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INTERNET ADDICTION AND SLEEP PROBLEMS AMONG PREPARATORY SCHOOL STUDENTS IN KARBALA CITY

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ABSTRACT

Background: Internet addiction (IA) is characterized by the inability to control internet use, resulting in impaired social, academic, occupational, and psychological functioning. Excessive smartphone use has been linked to behavioral problems, reduced academic performance, poor social interaction, relationship difficulties, and physical complaints such as blurred vision and musculoskeletal pain. This study aimed to determine the prevalence of IA among preparatory school students and examine its association with sleep quality. **Methods:** A cross-sectional descriptive study was conducted among preparatory school students in Karbala, Iraq, using a self-administered questionnaire. The survey included three sections: sociodemographic characteristics, a 10-item Internet Addiction Scale (SAS-SV), and a 13-item questionnaire assessing sleep habits, sleep problems, and sleep quality. Data were analyzed using SPSS version 24.0. **Results:** A total of 476 students participated; 58.2% were male, with a mean age of 16.93 ± 1.17 years. Instagram was the most frequently used application (68.9%). Based on the SAS-SV, 28.6% of participants met the criteria for internet addiction. IA was more common among males than females (36.5% vs. 17.6%). significant association was observed between IA and poor sleep quality, with 55.5% of addicted students reporting very poor sleep. Approximately 60% also reported excessive daytime sleepiness during lessons and difficulty waking in morning. **Conclusion:** Internet addiction affects nearly one-third of preparatory students and is more prevalent among males. Instagram and smartphones are the dominant platforms for internet use. IA is significantly associated with poor sleep quality and unhealthy sleep habits, highlighting the need for targeted preventive and educational interventions.

KEYWORDS: Internet addiction; Smartphone addiction; Sleep quality; Adolescents; Preparatory school students; Iraq.

INTRODUCTION

Internet use has become an essential part of daily life, particularly among adolescents, for education, communication, entertainment, and social networking. In Iraq, digital engagement has increased rapidly, with recent reports indicating that approximately 73.8% of the population (34.3 million users) actively use social media platforms, with TikTok and Facebook being the most popular applications.[1] Earlier national reports also showed widespread use of platforms such as Facebook, YouTube, WhatsApp, Instagram, Telegram, and online games, reflecting the growing dependence on digital technologies among Iraqi youth.[2]

Despite its many benefits, excessive internet use has emerged as a significant public health concern. Internet addiction (IA) is characterized by the inability to control internet use, resulting in impairment of social, academic, occupational, and psychological functioning.[3] The prevalence of IA varies worldwide, ranging from 7.9% to 25.2% in Europe and the United States, 17.3% to 23.6% in the Middle East and Africa, and reaching as

high as 50.9% in some Asian countrie.[4] In Iraq, recent studies have report ed high rates of problematic internet use among adolescents and university students, with 66.3% of secondary school students in Al-Diwaniyah exhibiting problematic internet use behaviors.[5]

Adolescents are particularly vulnerable to internet addiction because they are the most active users of digital technologies during a developmental stage characterized by major physical, psychological, and social changes.[6] Excessive internet use has been associated with reduced academic performance, impaired social relationships, anxiety, depression, low self-esteem, and behavioral problems.[7] Consequently, internet addiction has become an important issue affecting adolescents' mental health and overall well-being.

One of the most important consequences of excessive internet use is its adverse effect on sleep. Frequent smartphone and internet use, particularly before bedtime, increases exposure to blue light, suppresses melatonin secretion, delays sleep onset, shortens sleep duration, and disrupts the normal circadian rhythm.[8] Poor sleep quality has been linked to daytime sleepiness, impaired cognitive performance, decreased academic achievement, obesity, metabolic disorders, chronic pain, cardiovascular diseases, depression, and other mental health problems.[9] Several studies have consistently demonstrated that adolescents with internet addiction experience significantly poorer sleep quality and more sleep disturbances than their peers.[10]

The present study aimed to determine the prevalence and level of internet addiction among preparatory school students in Karbala City, Iraq, and to investigate the association between internet addiction and sleep quality, including sleep-related problems and sleep patterns. Furthermore, the study sought to identify the relationship between internet addiction and selected demographic characteristics and internet use behaviors among the participating students.

METHODS

Study Design: An analytical cross-sectional study was adopted using a self-administered questionnaire.

Setting and sampling: This study was conducted in Karbala city in Iraq from 20 of March 2025 till 7 of May 2025 among preparatory school students in Karbala city.

The current study samples were selected using multistage cluster sampling of preparatory school students, excluding sixth-grade students due to the coincidence with the exam period. This study involved distributing approximately 80 questionnaires to each school with the assistance of the educational supervisor for the mentioned intermediate and secondary schools, after obtaining approval from the administration. Those who agreed were handed the questionnaire manually, and notes were provided emphasizing that it was for academic research purposes and did not involve revealing identities or personal information. However, about 70 students did not complete filling out the data. And as the academic year was reaching end and the exams soon. However, the planned sample was achieved and exceeded. The study aimed to maintain privacy in this questionnaire for each participant to fill it alone. The samples were recruited from eight secondary and preparatory schools distributed in the center and districts of Karbala Governorate in Iraq with varying of age, sex and socioeconomic status to determine the level of IA among preparatory school students and identify the association of IA on their sleep problems. To ensure that the population of the research is properly represented, and to accomplish the goal of the research, the researcher utilizes the simple random sampling approach to select the sample.

Data collection: Data was collected through an anonymous form self-administrated questionnaire, participants were informed about the questionnaire and study purpose and assured of the anonymity of their responses. The questionnaire form was distributed to the participants by the researcher in various locations inside the schools. It took 6-8 minutes approximately to complete the survey**.**

Pilot Study: In order to manage any difficulty that might arise during data collection, a pilot project with 30 participants was conducted in march 2025 to assess the validity of the questions and the amount of time needed for participant response, participants take an average of (6-8) minutes to finish filling out the questionnaire.Few items was deleted from questionnaire and fine details were added.

Data collection tools: A validated questionnaire was adapted from a previously published study with minor modifications following discussions with the research supervisors. The questionnaire was professionally translated into Arabic and finalized prior to data collection. The final instrument comprised 43 questions organized into three sections. The first section collected participants' sociodemographic and lifestyle characteristics, including age, sex, grade level, family income, school type (governmental or private), parental educational level, weekly internet usage duration, type of electronic device used, average daily internet and application use, reasons for internet or application use, stimulant consumption and the types of stimulants used, unhealthy habits associated with electronic device use, and health problems related to internet addiction. The second section assessed smartphone addiction using the Smartphone Addiction Scale–Short Version (SAS-SV), which consists of 10 items rated on a six-point Likert scale ranging from strongly disagree (1) to strongly agree (6). Total scores ranged from 10 to 60, with higher scores indicating greater levels of smartphone addiction. Excessive smartphone use was defined using validated

cutoff scores of ≥33 for females and ≥31 for males. The internal consistency of the SAS-SV was evaluated using Cronbach's alpha coefficient.[11] The third section comprised 13 questions adapted from a previously published study[12] to assess sleep habits, sleep-related problems, and overall sleep quality among adolescents.

Scoring: The questionnaire items were scored for each item (true answer=1, false or don't know answer=0). Then, the sum of the scores was obtained and divided by the number of items to develop the mean knowledge score. Knowledge Percent was calculated for each item of the questionnaire by multiplying mean score for the item by 100**.**

Ethical Approval: The study protocol was approved by the Council of Arabic Board of Family Medicine (Protocol Approval Number: 25-23 in 18/ 3 /2025), and approved also from training and human development centre /research and Karbala education directorate also consent taken from schools administrations` that study take place, verbal consent was obtained from the participants, and they were reassured that their involvement in the study was entirely voluntary.

Statistical Analysis The analysis of data was carried out using the Statistical Package for Social Sciences (SPSS) 24. Standard deviation, mean, percentage, frequency was used to describe the demographic data, internet usage data of the participants. Chi-square test (X^2 -test) of independence was used to test the association between categorical data of two groups. A T-test was used for comparing means between two independent groups for quantitative data. All analyses were done with 95% confidence intervals (CI) and level of significance was considered as p-value ≤ 0.0**5.**

RESULTS

A total of 476 participants were included in the study. The mean age of the participants was 16.93 ± 1.17 years, with an age range of 15–21 years. Regarding sex distribution, 277 (58.2%) participants were male, while 199 (41.8%) were female. In terms of academic grade, 272 (57.1%) participants were in the 5th grade, whereas 204 (42.9%) were in the 4th grade. Most participants reported having a moderate family income (278, 58.4%), followed by those with a good income (176, 37.0%), while only 22 (4.6%) reported a low income.

Concerning the educational level of fathers, more than half of the participants' fathers had attained a university education (249, 52.3%). This was followed by secondary school education (149, 31.3%), primary school education (56, 11.8%), and no formal education (22, 4.6%). Similarly, for mothers' educational level, nearly half had a university education (231, 48.5%), followed by secondary school education (141, 29.6%), primary school education (69, 14.5%), and no formal education (34, 7.1%), as presented in **Figure 1**.

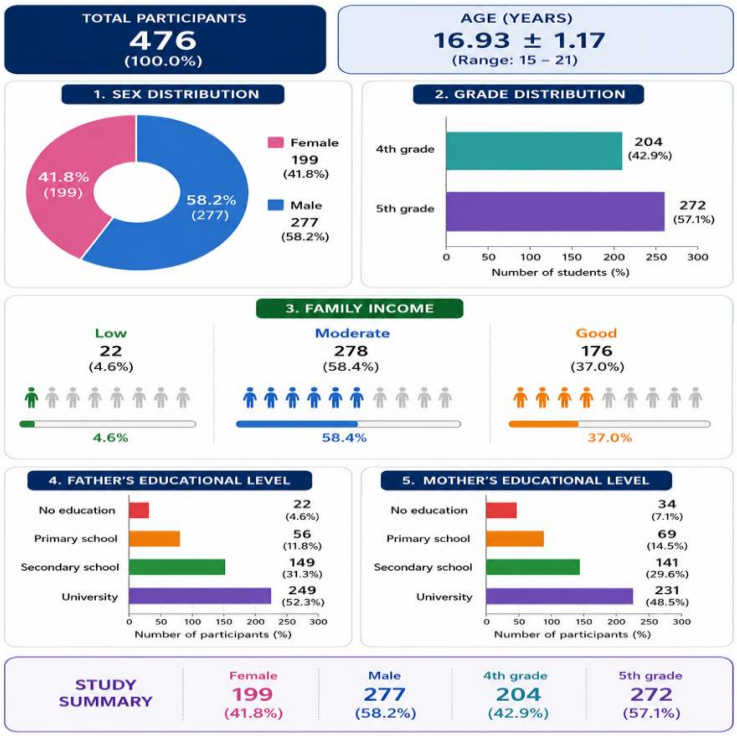


Figure 1: Graphical overview of the baseline sociodemographic characteristics of the study participants. (A) **Total study population (N = 476) and age distribution, showing a mean age of 16.93 ± 1.17 years (range: 15–21 years).** (B) **Sex distribution of participants, comprising 277 males (58.2%) and 199 females (41.8%).** (C) **Grade distribution, with 204 (42.9%) students in the 4th grade and 272 (57.1%) in the 5th grade.** (D) **Family income status categorized as low (22, 4.6%), moderate (278, 58.4%), and good (176,**

37.0%). (E) **Educational level of parents, illustrating the distribution of fathers' and mothers' educational attainment, including no formal education, primary school, secondary school, and university education.**

Figure 2 presented the most commonly used social media and communication applications among the study participants. Instagram was the most frequently used application, reported by 329 participants (68.9%), followed by TikTok, which was used by 262 participants (55.0%). Approximately one-quarter of the participants used WhatsApp (111, 23.0%), while Facebook was used by 95 participants (20.0%).

Less frequently used applications included YouTube, reported by 71 participants (14.9%), and Telegram, reported by 61 participants (12.8%). Overall, Instagram and TikTok were the dominant applications among the participants, whereas YouTube and Telegram were the least commonly used.

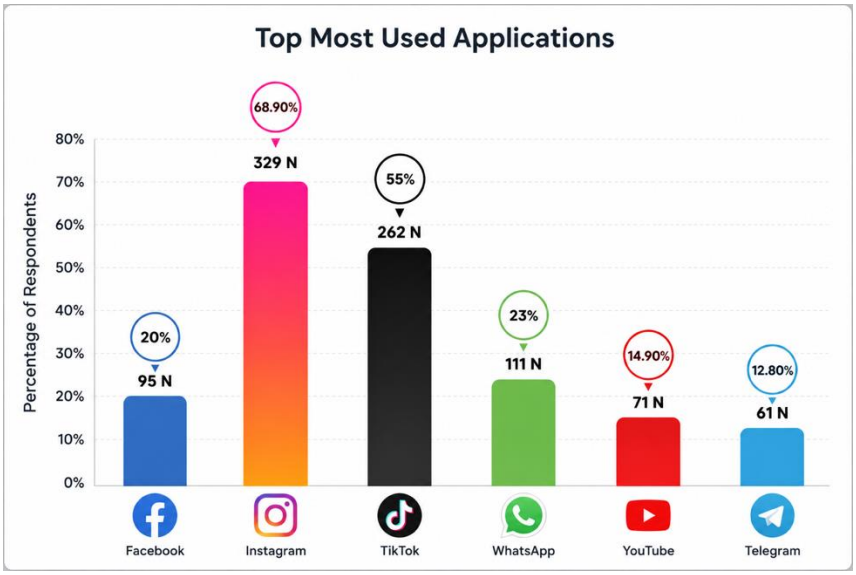


Figure 2: Frequency of the most commonly used social media applications among study participants. (A) Facebook (20.0%; *n* = 95). (B) Instagram (68.9%; *n* = 329). (C) TikTok (55.0%; *n* = 262). (D) WhatsApp (23.0%; *n* = 111). (E)YouTube (14.9%; *n* = 71). (F) Telegram (12.8%; *n* = 61). Percentages indicate the proportion of participants reporting the use of each application.

Figure 3 summarized the main reasons for using the internet or other electronic applications among the study participants. The most commonly reported reason was browsing, with 327 participants (68.7%) indicating that they used the internet for this purpose. This was followed closely by studying, reported by 308 participants (64.7%), and communication, reported by 270 participants (56.7%).

Recreational use was also common, with 201 participants (42.2%) reporting that they used the internet for gaming. In contrast, only 37 participants (7.8%) reported using the internet for other purposes. Overall, browsing and educational activities represented the primary reasons for internet use among the participants, whereas other miscellaneous purposes were reported least frequently.

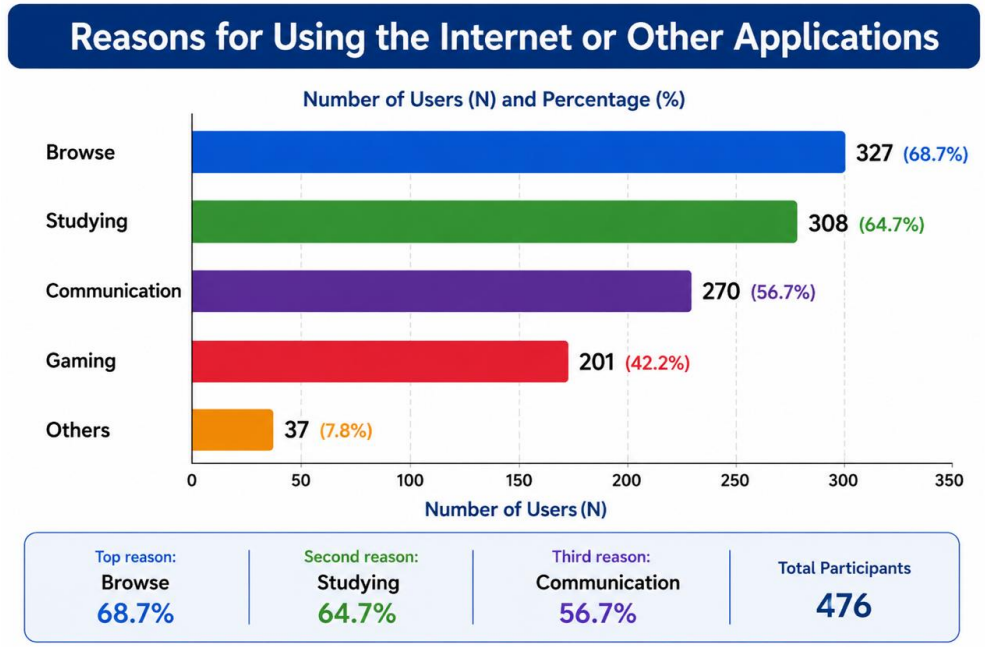


Figure 3: Frequency of the reported reasons for internet and social media application use among the study participants (N = 476). (A) Browsing (68.7%; *n* = 327), (B) Studying (64.7%; *n* = 308), (C) Communication (56.7%; *n* = 270), (D)Gaming (42.2%; *n* = 201), and (E) Other purposes (7.8%; *n* = 37). Browsing was the most common reason for internet use, followed by studying and communication.

Figure 4 presented the patterns of internet and electronic device use among the study participants. The vast majority of participants accessed the internet using a smartphone, reported by 434 participants (91.0%). Other devices were used less frequently, including gaming consoles (67, 14.0%), tablets (66, 13.8%), laptops (49, 10.3%), and desktop computers (36, 7.5%).

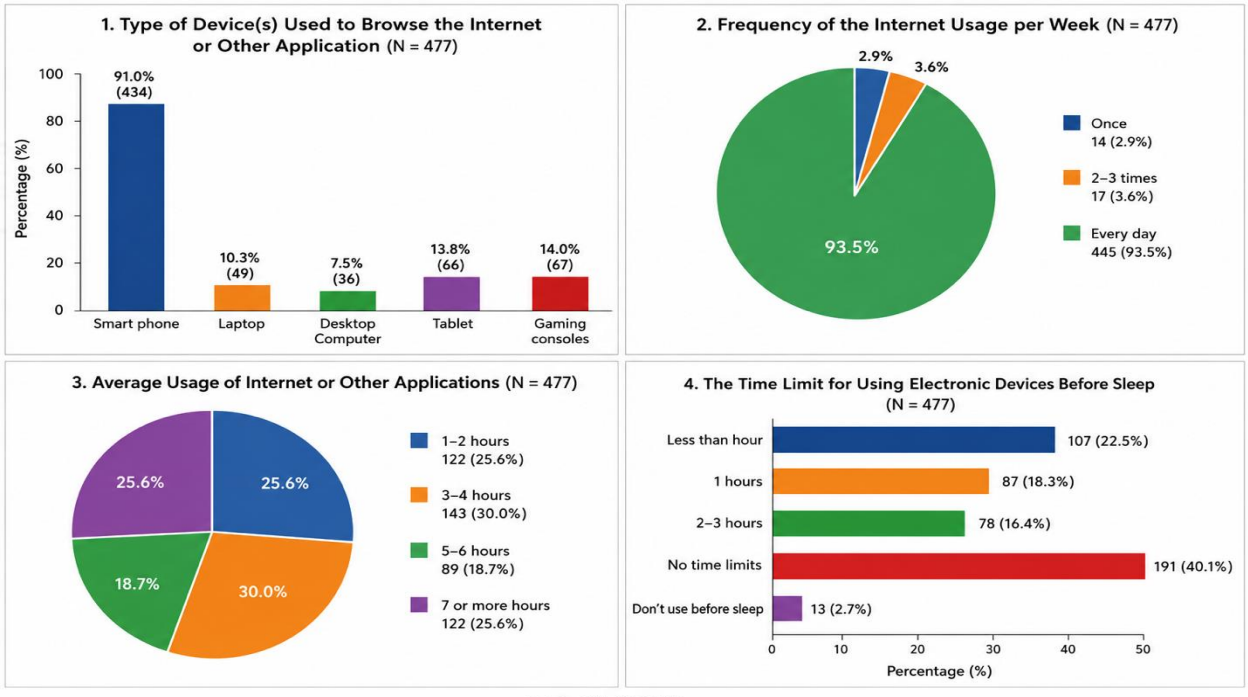


Figure 4: Overview of electronic device ownership and internet use patterns among the study participants. (A) Types of devices used to access the internet or other applications, showing smartphones as the predominant device (434, 91.0%), followed by gaming consoles (67, 14.0%), tablets (66, 13.8%), laptops (49, 10.3%), and desktop computers (36, 7.5%). (B) Weekly frequency of internet use, with the majority of participants reporting daily use (445, 93.5%), while 17 (3.6%) used the internet 2–3 times per week and 14

(2.9%) used it once per week. (C) Average daily duration of internet or application use, with 143 participants (30.0%) reporting 3–4 hours per day, 122 (25.6%) reporting 1–2 hours, 122 (25.6%) reporting 7 or more hours, and 89 (18.7%) reporting 5–6 hours. (D) Time limits for electronic device use before sleep, where 191 participants (40.1%) reported having no time limits, 107 (22.5%) limited use to less than 1 hour before sleep, 87 (18.3%) to 1 hour, 78 (16.4%) to 2–3 hours, and 13 (2.7%) reported not using electronic devices before sleep.

Regarding the frequency of internet use, almost all participants reported using the internet every day (445, 93.5%), whereas only 17 (3.6%) used it 2–3 times per week, and 14 (2.9%) used it once per week. The average daily duration of internet or application use varied among participants. The largest proportion reported using the internet for 3–4 hours per day (143, 30.0%). Equal proportions of participants reported using the internet for 1–2 hours (122, 25.6%) and 7 hours or more (122, 25.6%) per day, while 89 participants (18.7%) reported an average usage of 5–6 hours per day.

With respect to electronic device use before sleep, 191 participants (40.1%) reported having no time limits for using electronic devices before bedtime. In comparison, 107 (22.5%) limited device use to less than one hour before sleep, 87 (18.3%) to one hour, and 78 (16.4%) to 2–3 hours before bedtime. Only 13 participants (2.7%) reported not using electronic devices before sleep.

Figure 5 summarized the health-related effects and behavioral habits associated with the use of electronic devices among the study participants. Regarding vision status, 214 participants (45.0%) reported no vision problems, while 144 (30.3%) reported experiencing vision problems, and 118 (24.8%) were uncertain about whether they had vision problems.

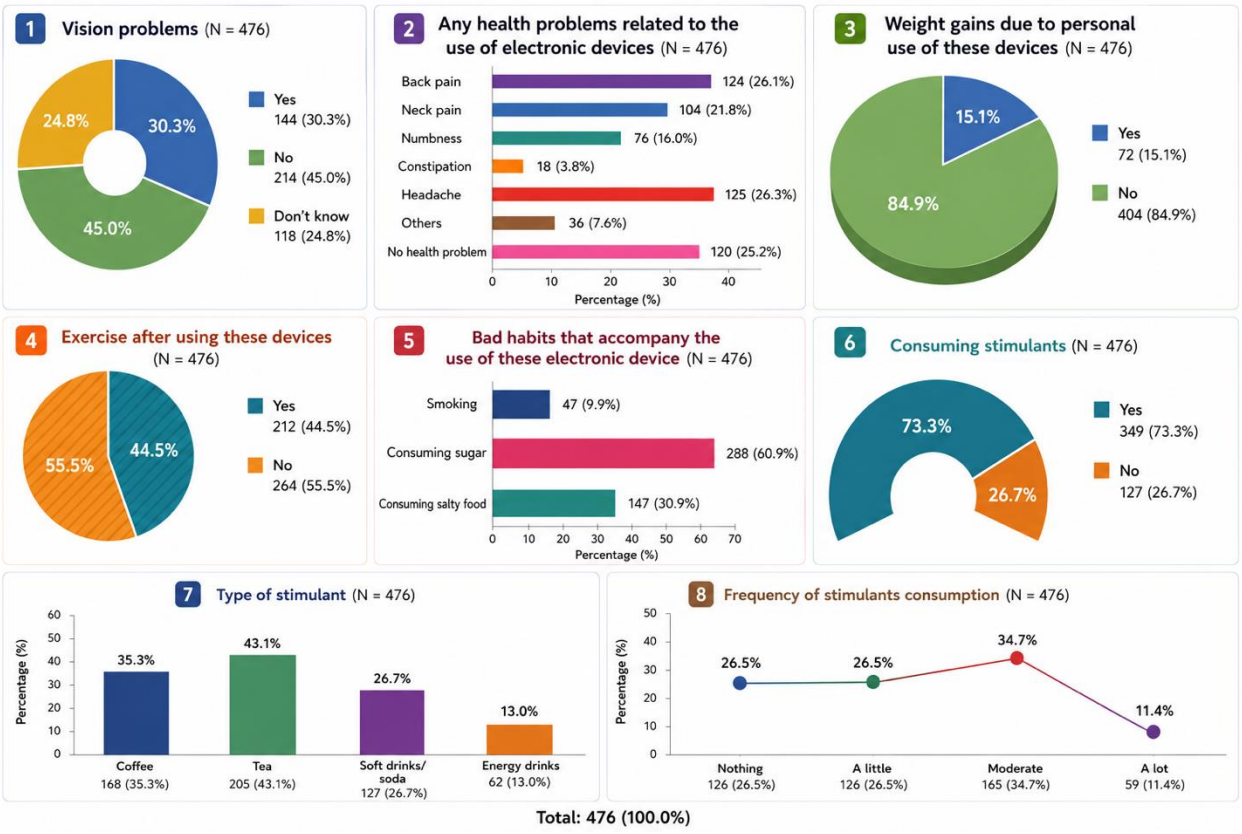


Figure 5: Overview of the self-reported health effects and lifestyle behaviors associated with electronic device and internet use among the study participants. (A) **Self-reported vision problems, with 144 participants (30.3%) reporting vision problems, 214 (45.0%) reporting no vision problems, and 118 (24.8%) indicating they did not know.** (B) **Health problems related to electronic device use, including headache (125, 26.3%), back pain (124, 26.1%), no health problems (120, 25.2%), neck pain (104, 21.8%), numbness (76, 16.0%), other health problems (36, 7.6%), and constipation (18, 3.8%).** (C) **Self-reported weight gain attributed to electronic device use, with 72 participants (15.1%) reporting weight gain and 404 (84.9%) reporting no weight gain.** (D) **Exercise after using electronic devices, where 212 participants (44.5%) reported engaging in physical exercise, whereas 264 (55.5%) did not.** (E) **Unhealthy habits accompanying electronic device use, including sugar consumption (288, 60.9%), salty food consumption (147, 30.9%), and smoking (47, 9.9%).** (F) **Consumption of stimulants, reported by 349 participants (73.3%), while 127 (26.7%) reported no stimulant consumption.** (G) **Types of stimulants consumed, with tea (205, 43.1%) being the most common, followed by coffee (168, 35.3%), soft drinks/soda (127, 26.7%),**

and energy drinks (62, 13.0%). (H) **Frequency of stimulant consumption, categorized as moderate (165, 34.7%), none (126, 26.5%), a little (126, 26.5%), and a lot (59, 11.4%).**

The most commonly reported health complaints related to electronic device use were headache (125, 26.3%) and back pain (124, 26.1%), followed by neck pain (104, 21.8%) and numbness (76, 16.0%). A smaller proportion reported other health problems (36, 7.6%) or constipation (18, 3.8%). Notably, 120 participants (25.2%) indicated that they had no health problems related to electronic device use.

Most participants (404, 84.9%) reported no weight gain attributable to the use of electronic devices, whereas 72 (15.1%) believed that their device use had contributed to weight gain. Similarly, 264 participants (55.5%) reported that they did not exercise after using electronic devices, while 212 (44.5%) reported engaging in physical exercise. With respect to accompanying habits, consuming sugar was the most frequently reported behavior (288, 60.9%), followed by consuming salty foods (147, 30.9%) and smoking (47, 9.9%).

The majority of participants (349, 73.3%) reported consuming stimulants, whereas 127 (26.7%) did not. Among stimulant users, tea was the most commonly consumed beverage (205, 43.1%), followed by coffee (168, 35.3%), soft drinks/soda (127, 26.7%), and energy drinks (62, 13.0%). Regarding the frequency of stimulant consumption, 165 participants (34.7%) reported moderate consumption, while 126 (26.5%) reported consuming no stimulants and an equal proportion (126, 26.5%) reported consuming a little. Only 59 participants (11.4%) reported consuming a lot of stimulants.

Figure 6 demonstrated the participants' sleep patterns and sleep-related behaviors. Regarding falling asleep in class, 202 participants (42.4%) reported never falling asleep during class, 153 (32.1%) reported rarely, 83 (17.4%) reported sometimes, and 38 (8.0%) reported usually falling asleep in class.

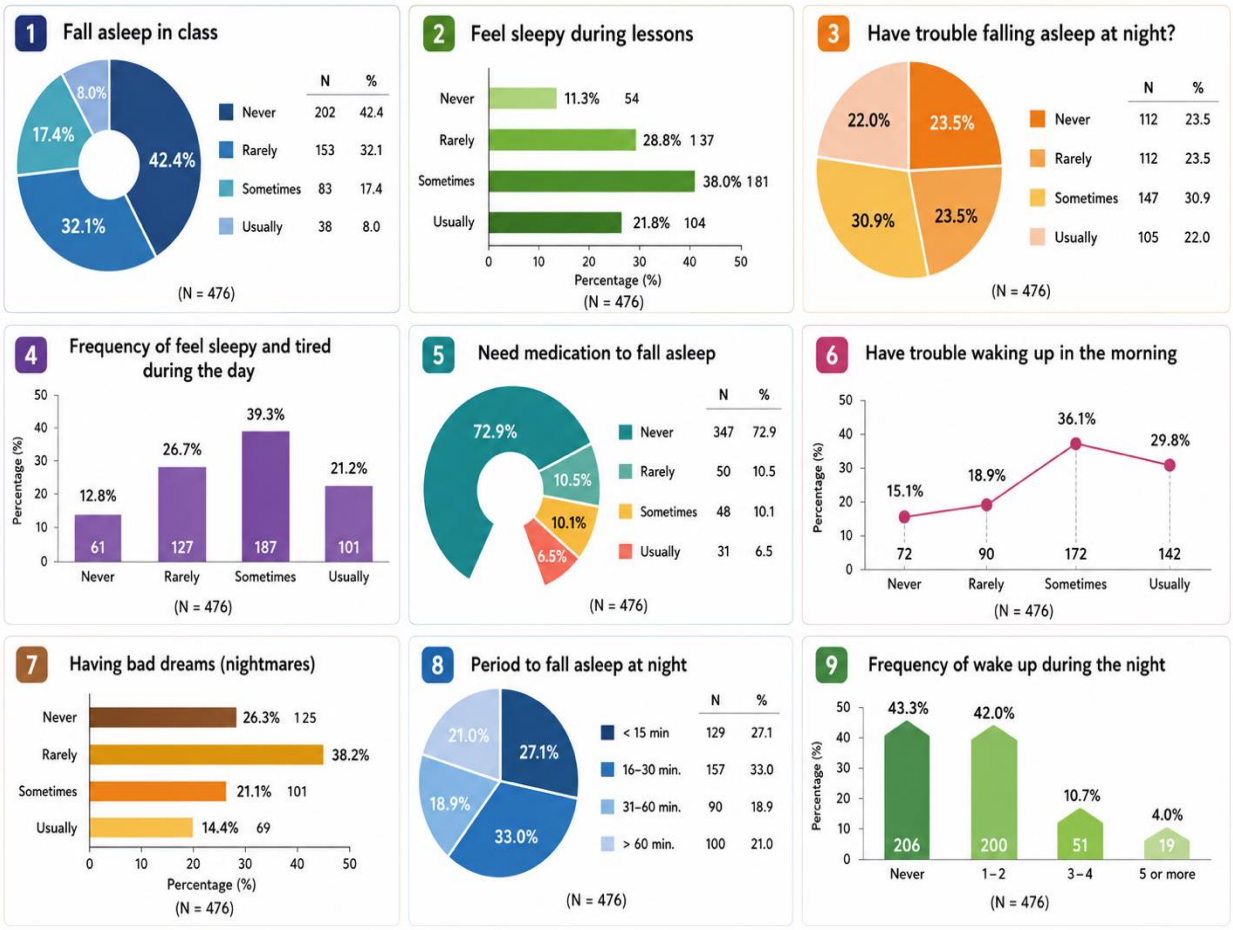


Figure 6: Overview of sleep behaviors and sleep-related problems reported by the study participants. (A) Frequency of falling asleep during class, with 202 participants (42.4%) reporting never, 153 (32.1%) rarely, 83 (17.4%) sometimes, and 38 (8.0%) usually falling asleep in class. (B) Frequency of feeling sleepy during lessons, where 54 participants (11.3%) reported never, 137 (28.8%) rarely, 181 (38.0%) sometimes, and 104 (21.8%) usually feeling sleepy. (C) Difficulty falling asleep at night, reported as never by 112 participants (23.5%), rarely by 112 (23.5%), sometimes by 147 (30.9%), and usually by 105

(22.0%). (D) Frequency of feeling sleepy and tired during the daytime, with 61 participants (12.8%) reporting never, 127 (26.7%) rarely, 187 (39.3%) sometimes, and 101 (21.2%) usually experiencing daytime sleepiness. (E) Need for medication to initiate sleep, with 347 participants (72.9%) reporting never, 50 (10.5%) rarely, 48 (10.1%) sometimes, and 31 (6.5%) usually requiring medication. (F) Difficulty waking up in the morning, reported as never by 72 participants (15.1%), rarely by 90 (18.9%), sometimes by 172 (36.1%), and usually by 142 (29.8%). (G) Frequency of nightmares, with 125 participants (26.3%) reporting never, 182 (38.2%) rarely, 101 (21.1%) sometimes, and 69 (14.4%) usually experiencing nightmares. (H) Time required to fall asleep at night, with 129 participants (27.1%) falling asleep in <15 minutes, 157 (33.0%) within 16–30 minutes, 90 (18.9%) within 31–60 minutes, and 100 (21.0%) requiring more than 60 minutes. (I) Frequency of waking during the night, where 206 participants (43.3%) reported never waking, 200 (42.0%) waking 1–2 times, 51 (10.7%) waking 3–4 times, and 19 (4.0%) waking five or more times per night.

Sleepiness during lessons was relatively common, with 181 participants (38.0%) reporting that they sometimes felt sleepy during lessons and 104 (21.8%) reporting that they usually experienced sleepiness. In contrast, 137 (28.8%) and 54 (11.3%) reported rarely and never feeling sleepy during lessons, respectively. Regarding difficulty falling asleep at night, 147 participants (30.9%) reported sometimes experiencing this problem, while 105 (22.0%) reported usually having difficulty. Equal proportions (112 participants, 23.5% each) reported neveror rarely having trouble falling asleep.

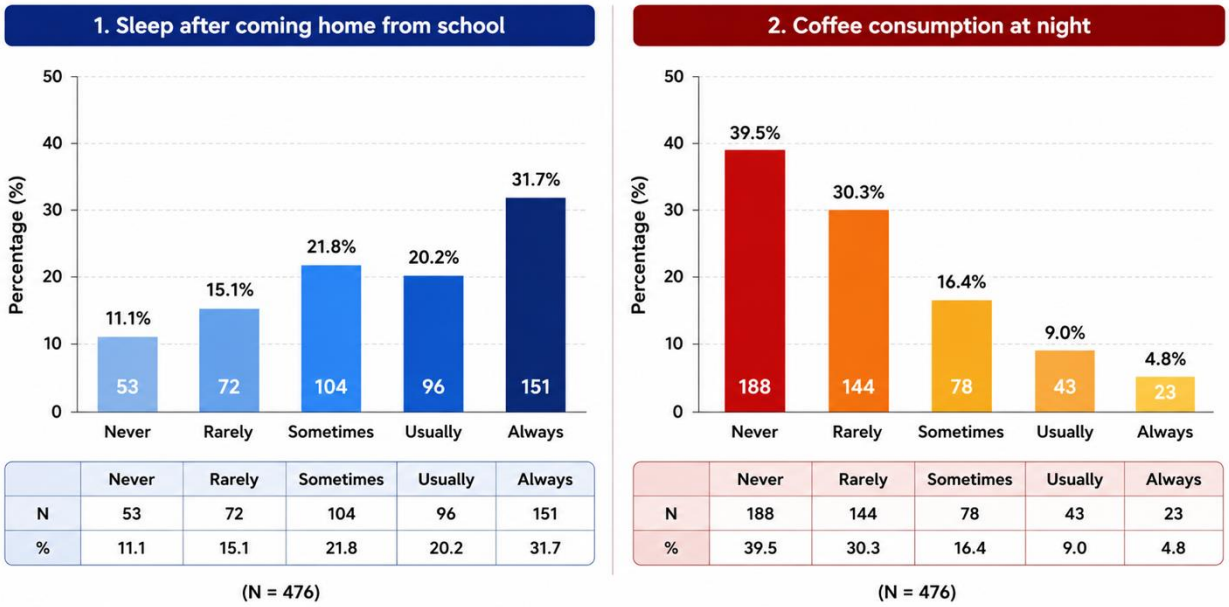
Similarly, daytime sleepiness and fatigue were frequently reported, with 187 participants (39.3%) indicating that they sometimes felt sleepy and tired during the day, followed by 127 (26.7%) reporting rarely, 101 (21.2%) reporting usually, and 61 (12.8%) reporting never. The majority of participants (347, 72.9%) reported never needing medication to fall asleep. Only 50 (10.5%), 48 (10.1%), and 31 (6.5%) reported rarely, sometimes, and usually requiring sleep medication, respectively.

Difficulty waking up in the morning was also common, with 172 participants (36.1%) reporting this problem sometimesand 142 (29.8%) reporting it usually. In comparison, 90 (18.9%) and 72 (15.1%) reported experiencing this problem rarely and never, respectively. Regarding nightmares, 182 participants (38.2%) reported rarely experiencing bad dreams, 125 (26.3%) reported never, 101 (21.1%) reported sometimes, and 69 (14.4%) reported usually having nightmares.

The time required to fall asleep at night varied among participants. The largest proportion (157, 33.0%) reported falling asleep within 16–30 minutes, followed by 129 (27.1%) within less than 15 minutes, 100 (21.0%) after more than 60 minutes, and 90 (18.9%) within 31–60 minutes.

Finally, regarding nocturnal awakenings, 206 participants (43.3%) reported never waking up during the night, while 200 (42.0%) reported waking up 1–2 times per night. Only 51 (10.7%) reported waking 3–4 times, and 19 (4.0%) reported waking five or more times each night. Overall, the findings indicate that daytime sleepiness, difficulty waking in the morning, and occasional difficulty initiating sleep were common among the participants, whereas the use of sleep medication was relatively uncommon.

Figure 7 summarizes the participants' habits of sleeping after returning home from school and consuming coffee at night. Regarding sleeping after school, the largest proportion of participants reported always sleeping after coming home (151, 31.7%). This was followed by sometimes (104, 21.8%), usually (96, 20.2%), rarely (72, 15.1%), and never (53, 11.1%). These findings indicate that daytime sleep after school was a common practice among the study participants.



	Never	Rarely	Sometimes	Usually	Always
N	53	72	104	96	151
%	11.1	15.1	21.8	20.2	31.7

	Never	Rarely	Sometimes	Usually	Always
N	188	144	78	43	23
%	39.5	30.3	16.4	9.0	4.8

Figure 7: Sleep-related habits and nighttime coffee consumption among the study participants. (A) Frequency of sleeping after returning home from school, with 53 participants (11.1%) reporting never, 72 (15.1%) rarely, 104 (21.8%) sometimes, 96 (20.2%) usually, and 151 (31.7%) always sleeping after school. (B) Frequency of coffee consumption at night, where 188 participants (39.5%) reported never drinking coffee at night, 144 (30.3%) rarely, 78 (16.4%) sometimes, 43 (9.0%) usually, and 23 (4.8%) always consuming coffee during the night.

Regarding nighttime coffee consumption, 188 participants (39.5%) reported never drinking coffee at night, while 144 (30.3%) reported rarely consuming coffee before bedtime. In contrast, 78 participants (16.4%) reported sometimes, 43 (9.0%) usually, and only 23 (4.8%) always consumed coffee at night. Overall, the results suggest that regular nighttime coffee consumption was relatively uncommon, whereas sleeping after returning home from school was frequently reported.

Figure 8 illustrated the self-reported sleep quality ratings of the study participants. The largest proportion of participants rated their sleep quality as good, accounting for 174 respondents (36.6%). This was followed by moderate sleep quality, reported by 145 participants (30.5%). A smaller proportion of participants perceived their sleep quality as very good (71, 14.9%), whereas 49 participants (10.3%) rated their sleep as bad. The fewest participants (37, 7.8%) reported having very bad sleep quality.

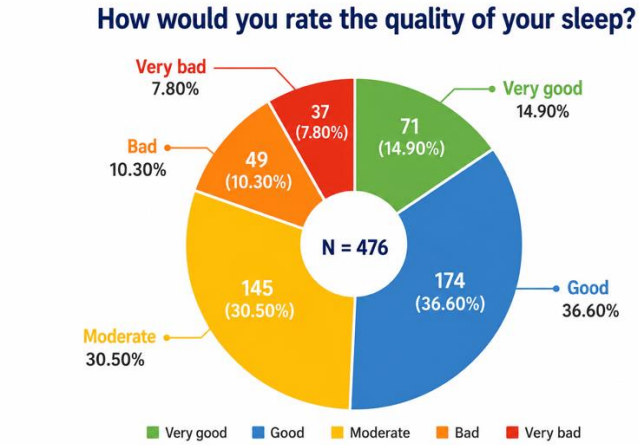


Figure 8: Distribution of self-reported overall sleep quality among the study participants. (A) Very good sleep quality was reported by 71 participants (14.9%). (B) Good sleep quality was the most frequently reported category, accounting for 174 participants (36.6%). (C) Moderate sleep quality was reported by 145 participants (30.5%). (D) Bad sleep quality was reported by 49 participants (10.3%). (E) Very bad sleep quality was reported by 37 participants (7.8%). Overall, most participants perceived their sleep quality as good or moderate, whereas fewer than one-fifth reported poor or very poor sleep quality.

Figure 9 shown the distribution of smartphone addiction status among the study participants according to the Smartphone Addiction Scale–Short Version (SAS-SV). Of the 476 participants, the majority were classified as non-addicted, comprising 340 participants (71.4%), whereas 136 participants (28.6%) met the criteria for smartphone addiction.

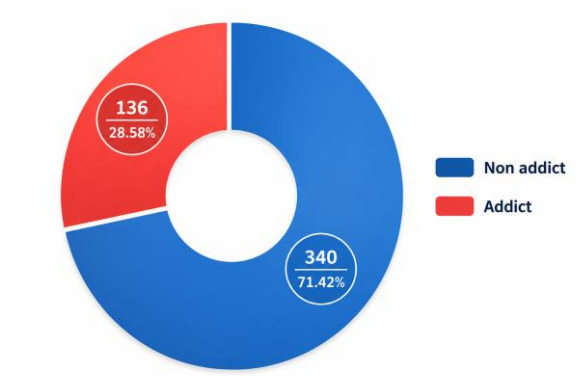


Figure 9: addiction assessment using smart-phone addiction scale-short version SAS.

Overall, these findings indicate that approximately three-quarters of the participants were not classified as smartphone addicts, while nearly one-third exhibited smartphone addiction, suggesting that smartphone addiction is relatively common among the study population.

Figure 10 provided information about the association between demographic characteristics and smartphone addiction status as assessed by the Smartphone Addiction Scale–Short Version (SAS-SV). The mean age of participants was 16.93 ± 1.17 years. Participants classified as addicted were significantly older than those classified as non-addicted (17.26 ± 1.20 vs. 16.80 ± 1.13 years, P < 0.001).

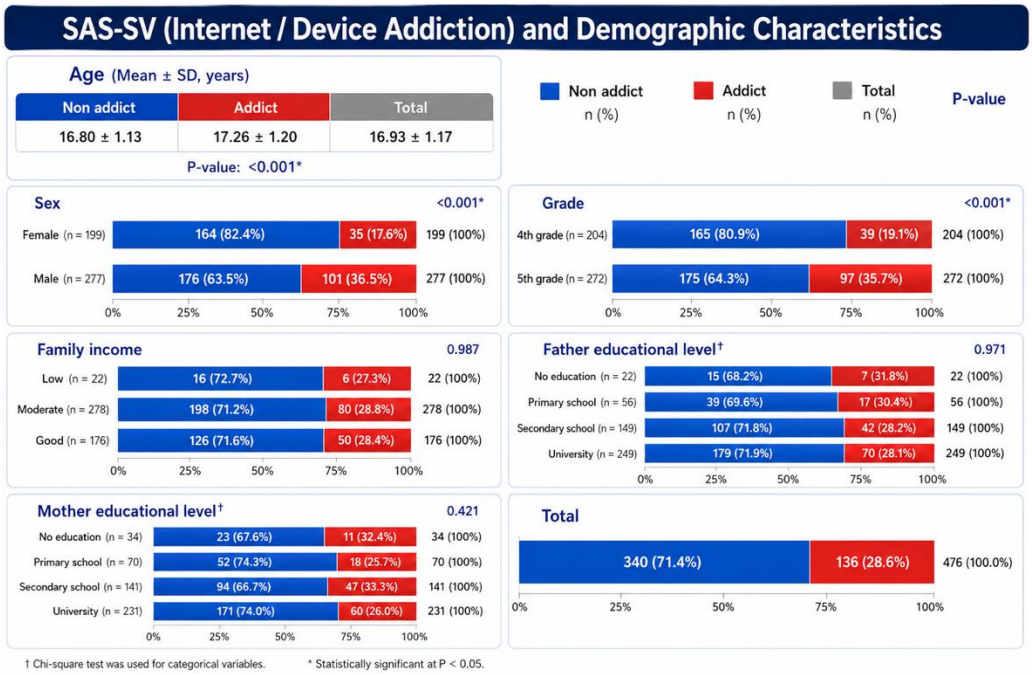


Figure 10: Association between Smartphone Addiction Scale–Short Version (SAS-SV) classification and participants' demographic characteristics. (1) Comparison of the mean age between non-addicted (16.80 ± 1.13 years) and addicted participants (17.26 ± 1.20 years), showing a statistically significant difference (*P* < 0.001). (2) Association between addiction status and sex, demonstrating a higher prevalence of addiction among males (36.5%) than females (17.6%) (*P* < 0.001). (3) Association between addiction status and school grade, with addiction being more common among 5th-grade students (35.7%) than 4th-grade students (19.1%) (*P* < 0.001). (4) Association between addiction status and family income, showing no statistically significant relationship (*P* = 0.987). (5) Association between addiction status and fathers' educational level, with no significant association observed (*P* = 0.971). (6) Association between addiction status and mothers' educational

level, which was also not statistically significant (*P* = 0.421). (7) Overall prevalence of smartphone/internet addiction according to the SAS-SV, showing that 340 participants (71.4%) were classified as non-addicted, whereas 136 participants (28.6%) met the criteria for addiction.

P values were calculated using the Chi-square test for categorical variables and the independent-samples *t*-test for age. Statistical significance was defined as $P < 0.05$.

A significant association was observed between sex and smartphone addiction (P < 0.001). Among female participants, 35 of 199 (17.6%) were classified as addicted, compared with 101 of 277 (36.5%) of male participants, indicating a substantially higher prevalence of smartphone addiction among males.

Similarly, grade level was significantly associated with smartphone addiction (P < 0.001). Students in the 5th grade had a higher prevalence of smartphone addiction than those in the 4th grade (35.7% vs. 19.1%, respectively).

No significant association was found between family income and smartphone addiction (P = 0.987). The prevalence of addiction was comparable across income categories, ranging from 27.3% among students with low family income to 28.8% and 28.4% among those with moderate and good family income, respectively.

Likewise, neither father's educational level (P = 0.971) nor mother's educational level (P = 0.421) showed a statistically significant association with smartphone addiction. The prevalence of addiction remained relatively similar across all parental education categories.

Figure 11 presented the association between internet use, sleep-related characteristics, and smartphone addiction status according to the Smartphone Addiction Scale–Short Version (SAS-SV).

The frequency of weekly internet use was not significantly associated with smartphone addiction (P = 0.568). Although addiction was reported by 42.9% of participants who used the internet once weekly, this subgroup was very small. Among daily internet users, 28.5% were classified as addicted. In contrast, the average daily duration of internet use showed a significant association with smartphone addiction (P < 0.001). The prevalence of addiction increased progressively with longer internet use, rising from 19.7% among participants using the internet for 1–2 hours/day, to 23.1% for 3–4 hours/day, 29.2% for 5–6 hours/day, and reaching 43.4% among those using the internet for 7 hours or more/day.

No significant association was observed between the time limit for electronic device use before sleep and smartphone addiction (P = 0.131). However, none of the participants who reported not using electronic devices before bedtime were classified as addicted. Several sleep-related variables demonstrated significant associations with smartphone addiction. Participants who usually felt sleepy during lessons had a markedly higher prevalence of addiction (49.0%) compared with those who never experienced sleepiness during lessons (9.3%; P < 0.001). Similarly, the prevalence of smartphone addiction increased with the frequency of difficulty falling asleep at night (P < 0.001), ranging from 16.1% among those who never experienced difficulty to 46.7% among those who usually had trouble initiating sleep.

A significant association was also found between smartphone addiction and daytime sleepiness or fatigue (P = 0.013). The prevalence of addiction increased from 22.0–23.0% among participants who never or rarely felt sleepy during the day to 36.6% among those who usually experienced daytime sleepiness. The use of sleep medication was not significantly associated with smartphone addiction (P = 0.079), although higher proportions of addiction were observed among participants who usually or rarely required medication to fall asleep. Participants who usually had difficulty waking up in the morning were significantly more likely to be classified as addicted (38.7%) compared with those who rarely (18.9%) or never (25.0%) experienced this problem (P = 0.005).

The frequency of nightmares was also significantly associated with smartphone addiction (P = 0.004). The prevalence of addiction increased from 24.8% among participants who never experienced nightmares to 42.6% among those who usually had bad dreams. Likewise, sleep latency demonstrated a significant relationship with smartphone addiction (P = 0.002). Participants requiring more than 60 minutes to fall asleep had the highest prevalence of addiction (41.0%), compared with 23.3%among those falling asleep within 15 minutes. Finally, the frequency of nocturnal awakenings was significantly associated with smartphone addiction (P = 0.007). Addiction prevalence increased with the number of nighttime awakenings, from 23.3% among participants who never woke during the night to 47.4% among those waking five or more times per night.

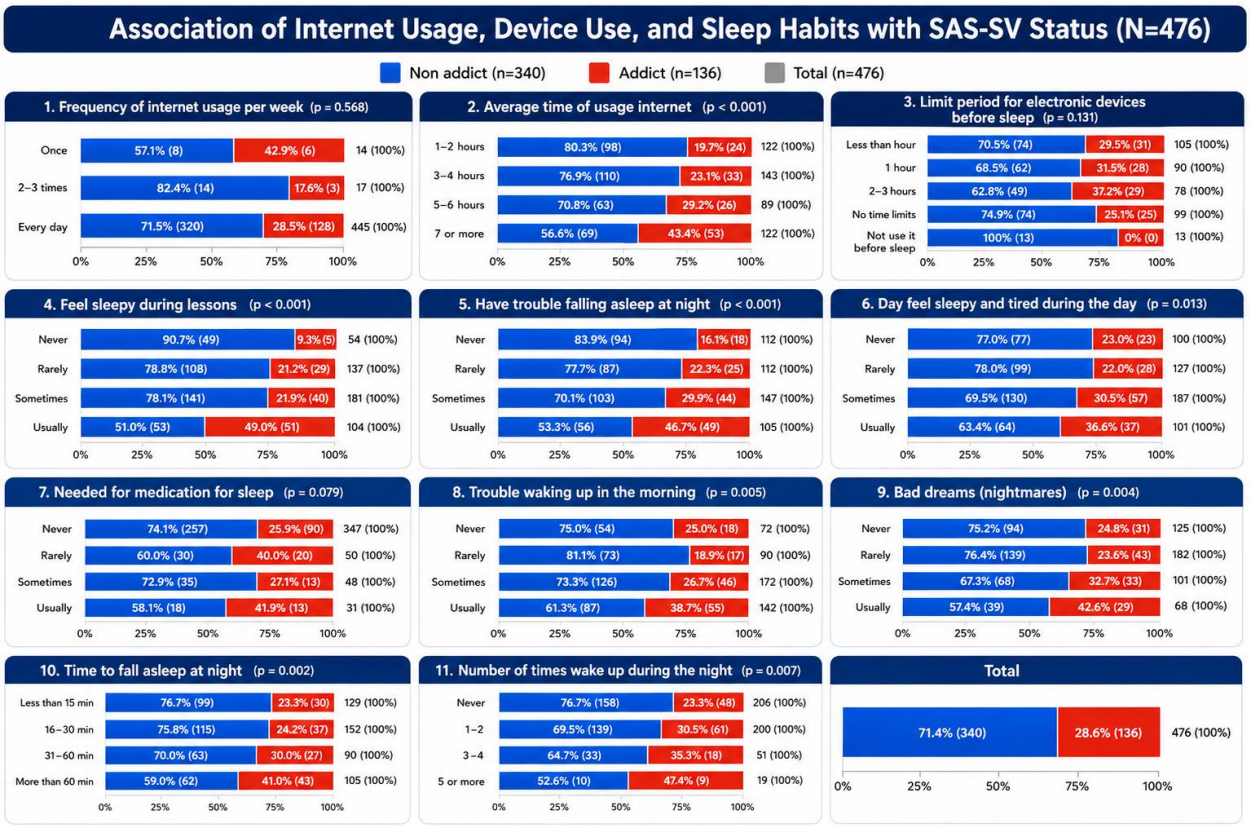


Figure 11: Association between internet use patterns, electronic device use, sleep-related behaviors, and Smartphone Addiction Scale–Short Version (SAS-SV) status among the study participants. 1. Frequency of internet use per week, showing no significant association with addiction status (*P* = 0.568). 2. Average daily internet use, demonstrating a significant increase in addiction prevalence with longer daily usage duration (*P* < 0.001). 3. Time limits for electronic device use before sleep, showing no significant association with addiction status (*P* = 0.131). 4. **Frequency of feeling sleepy during lessons, significantly associated with addiction status (*P* < 0.001).** 5. **Difficulty falling asleep at night, significantly associated with addiction status (*P* < 0.001).** 6. **Frequency of daytime sleepiness and fatigue, showing a significant association with addiction status (*P* = 0.013).** 7. **Requirement for medication to initiate sleep, demonstrating no statistically significant association with addiction status (*P* = 0.079).** 8. **Difficulty waking up in the morning, significantly associated with addiction status (*P* = 0.005).** 9. **Frequency of nightmares (bad dreams), significantly associated with addiction status (*P* = 0.004).** 10. **Time required to fall asleep at night, showing a significant association with addiction status (*P* = 0.002).** 11. **Number of nocturnal awakenings during the night, significantly associated with addiction status (*P*= 0.007).** 12. **Overall prevalence of SAS-SV classification, with 340 participants (71.4%) classified as non-addicted and 136 (28.6%) classified as addicted.**

Figure 12 presents the association between after-school sleep habits, nighttime coffee consumption, sleep quality, and smartphone addiction status as assessed by the Smartphone Addiction Scale–Short Version (SAS-SV).

The frequency of sleeping after coming home from school was not significantly associated with smartphone addiction (P = 0.052), although the prevalence of addiction tended to increase with more frequent daytime sleeping. Smartphone addiction was reported by 20.8% of participants who never slept after school, compared with 34.4% of those who always slept after returning home. In contrast, nighttime coffee consumption was significantly associated with smartphone addiction (P < 0.001). The prevalence of addiction increased progressively with the frequency of coffee consumption at night, rising from 24.5%among participants who never drank coffee at night and 23.6% among those who rarely consumed it, to 29.5% among those who sometimes consumed coffee, 41.9% among those who usually consumed coffee, and 65.2% among participants who always drank coffee at night. A highly significant association was also observed between self-rated sleep quality and smartphone addiction (P < 0.001). Participants reporting very good or good sleep quality had relatively low addiction rates (18.3% and 16.1%, respectively). However, the prevalence of smartphone addiction increased substantially among those reporting moderate (35.2%), bad (49.0%), and very bad (55.5%) sleep quality.

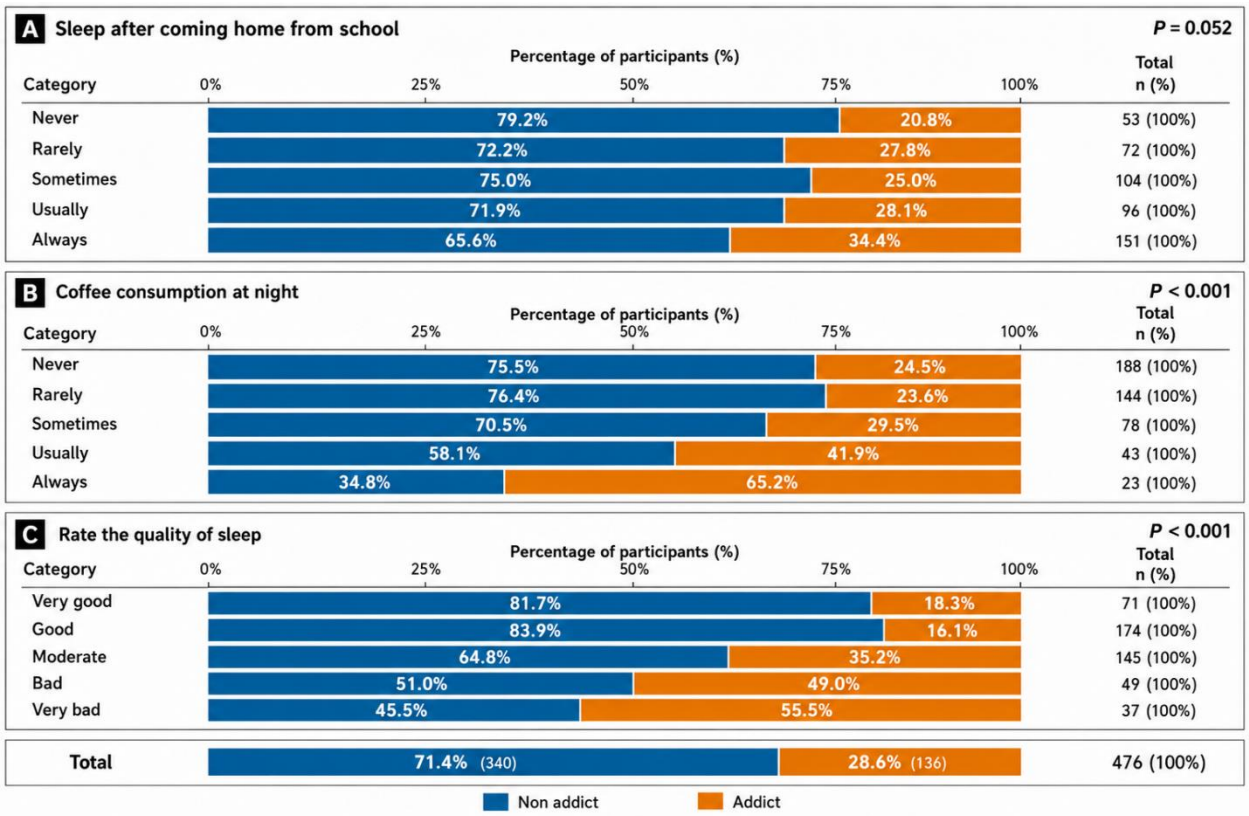


Figure 12: **Association between Smartphone Addiction Scale–Short Version (SAS-SV) classification and selected sleep-related behaviors.** (A) **Relationship between smartphone addiction status and the frequency of sleeping after returning home from school. No statistically significant association was observed (*P* = 0.052).** (B) **Relationship between smartphone addiction status and nighttime coffee consumption. The prevalence of smartphone addiction increased with more frequent coffee consumption at night, demonstrating a statistically significant association (*P* < 0.001).** (C) **Relationship between smartphone addiction status and self-reported sleep quality. Participants reporting poor or very poor sleep quality exhibited a higher prevalence of smartphone addiction than those reporting good or very good sleep quality (*P* < 0.001). Overall, 340 participants (71.4%) were classified as non-addicted and 136 (28.6%) met the criteria for smartphone addiction according to the SAS-SV.**

P values were calculated using the Chi-square test. Statistical significance was defined as $P < 0.05$.

DISCUSSION

The results of this survey, which involved 476 preparatory school students, there were (277) boys and (199) girls in Karbala, Iraq, indicated that there were slightly more men than females (58.2% vs. 41.8%). The reason for this is that the administration of one of the selected girls' preparatory schools declined to take part in the study. The sex disparity was further exacerbated by a few female students who chose not to participate in the recruitment process. Sex disparity was observed in earlier studies, in meta- analysis study, male sex were preforming 43.35% of all participants[13], however, one Iraqi study carried in Mosul city 54.8% of participants were female.[14]

The most used application was Instagram (68.9%) followed by Tick Tock (55%), WhatsApp (23%), and Facebook (20%), reflecting the dynamic nature of social media, where platforms rise and fall in popularity among young users, following the likes of Facebook and others, the most frequently used device was Smart phone in majority of participant (91.0%), more than half of participant uses internet for browsing and study. In earlier study carried out in Erbil demonstrated that 96% uses smart phones to access internet, and 49% uses Facebook. While in another study, in India a combination of reasons (entertainment, education and other cause) were the reason to uses internet in 83.3%.[14]

The majority of participants used these applications daily for an average of three to four hours, with nearly one-third (30%) and almost forty percent (40.1%) having no restriction on how much time they spent on the internet before bed). 93.5% were using internet every day. According to the Lam survey, 37.9% of respondents spend more than three hours on the internet each day, and 69.8% of respondents use it daily, indicating that internet usage is on the rise without restrictions.[15]

addiction assessment using smart-phone addiction scale-short version (SAS-SV) showed that 28.58% were addict (95%CI: 24.4-32.6). the proportion of participant with

addiction was lower than the percentage observed in a study carried out in Kurdistan-Iraq on 2019 (36.5%)[16], in university of Karbala-IRAQ (68.7%)[17] 69.9% in Babylon.[18] Lower prevalence of internet addiction was reported by Shen Y et al. Study[19] (7.7%), that included 8,098 college students. The study uses Revised Chinese Internet Addiction Scale. The prevalence of internet addiction differed significantly across nations. Internet addiction was found to be 6.0% worldwide, according to a meta-analysis that included 80 reports with 89,281 participants from 31 countries in seven regions. Northern and Western Europe had the lowest prevalence (2.6%), whereas the Middle East had the highest prevalence (10.9%).[21] According to a different meta-analysis, 11.3% of Chinese college students had an overall prevalence of internet addiction[21] in a recent meta-analysis study that included 2,123,762 people from 64 different nations. The global pooled prevalence estimates for smartphone addiction were 26.99% (95% CI, 22.73–31.73), social media addiction was 17.42% (95% CI, 12.42–23.89), Internet addiction was 14.22% (95% CI, 12.90–15.65), cybersex addiction was 8.23% (95% CI, 5.75–11.66), and game addiction was 6.04% (95% CI, 4.80–7.57). Low- and lower-middle-income nations and the Eastern Mediterranean region had higher rates of digital addiction.[22] Diverse socioeconomic and cultural backgrounds, as well as different questionnaires and cutoff scores, may be the cause of the varying prevalence rates in various research.

Research indicates that inappropriate internet use is strongly linked to mood swings, depression, poor sleep, and negative health outcomes like obesity and low self-esteem. Students who use the internet extensively are more likely to have sleep issues.[23] Assessing sleep quality revealed that moderate sleep quality was found in (30.5%), (10.3%) had bad sleep and (7.8%) had very bad sleep quality, more than one third of participant had good sleep (36.5%). Current finding was lower than the proportion of poor sleep in a studies carried in Baghdad (29.4%)[24] and Bangladesh (48.5%).[25] According to Afandi et al[26], 67.2% of university students in the United Arab Emirates (UAE) had poor sleep quality. Although the causes of these contradictory results are unknown, they may be related to the kinds of students (medical specialties, schoolchildren, etc.) or the variations in the general ease of access to the internet among nations.

In contrast to earlier reports that addiction was more observed in young age group individuals[27], addict individuals in current study were older than non -addict (17.26 ±1.20 vs. 16.80±1.13, p <0.001). These differences may be due to sociocultural causes. Gaining more autonomy, leisure time, and social activities that are less regulated by parents occurs around the end of adolescence in Iraqi society rather than earlier as in other nations. In comparing addiction in both sexes, addict males were 36.5% in comparison to 17.6% of addict females. Those finding were in line with earlier studies, Male students are more likely to play online games and spend more time online, which may account for the male prevalence of IAD.[21]

Using a sample of 2059 Chinese teenagers, Chi et al.[28] Discovered that boys scored noticeably higher than girls on problematic internet usage severity. PIU severity was higher in men, according to Kannan et al.[29] study of gender differences among 201 Indian medical students using physical and mental health measures. Similarly, in a variety of samples, including Bengali (Hassan T)[30], Vietnamese[31], British[32], men/boys outscored women/girls on problematic internet usage severity. As academic years progressed, the prevalence of IAD rose, which is consistent with the results of some[21] but not all research.[17] other factors such as family income ,father education level and mother education level were not significantly correlated, This contradicts previous findings in Iran, The impact of moms' literacy on their behavior related to Internet addiction In other words, children of moms with greater levels of education were more likely to be addicted to the Internet than children of mothers with lower levels of education.[33]

Internet addiction was commonly documented in previous studies among people whose mothers were university or higher level graduates, whose fathers were authoritarians, and whose mothers had jobs.[27] Sleep quality is of great importance, as it affects the sensitive, developmental stage of adolescence in various ways. Literature has shown that the effect may be physiological or psychological, and can lead to obesity and anxiety. Apart from these health-related risks, bad sleep quality has been related to low academic performance and substance use.[34]

In the Current study, internet addiction was frequently observed in those who spend more than 7 hours on internet, those who usually feel sleepy during the lessons, had trouble in sleeping at night, feeling sleepy during the day, had trouble in waking up at morning and had night mares. Additionally, those who needed >60 min. To fall asleep, frequently wake at night, and always consume coffee at nights.

It is interesting to observe that non-adaptive Internet users have trouble falling asleep; in all groups, sleep onset latency increased gradually as the degree of IA grew. Internet-dependent teenagers who had disruptions to their regular nightly sleep patterns also exhibited a markedly elevated level of daytime sleepiness, which deteriorated as their degree of IA increased. The higher rate of nighttime activity among Internet over users, nighttime sleep disorders like insomnia, and the presence of common pathogenic factors in IA and excessive daytime sleepiness, like personality traits, depression, and anxiety, are some potential explanations for this relationship.[35]

In earlier study, Students with IA scored considerably higher on subjective sleep quality (p<0.001), sleep latency (p<0.001), sleep disruptions (p<0.001), sleep duration (p<0.05), and sleep efficiency (p<0.001) than students without IA.[36] In meta- analysis study that assess effect of problematic gaming on sleep quality, a Significant overall effects were found in terms of sleep duration (g = -0.238, 95% CI = -0.364, -0.112), poor sleep quality (OR = 2.02, 95% CI = 1.47, 2.78), daytime sleepiness (OR=1.57,95%CI=1.00,2.46), and sleep problems (OR=2.60,95%CI=1.94,3.47).[37] In another meta-analysis, findings showed that people with internet addiction had a much higher odds of having sleep issues and a significantly shorter sleep duration.[38]

The relation with quality of sleep showed that 55.5% of those who had very bad sleep were addict in comparison to 18.3% of those who had very good sleep. In one study, carried out in turkey, 80.3% of internet addict had poor sleeping quality in compare to 19.7% who had good sleeping quality.[39] According to a previous study, the students who were addicted to the Internet had much worse sleep.[40]

A total of 400 students submitted the surveys, and the results indicated that those with Internet addiction had the highest percentage of poor sleep quality (60%) while those without addiction had the lowest percentage (27%). Furthermore, Internet addiction was significantly associated with subjective sleep quality (r = 0.189, p = 0.05), sleep latency (r = 0.129, p = 0.01), sleep duration (r = 0.119, p = 0.01), habitual sleep efficiency (r = 0.186, p = 0.05), sleep disturbances (r = 0.169, p = 0.05), use of sleeping medication (r = 0.203, p = 0.05), and daytime dysfunction (r = 0.188, p = 0.05).[41] It is yet unclear what processes underlie the association between IA and sleep problems. A two-sided, multivariate model of mutual influence is the most likely. IA can develop as a result of sleep abnormalities that reflect psychosocial issues, depression, and anxiety-phobic disorders. The emission of blue light from screens, which is known to inhibit the pineal gland's production of melatonin and so lengthen sleep latency, is another possibility.[42]

Limitation: There were certain restrictions on this investigation. First, self-administrated questionnaires were used to collect all of the data. It's possible that the recall factor contributed. We were only able to ascertain the association between individual variables not the precise cause and effect relationships because of the cross-sectional study's limitations. Therefore, to determine the precise association a follow-up study might be carried out.

CONCLUSION

The present study demonstrated that **Instagram was the most frequently used social media application among adolescents, with smartphones serving as the primary device for internet access**. Approximately **28.6% of participants met the criteria for smartphone addiction**, with a significantly higher prevalence among males than females (**36.5% vs. 17.6%**, $P < 0.001$). Most participants reported using the internet **daily**, with **3–4 hours of average daily use** being the most common duration, while longer daily internet use was significantly associated with smartphone addiction ($P < 0.001$). Smartphone addiction was also significantly associated with several indicators of poor sleep, including **feeling sleepy during lessons** ($P < 0.001$), **difficulty falling asleep at night** ($P < 0.001$), **daytime sleepiness and fatigue** ($P = 0.013$), **difficulty waking up in the morning** ($P = 0.005$), and **poor overall sleep quality** ($P < 0.001$). Notably, approximately **60% of students reported experiencing daytime sleepiness during lessons and difficulty waking in the morning**, while **55.5% of participants with very poor sleep quality were classified as smartphone addicted**. These findings highlight the close relationship between excessive smartphone use and impaired sleep patterns, emphasizing the need for targeted educational and behavioral interventions to promote healthier digital habits and improve sleep health among adolescents.

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