67	24	295		
Being disturbed by phone during night	Not at all	123	31	14	168	.325
	Occasionally	60	25	8	93	
	Often	21	11	2	34	
Total	204	67	24	295		

**Table 3. Association between smartphone use and daytime sleepiness and fatigue (n=295).**

Smartphone Usage	Daytime sleepiness and fatigue Feeling sleepy and fatigued in daytime			Total	p Value	
	Not at all	Occasionally	Often			
Total time spent daily using smartphone (hours/day)	<2	37	36	12	85	.001
	2- <4	18	44	32	94	
	4- <6	8	31	24	63	
	6 or >	6	26	21	53	
Total		69	137	89	295	
Time spent using smartphone at bedtime (hours/day)	Nil or <½	42	60	29	131	.009
	½- <1	20	49	40	109	
	1 or >	7	28	20	55	
	Total		69	137	89	
Checking phone during night	Not at all	21	32	13	66	.013
	Occasionally	40	72	46	158	
	Often	8	33	30	71	
	Total		69	137	89	
Being disturbed by phone during night	Not at all	43	84	41	168	.024
	Occasionally	21	42	30	93	
	Often	5	11	18	34	
	Total		69	137	89	

Among 295 students, 63 (21.4%) used smartphones for 4- <6 hours/day and 53 (18%) for  $\geq 6$  hours/day. 272 (92.2%) used smartphones at bedtime. 204 (69.2%) reported <7 hours of sleep/day and 67 (22.7%) slept for 7- <9 hours/day.

When asked if excessive smartphone use had any adverse health effects, 199 (67.5%) replied 'yes' and 96 (32.5%) said 'no'. Those who replied 'yes' were asked to specify them. Relationship of smartphone use and total hours of sleep is shown in Table 2. Relationship of smartphone use and daytime sleepiness is shown in Table 3. Visual damage, lack of productivity and headache were commonest adverse effects of smart phone usage (Fig. ).

## DISCUSSION

The results showed high smartphones usage with 21.4% respondents using it for 4-6 hours, and 18% using it for  $\geq 6$  hours daily. Higher figures of 33.95% and 48.84% respectively were seen in a Malaysian study.<sup>19</sup> Our sample showed 92.2% using smartphones at bedtime, similar to Malaysian and Moroccan studies which found bedtime usage of 96.75% and 97.3%.<sup>19,21</sup> Only 22.7% students achieved the recommended 7-9 hours' sleep daily, with 69.2% getting <7 hours.<sup>5</sup> A Rawalpindi/Islamabad study also showed only 30% students getting >7 hours of sleep daily.<sup>17</sup> Although our sample consisted of medical students, only 67.5% were aware that excessive use could have detrimental health effects, and none

mentioned disturbed sleep as one.

As bedtime use increased, sleep duration decreased. Total daily smartphone use showed no association with sleep duration, nor did checking the phone or being disturbed by its ringing or alerts during the night. This is in line with findings of a Turkish and an American study which found no relationship between smartphone use and sleep duration.<sup>11,18</sup>

However, a review worldwide found a strong association between screen use and poor sleep outcomes, both duration and quality.<sup>6</sup> Another found weak-to-moderate correlation between problematic phone use and sleep quantity and quality.<sup>7</sup>

We found all four variables tested showing significant associations, with daytime sleepiness and fatigue increasing with increasing total smartphone usage and with increasing bedtime usage. The latter is in line with results from Morocco, and Belgium.<sup>21,22</sup> Students' habit of checking their phones or being disturbed by it during the night also showed a significant association with increasing daytime sleepiness and fatigue. Cross-sectional design, convenience sampling and self-reporting prevent this study from being generalizable. Other factors affecting sleep also need to be analyzed.

## CONCLUSION

Excessive smartphone use among students negatively impacts sleep with resultant complications. Bedtime use of smartphones showed a significant association with sleep duration, but more importantly, excessive phone use at any time showed a significant association with daytime sleepiness or fatigue.

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Critical revision of article for important intellectual content: Muhammad Ashraf Chaudhry  
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