

# Problematic Use Of Mobile Phones And Poor Sleep Quality In Adolescents: A Cross-Sectional Study

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## Abstract

**Introduction:** Adolescence is a critical period of transition, and chronic sleep loss is a significant public health issue in this population. Problematic use of mobile phones (PUMP) has emerged as a potential contributor to poor sleep quality. This study aimed to assess the association between mobile phone use and sleep quality in Egyptian adolescents.

**Methods:** This cross-sectional study included 154 adolescents aged 12-19 years attending Kasralainy outpatient clinics. Data were collected using a structured questionnaire included sociodemographic data, questions to exclude medical conditions affecting sleep, the Arabic version of the Problematic Use Mobile Phone scale, and the Arabic version of the Pittsburgh Sleep Quality Index questionnaire.

**Results:** The median PUMP score was 64, with a prevalence of mobile addiction (PUMP score  $\geq 60$ ) of 60%. The median PSQI score was 6, with 73.4% of participants reporting poor sleep quality (PSQI  $\geq 5$ ). Poor sleep quality was significantly associated with older age, longer duration of daily mobile phone use ( $P < 0.0001$ ), and a higher PUMP score ( $P < 0.05$ ). High mobile phone users exhibited poorer subjective sleep quality, shorter sleep duration, and more daytime dysfunction compared to low users.

**Conclusion:** Poor sleep quality is highly prevalent among Egyptian adolescents and is significantly associated with problematic mobile phone use.

**Key words:** Adolescent, sleep quality, mobile phone use.

## Introduction

Significant physical, mental, and social changes from childhood to adulthood occur throughout adolescence. <sup>(1)</sup> <sup>(2)</sup> This phase necessitates supportive parental care, supervision, and empathy. <sup>(2)</sup> While attention is often focused on overt behavioral problems such as illicit drug use or criminal activity, a pervasive and silent health issue—chronic sleep loss and inadequate sleep quality—affects a large proportion of adolescents. <sup>(3)</sup> This concern is increasingly recognized globally, with numerous nations reporting significant rates of sleep disruption among their young ones. <sup>(4)</sup>

Adolescents should get eight to ten hours of sleep every night. <sup>(5)</sup> <sup>(6)</sup> However, this amount is rarely achieved by teenagers. <sup>(6)</sup> Lack of sleep is associated with a number of detrimental effects, such as drowsiness during the day, depression, increased use of stimulants, increased risk-taking, poor academic performance, and an increased risk of unintentional injuries. <sup>(7)</sup>

In contemporary society, mobile phone devices are become an indispensable tool for communication and entertainment, particularly among adolescents. However, this accessibility has led to a pattern of dependency, with some adolescents taking their phones to bed, which directly interferes with sleep. <sup>(8)</sup> <sup>(9)</sup> <sup>(10)</sup>

**Problematic Use of Mobile Phones (PUMP)** is defined as inadequate usage of mobile devices that exhibits a pattern of excessive reliance with detrimental effects. <sup>(11)</sup> Excessive use and dependency on a cell phone can be considered an addictive disorder. <sup>(12)</sup> Given the rapid increase in mobile phone use over the last decade, and the limited data from Egypt, this research was conducted to assess the association between mobile phone use and sleep quality in Egyptian adolescents. Our hypothesis is that problematic mobile phone use is responsible for poor sleep quality in this population.

## Methodology

### Study Design and Subjects

One hundred fifty four teenagers between the ages of 12 and 19 who visited Kasralainy's outpatient clinics participated in this cross-sectional study. Data collection spanned two months, from April 2023 to May 2023.

### Procedures and Data Collection

Firstly, informed written consent was obtained from each participant. Subsequently, participants completed a structured questionnaire that included:

1. **Sociodemographic Data:** Age, sex, area of residence, school level, and parents' occupation.
2. **Exclusion Criteria Screening:** Questions were included to exclude medical diseases known to affect sleep (e.g., obstructive sleep apnea, hyper- or hypothyroidism) and the use of medications that can affect sleep quality (e.g., diuretics).
3. **Mobile Phone Use Duration:** A question regarding the duration of daily mobile phone use.
4. **Depression Screening:** The Arabic version of the Patient Health Questionnaire 2 (PHQ-2), which includes two questions about mood and interest over the past two weeks, was used to exclude depression.
5. **Anxiety Screening:** The Arabic version of the Generalized Anxiety Disorder (GAD-7) questionnaire, a seven-item, self-report tool assessing anxiety symptoms over the previous two weeks, was used to exclude anxiety disorders.

**Problematic Mobile Phone Use Assessment:** The Arabic version of the Problematic Use Mobile Phone (PUMP) scale <sup>(13)</sup> was used. This validated 20-item tool assesses smartphone addiction, covering aspects such as dependency (e.g., mood changes when stopping use, using the phone at bedtime, ignoring people). On a 5-point Likert-type scale, with 1 denoting "strongly disagree" and 5 denoting "strongly agree," participants provided their answers. Greater scores indicate greater levels of mobile phone addiction. The PUMP score is the total of all item scores.

**Sleep Quality Assessment: Pittsburgh Sleep Quality Index (PSQI)** questionnaire in Arabic version <sup>(14)</sup> was used. The PSQI, which consists of 18 questions and yields seven component scores—subjective sleep quality, sleep latency, habitual sleep efficiency, sleep length, use of sleeping medication, sleep disruptions, and daytime dysfunction—is a standardized, valid, and reliable assessment of sleep quality. Each question receives a score ranging from 0 to 3. The total PSQI score ranges from 0 to 21. A total score of five or more indicates poor sleep quality, whereas a score of less than five indicates good sleep quality.

#### **Sample size estimation and technique:**

Using a G\*Power calculation, we established that a minimum sample size of 102 participants is necessary to achieve 80% statistical power for testing our hypothesis. The null hypothesis proposes that the average total daily sleep duration among smartphone addicts is approximately 8.2 hours, comparable to that of non-abusers. Conversely, the alternative hypothesis suggests that smartphone abusers experience a significantly reduced total daily sleep time, averaging around 7.4 hours. This sample size estimation was derived from the findings of Moustakbal and Maataoui (2022), who conducted a cross-sectional study on sleep length, quality, and mobile phone use among Moroccan adolescents <sup>(15)</sup>

#### **Statistical analysis:**

All completed questionnaires were reviewed. Pre-coded data was computerized using Windows' Microsoft Office Excel Software, 2010. Data collection at the end of each working day occurred on a weekly basis. The data was then double-checked and moved to the Social Science Statistical Suite, version 21 (SPSS-V21) for data analysis using the correct methods. Simple descriptive statistics (arithmetic mean and standard deviation) were used for the quantitative data description and for qualitative data frequencies. The chi-square method was used to allow a comparison of the proportions. For comparing quantitative data not usually distributed, Pearson and non-parametric spearman correlations were used.

#### **Ethical Approval**

The Research and Ethics Committee of Cairo University's Faculty of Medicine in Cairo, Egypt, accepted the study protocol (IRB Number: MS-606-2022).

#### **Study Limitations**

The study encountered several limitations. First, some adolescents were uncooperative or had limited time while waiting for their appointments, which may have affected participation. Second, the length of the questionnaires led to participant boredom, and while efforts were made to encourage completion, some participants did not finish the survey. These factors may introduce a degree of selection bias and affect the completeness of the data.

## **Results**

A total of 154 adolescents fulfilling the inclusion criteria completed the questionnaires.

#### **Baseline Characteristics**

The median age of the participants was 18 years (range: 12-19 years). Approximately 60% of the participants were female, and the majority (89.6%) were students. Most participants resided in Cairo and Giza. Regarding parental occupation, the majority of

fathers were employees, and the majority of mothers were housewives (table 1).

The median duration of daily mobile phone use was 5.5 hours (range: 0.25-15 hours). The median PUMP score was 64 (range: 20-95). The prevalence of mobile addiction, defined as a PUMP score of  $\geq 60$ , was 60% (table 1).

### Sleep Quality Parameters

The median average time until falling asleep (sleep latency) was 15 minutes (range: 1-120 minutes). The mean actual hours of sleep were 7.58 hours (SD not provided in text, but inferred from discussion), with a range of 2 to 14 hours. The median PSQI score was 6 (range: 0-14) (table 2).

**Poor sleep quality (PSQI  $\geq 5$ ) was highly prevalent, affecting 73.4% of the participants.**

### Association with Sleep Quality

A comparison between the poor and good sleep quality groups revealed statistically significant differences in several factors (table 3):

- **Age: Older age was linked to poor sleep quality.**
- **The time frame of Daily Mobile Device Use: The groups differed in a way that was statistically significant.** ( $P < 0.0001$ ), with longer duration associated with poor sleep quality.
- **Problematic Mobile Phone Use Score:** There was a statistically significant difference between groups ( $P < 0.05$ ), with a higher PUMP score associated with poor sleep quality.

When comparing sleep quality components between high mobile phone users and low users, high mobile phone use was associated with lower subjective sleep quality, lesser sleep duration, more daytime dysfunction (table 4).

These differences were statistically significant. No significant difference was found in sleep lag, sleep effectiveness, sleep disruption, and usage of sleep aids did not differ significantly.

Data presented as median (IQR)

Furthermore, a multivariate analysis indicated that working mothers and the duration of daily smartphone use were independently associated with poor sleep quality (table 5).

**Table 1: Baseline Characteristics of the Study Population (n=154)**

| Characteristic                                   | Median (Range) or n (%) |
|--------------------------------------------------|-------------------------|
| Age (years)                                      | 18 (12-19)              |
| Female Sex                                       | 92 (60%)                |
| Student Status                                   | 138 (89.6%)             |
| Daily Mobile Phone Use (hours)                   | 5.5 (0.25-15)           |
| Problematic Mobile Phone Use (PUMP) Score        | 64 (20-95)              |
| Prevalence of Mobile Addiction (PUMP $\geq 60$ ) | 92 (60%)                |

**Table (2): Sleep Quality parameters among adolescents attending kasralainy**

|                                                                                      |             | Range |
|--------------------------------------------------------------------------------------|-------------|-------|
| <b>Average time until falling asleep in the last month (minutes)</b><br>Median (IQR) | 15 (10-30)  | 1-120 |
| <b>Actual hours of sleeping</b><br>Mean (SD)                                         | 7.58 (2.08) | 2-14  |
| <b>Pittsburgh Sleep Quality Index (PSQI)</b><br>Median (IQR)                         | 6 (4-8)     | 0-14  |

**Table (3): Predictors of sleep quality**

|                              | Good sleep quality (n=41) | Poor sleep quality (n=113) | P           |
|------------------------------|---------------------------|----------------------------|-------------|
| <b>Age</b>                   | 17 (15-19)                | 18 (17-19)                 | <b>0.03</b> |
| <b>Gender</b><br>Male/Female | 21 (51.2%)/ 20 (48.8%)    | 39 (34.5%)/ 74 (65.5%)     | 0.06        |

| Job                                                               |             |             |         |
|-------------------------------------------------------------------|-------------|-------------|---------|
| Student                                                           | 37 (90.2%)  | 101 (89.4%) | 1       |
| Worker                                                            | 3 (7.3%)    | 8 (7.1%)    |         |
| Not a student or worker                                           | 1 (2.4%)    | 4 (3.5%)    |         |
| <b>Mother's job</b>                                               |             |             |         |
| Housewife                                                         | 32 (78.05%) | 58 (51.3%)  | 0.006   |
| Employee                                                          | 9 (21.95%)  | 47 (41.6%)  |         |
| Daily worker                                                      | 0           | 8 (7.1%)    |         |
| <b>Father's job</b>                                               |             |             |         |
| Employee                                                          | 30 (73.17%) | 83          | 0.8     |
| Daily worker                                                      | 9 (21.95%)  | 21          |         |
| Not working                                                       | 2 (4.88%)   | 9           |         |
| <b>Duration of daily mobile phone use (hours)</b><br>Median (IQR) | 4 (2-6)     | 6 (5-10)    | <0.0001 |
| <b>Mobile use score</b><br>Median (IQR)                           | 58 (36-68)  | 67 (52-77)  | 0.001   |

**Table (4): Comparison between high mobile phone users (score>60) versus low users with sleep quality parameters**

|                          | Low mobile phone users<br>(n=61) | High phone users (n=93) | P       |
|--------------------------|----------------------------------|-------------------------|---------|
| Subjective sleep quality | 1 (0-1)                          | 1 (1-2)                 | 0.0001  |
| Sleep latency            | 1 (0-2)                          | 1 (1-2)                 | 0.2     |
| Sleep duration           | 0 (0-1)                          | 0 (0-1)                 | 0.04    |
| Sleep efficiency         | 0 (0-1)                          | 0 (0-0)                 | 0.5     |
| Sleep disturbance        | 1 (1-1)                          | 1 (1-2)                 | 0.25    |
| Use of sleep medication  | 0 (0-0)                          | 0 (0-0)                 | 0.5     |
| Day time dysfunction     | 1 (0-2)                          | 2 (1-2)                 | <0.0001 |

**Table (5): Multivariable logistic regression for predictors of poor sleep quality**

|                                  | OR (95% CI)        | P       |
|----------------------------------|--------------------|---------|
| Age                              | 1.16 (-0.95- 1.40) | 0.14    |
| Gender                           | 1.33 (0.58-3.06)   | 0.5     |
| Working mother                   | 2.81 (1.14-6.94)   | 0.025   |
| Duration of daily smartphone use | 1.38 (1.17-1.63)   | <0.0001 |

## Discussion

This study found that the average duration of daily mobile phone use among the adolescents was between 4 and 8 hours, with a median of 5.5 hours per day. This is comparable to findings from a 2021 study in Turkey by Gundogdu et al., which reported that 38.3% of young people used their smartphones for 4-6 hours a day <sup>(16)</sup>

The prevalence of poor sleep quality (PSQI  $\geq$  5) in our cohort was 73.4%. This high prevalence aligns with other studies in the region, such as a 2022 study among Moroccan adolescents by Moustakbal and Maataoui, which reported 71.9% poor sleep quality <sup>(15)</sup>. It is also higher than figures reported in other populations, such as 58.7% in Turkish adolescents <sup>(17)</sup>, 34.32% in South China <sup>(18)</sup>. Consistent with previous research, we found that poor sleep quality was associated with older age (late adolescents). This finding is supported by a 2012 study in South China by Zhou et al., which noted that the tendency toward poor sleep quality increased with age <sup>(18)</sup>. Moustakbal and Maataoui (2022) also observed this trend, reporting that 84% of late adolescents had poor sleep quality compared to 58% of young adolescents <sup>(15)</sup>

In contrast to some literature, our study found no statistically significant difference in sleep quality between both sexes. This agrees with a 2012 study among Chinese students by Zhou et al. <sup>(18)</sup>, but contradicts a 2022 Turkish study by Acikgoz et al., which reported that poor sleep quality was 1.5 times higher in female students <sup>(17)</sup>

The mean total sleep time in our study was 7.58 hours, which is below the recommended 8-10 hours per night <sup>(6)</sup>. This is slightly lower than the 8.01 hours reported by Moustakbal and Maataoui in 2022. <sup>(15)</sup>

Regarding the association between mobile phone use and specific sleep components, we found no significant difference in sleep latency between high and low mobile phone users (median time until falling asleep was 15 minutes). This result is consistent with a 2016 study in Iran by Mohammad beigi et al. <sup>(19)</sup>, but contradicts a 2019 study in India by Kadian et al., which found that sleep latency was adversely affected by increased mobile phone usage. <sup>(20)</sup>

Crucially, our findings demonstrated that high mobile phone use was related to lower subjective sleep quality, shorter sleep duration, and more daytime dysfunction. This partially aligns with Gundogdu et al. (2021), who found a statistically significant correlation between the Smartphone Addiction Scale score and the PSQI total score, as well as the sub-dimensions of subjective sleep quality, habitual sleep efficiency, sleep disturbances, and daytime dysfunction <sup>(16)</sup>

Finally, our linear regression analysis showed that age, gender, job status, or mother's work were not statistically significant predictors of higher PUMP scores. This contradicts studies by Soni et al. (2017) and Asiyah et al. (2018), which reported higher mobile phone scores in males and females, respectively, and an association with age. <sup>(21)(22)</sup>

## Conclusion

Among Egyptian teenagers, inadequate sleep quality is a major problem., affecting nearly three-quarters of the study population. The study finds a strong connection between problematic mobile phone use and low quality of sleep., particularly in terms of shorter sleep duration, poorer subjective quality, and increased daytime dysfunction. The duration of daily smartphone use was identified as an independent factor associated with poor sleep quality. These findings underscore the need for public health interventions and educational programs aimed at promoting responsible mobile phone use to mitigate its negative impact on adolescent sleep health.

### Ethical approval

The Kasr Alainy Family Medicine Department Council reviewed and approved the current study. Additionally, it received approval from Cairo University's Research Ethics Committee as well as the Scientific Research Ethical Committee of the Faculty of Medicine. The MS-606-2022 approval number is given.

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**Conflict of interest:** All authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Authors' contributions:

**First and second author:** Idea, scientific writing, literature search.

**Third author:** Idea, getting scientific approval, data collection.

**Fourth and Fifth author:** Idea, critical review, Revision.

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