RESEARCH PAPER

Association of Smartphone Addiction with Blood Pressure and Sleep Quality in Young Adults: A Cross-Sectional Study

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ABSTRACT

Background: Smartphone addiction is increasingly prevalent among young adults and may adversely influence cardiovascular parameters and sleep quality.

Objectives: To assess the association of smartphone addiction with blood pressure, anthropometric parameters, and sleep quality among young adults.

Methods: This cross-sectional study included 400 young adults aged 18–25 years. Smartphone addiction was assessed using the Smartphone Addiction Scale–Short Version (SAS-SV), and sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI). Anthropometric parameters and blood pressure were measured following standardized and validated measurement procedures. Data were analysed using Mann–Whitney U test, Kruskal–Wallis test, and binary logistic regression.

Results: Smartphone addiction was observed in 48.3% of participants. Individuals with smartphone addiction had significantly higher body mass index, systolic blood pressure, and pulse pressure ($p < 0.001$). Poor sleep quality was significantly associated with systolic blood pressure, diastolic blood pressure, and mean arterial pressure. Logistic regression identified body mass index (OR = 3.803), systolic blood pressure (OR = 7.631), and pulse pressure (OR = 0.146) as independent predictors of smartphone addiction.

Conclusion: Smartphone addiction is significantly associated with adverse anthropometric parameters and elevated blood pressure among young adults. Poor sleep quality may further aggravate cardiovascular risk, highlighting the need for early lifestyle interventions.

Keywords: *Smartphone addiction; blood pressure; body mass index; sleep quality; young adults*
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INTRODUCTION

Smartphones have become indispensable tools in contemporary society, significantly reshaping communication, access to information, and social interaction. Despite their numerous benefits, excessive and uncontrolled smartphone use has raised increasing concerns regarding its potential adverse effects on physical and psychological health. Recent evidence highlights the growing influence of digital and social media technologies on behavioural patterns, particularly among younger populations [1].

Smartphone addiction, a form of behavioural addiction characterized by compulsive smartphone use, difficulty in limiting usage, and continued engagement despite negative consequences, has gained considerable attention in recent years. Studies from India and other countries have reported a high prevalence of smartphone addiction among adolescents and young adults, with documented associations with depression, anxiety, impaired cognitive performance, and reduced academic achievement [2–5]. These behavioural and psychological disturbances may indirectly affect physiological systems, particularly cardiovascular regulation.

Hypertension remains a major global public health concern and is increasingly being observed among younger age groups. Elevated blood pressure during early adulthood is clinically significant, as it predisposes individuals to long-term cardiovascular morbidity and mortality. Emerging research suggests that excessive smartphone use may contribute to elevated blood pressure

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through mechanisms such as increased psychological stress, reduced physical activity, and disrupted sleep patterns [6–8]. However, evidence examining the relationship between smartphone addiction and blood pressure parameters among young adults, especially in the Indian setting, remains limited.

Sleep quality plays a vital role in maintaining cardiovascular and metabolic homeostasis. Poor sleep quality has been associated with increased sympathetic nervous system activity, altered endocrine function, obesity, and elevated blood pressure [10–12]. Smartphone use during bedtime hours has been shown to interfere with sleep by delaying sleep onset and reducing sleep duration, thereby potentially increasing cardiovascular risk. Although previous studies have reported associations between smartphone addiction, poor sleep quality, and elevated blood pressure, limited research has concurrently evaluated these factors among young adults [7,8,10].

Therefore, the present study was undertaken to assess smartphone addiction among young adults and to examine its association with blood pressure, anthropometric parameters, and sleep quality. Understanding these relationships may facilitate early identification of cardiovascular risk factors and support the development of preventive strategies aimed at promoting healthier digital behaviour and improved cardiovascular well-being in this vulnerable population.

OBJECTIVES

The objectives of the present study were to determine the prevalence of smartphone addiction among young adults using the Smartphone Addiction Scale, to assess anthropometric and blood pressure parameters, to evaluate sleep quality using the Pittsburgh Sleep Quality Index, and to examine the association between smartphone addiction, blood pressure, and sleep quality among young adults.

MATERIALS AND METHODS

Study Design and Participants

A cross-sectional observational study was conducted among 400 professional students aged 18–25 years who had been using smartphones for more than one year. Institutional Ethics Committee approval was obtained, and written informed consent was taken from all participants prior to the study.

Inclusion and Exclusion Criteria

Adults aged 18–25 years of either gender were included in the study. Participants with a history of sleep disorders, psychological disorders, neurological disorders, or endocrine disorders were excluded.

Data Collection

Data were collected using a self-administered questionnaire consisting of three parts. The first part included demographic details such as age, gender, education, and smartphone usage characteristics, including duration of smartphone use, daily hours of use, applications used, and time spent on activities such as browsing, gaming, and use of social media applications.

Anthropometric Measurements

Anthropometric parameters including weight, height, waist circumference, and hip circumference were measured using standardized procedures. Body mass index was derived by dividing body weight (kg) by the square of height (m^2).

Blood Pressure Measurement

Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured using a digital sphygmomanometer after the participant had rested in a sitting position for at least 4–5 minutes. Blood pressure was recorded twice in both arms with a 10-minute interval between measurements, and the mean of the obtained readings was considered for analysis. Elevated blood pressure was defined as SBP 120–139 mmHg and/or DBP 70–89 mmHg, in accordance with the National Health Mission classification, which aligns with European Society of Cardiology recommendations [6,7].

Assessment of Smartphone Addiction

Smartphone addiction was assessed using the Smartphone Addiction Scale–Short Version (SAS-SV), a validated self-report instrument originally developed in South Korea and later adapted into English [3,4]. The scale consists of 10 items assessing daily-life disturbance, withdrawal, cyberspace-oriented relationships, overuse, and tolerance. Each item is rated on a six-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Gender-specific cut-off scores were applied, with scores >31 for males and >33 for females indicating smartphone addiction [3].

Assessment of Sleep Quality

Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI), a widely used instrument for assessing sleep quality over the preceding month [12]. The PSQI comprises 19 items generating seven component scores, which together yield a global score ranging from 0 to 21, with higher scores indicating poorer sleep quality. A global score ≤5 was considered indicative of good sleep quality, while scores >5 denoted poor sleep quality. The PSQI has demonstrated good internal consistency and reliability [12].

Statistical Analysis

Data were analysed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic, anthropometric, and clinical variables. The distribution of continuous variables was assessed using the Shapiro–Wilk test. As most variables did not follow a normal distribution, non-parametric statistical tests were applied. The Mann–Whitney U test was used to compare anthropometric and cardiovascular parameters between smartphone-addicted and non-addicted groups. Differences across sleep quality categories (good,

moderate poor, poor, and severe poor) were assessed using the Kruskal–Wallis test. Binary logistic regression analysis was performed to identify predictors of smartphone addiction, and results were expressed as odds ratios with 95% confidence intervals. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 400 young adults (mean age: 19.15 ± 1.04 years) participated in the study. Based on Smartphone Addiction Scale–Short Version scores, participants were categorized into smartphone addiction (n = 193) and non-addiction (n = 207) groups.

Baseline Characteristics

The demographic, anthropometric, and blood pressure characteristics of the participants according to smartphone addiction status are presented in Table 1. Age and height were comparable between the two groups. Participants with smartphone addiction had higher mean values of body weight, body mass index, hip circumference, systolic blood pressure, pulse pressure, and mean arterial pressure compared to the non-addicted group. A higher proportion of females was observed in both groups.

Comparison Between Addiction and Non-Addiction Groups

Comparison of anthropometric and cardiovascular parameters between smartphone-addicted and non-addicted participants using the Mann–Whitney U test is shown in Table 2. The addiction group demonstrated significantly higher values of weight ($p < 0.001$), body mass index ($p < 0.001$), hip circumference ($p = 0.049$), waist–hip ratio ($p = 0.004$), systolic blood pressure ($p < 0.001$), and pulse pressure ($p < 0.001$). No statistically significant differences were observed for height, waist circumference, diastolic blood pressure, or mean arterial pressure.

Sleep Quality and Physiological Parameters

The comparison of anthropometric and cardiovascular parameters across sleep quality categories (good, moderate poor, poor, and severe poor) using the Kruskal–Wallis test is presented in Table 3. Significant differences were observed for body mass index, systolic blood pressure, diastolic blood pressure, and mean arterial pressure ($p < 0.05$). Weight, height, hip circumference, and waist–hip ratio also differed significantly across sleep quality categories. Waist circumference and pulse pressure did not show statistically significant variation.

Predictors of Smartphone Addiction

Binary logistic regression analysis identifying predictors of smartphone addiction is summarized in Table 4. Body mass index (OR = 3.803; 95% CI: 1.963–7.368), systolic blood pressure (OR = 7.631; $p = 0.045$), and pulse pressure (OR = 0.146; $p = 0.001$) emerged as significant predictors. Height also showed a significant association with smartphone addiction. Waist circumference, waist–hip ratio, diastolic blood pressure, and mean arterial pressure were not statistically significant predictors.

Table 1: Baseline Characteristics and Clinical Parameters of Study Participants by Smartphone Addiction Status

Variable	Addiction (n = 193) Mean ± SD / n (%)	Non-Addiction (n = 207) Mean ± SD / n (%)	Overall Total (n = 400) Mean ± SD / n (%)
Demographics			
Age (years)	19.10 ± 1.12	19.18 ± 0.97	19.15 ± 1.04
Gender (Female/Male)	119 (61.7%) / 74 (38.3%)	119 (57.5%) / 88 (42.5%)	238 (59.5%) / 162 (40.5%)
Anthropometric Parameters			
Weight (kg)	65.95 ± 10.45	61.93 ± 13.59	63.87 ± 12.33
Height (cm)	165.32 ± 9.82	165.69 ± 10.49	165.51 ± 10.16
BMI (kg/m²)	24.18 ± 3.57	22.49 ± 3.92	23.30 ± 3.84
Waist Circumference (cm)	81.06 ± 11.08	80.30 ± 10.22	80.67 ± 10.64
Hip Circumference (cm)	95.01 ± 10.84	92.84 ± 9.76	93.89 ± 10.34
Waist-Hip Ratio	0.850 ± 0.056	0.864 ± 0.053	0.857 ± 0.055
Blood Pressure Parameters			
Systolic BP (mmHg)	119.12 ± 6.75	112.43 ± 9.25	115.66 ± 8.79
Diastolic BP (mmHg)	73.95 ± 9.74	72.85 ± 7.77	73.38 ± 8.78
Pulse Pressure (mmHg)	44.70 ± 10.63	39.58 ± 9.24	42.05 ± 10.25

MAP (mmHg)	74.59 ± 10.45	73.17 ± 7.77	73.85 ± 9.18

Table 2: Comparison of Anthropometric and Cardiovascular Parameters Between Smartphone Addiction and Non-Addiction Groups (Mann–Whitney U Test)

Variable	Mean Rank (Non-Addicted)	Mean Rank (Addicted)	U	Z	p-value
Weight (kg)	175.20	227.63	14,738.5	-4.538	0.000
Height (cm)	204.16	196.57	19,217.0	-0.657	0.511
BMI (kg/m²)	173.17	229.81	14,319.0	-4.896	0.000
Waist Circumference	196.76	204.51	19,202.0	-0.671	0.502
Hip Circumference	189.53	212.27	17,704.5	-1.973	0.049
Waist-Hip Ratio	216.56	183.27	16,650.5	-2.878	0.004
Systolic BP (mmHg)	153.35	251.08	10,214.5	-8.456	0.000
Diastolic BP (mmHg)	197.42	203.81	19,337.0	-0.553	0.580
Pulse Pressure (mmHg)	169.11	234.16	13,478.5	-5.627	0.000
MAP (mmHg)	197.07	204.18	19,265.5	-0.615	0.539

U Mann-Whitney U statistic

Z Standardized test statistic

P Probability (2- tailed) <0.05 indicates significant difference

Table 3: Comparison of Anthropometric and Cardiovascular Parameters Across Sleep Quality Categories (Kruskal–Wallis Test)

Variable	Mean Rank: Good	Moderate Poor	Poor	Severe Poor	H (df=3)	p-value
Weight (kg)	179.19	216.41	270.73	201.04	28.006	0.000
Height (cm)	195.48	179.41	220.04	237.54	9.254	0.026
BMI (kg/m²)	182.33	232.98	259.52	171.29	27.871	0.000
Waist Circumference	195.12	228.20	198.97	183.27	5.926	0.115
Hip Circumference	194.80	240.47	211.34	151.51	18.662	0.000
Waist–Hip Ratio	208.60	178.47	160.32	240.77	15.733	0.001
Systolic BP (mmHg)	169.23	237.59	280.35	204.21	48.827	0.000
Diastolic BP (mmHg)	181.78	221.28	211.85	244.62	15.761	0.001
Pulse Pressure (mmHg)	191.01	215.33	233.38	186.46	7.602	0.055
MAP (mmHg)	181.16	222.51	212.81	244.54	16.493	0.001

H: Kruskal–Wallis

Table 4: Binary Logistic Regression Predicting Smartphone Addiction from Anthropometric and Cardiovascular Parameters

Variable	B	S.E.	Wald	p-value	OR (Exp(B))	95% CI for OR
Weight	-0.389	0.117	11.151	0.001	0.677	0.539 – 0.851
Height	0.318	0.091	12.204	0.000	1.375	1.150 – 1.643
BMI	1.336	0.337	15.672	0.000	3.803	1.963 – 7.368
Waist Circumference	0.291	0.159	3.341	0.068	1.338	0.979 – 1.828
Hip Circumference	-0.291	0.135	4.662	0.031	0.748	0.574 – 0.974
Waist-Hip Ratio	-0.812	0.42	3.79	0.052	0.440	0.19 – 1.000
Systolic BP	2.032	1.013	4.024	0.045	7.631	0.340 – 17.130
Diastolic BP	-2.032	1.220	2.770	0.097	0.131	0.006 – 2.837
Pulse Pressure	-1.921	0.279	47.511	0.001	0.146	0.098 – 0.217

Mean Arterial Pressure	0.087	0.736	0.014	0.001	1.091	0.258 – 4.617

B: regression coefficient

S.E.: standard error

Wald statistic

Exp(B): Odds Ratio

DISCUSSION

The present study demonstrates a significant association between smartphone addiction and adverse anthropometric and cardiovascular parameters among young adults. Participants with smartphone addiction exhibited higher body mass index, systolic blood pressure, and pulse pressure, suggesting early physiological stress possibly related to prolonged screen exposure, sedentary behaviour, and associated lifestyle patterns. These findings support existing evidence indicating that excessive smartphone use may contribute to metabolic and cardiovascular risk through reduced physical activity and altered daily routines [8,9].

An important observation of the present study is the relationship between smartphone addiction and sleep quality. Poor sleep quality was significantly associated with higher body mass index and elevated blood pressure parameters. Sleep deprivation is known to increase sympathetic nervous system activity and disrupt hormonal regulation, leading to adverse cardiovascular effects [10]. These findings are consistent with reports by Zou et al. [6], who demonstrated an association between smartphone addiction, poor sleep quality, and adolescent hypertension. Similar observations of elevated systolic and diastolic blood pressure among individuals with problematic smartphone use have also been reported by Liu et al. [8].

Binary logistic regression analysis further identified body mass index and systolic blood pressure as significant predictors of smartphone addiction, highlighting the interrelationship between digital behaviour and cardiometabolic health. The inverse association observed between body weight and smartphone addiction is noteworthy and may reflect complex behavioural or socio-environmental factors influencing smartphone usage patterns. However, this finding requires cautious interpretation and warrants further investigation through longitudinal and behavioural studies to elucidate underlying mechanisms.

Overall, the findings of the present study are in agreement with previous research demonstrating associations between excessive smartphone use, poor sleep quality, and elevated blood pressure [8–11]. Earlier studies have also shown that smartphone addiction is associated with increased psychological stress, reduced physical activity, and unhealthy dietary behaviours, which collectively contribute to adverse metabolic outcomes. These observations underscore the growing public health concern surrounding smartphone addiction and its potential impact on cardiovascular health among young adults.

CONCLUSION

The present study demonstrates a significant association between smartphone addiction and elevated systolic blood pressure, higher body mass index, and increased pulse pressure among young adults, suggesting early cardiovascular and metabolic strain potentially linked to excessive smartphone use. Sleep quality was also found to be associated with variations in blood pressure and body mass index, highlighting the contributory role of poor sleep in adverse physiological outcomes. These findings emphasize the interconnected influence of digital behaviour, sleep patterns, and cardiometabolic risk in young adults.

LIMITATIONS

The cross-sectional nature of the study precludes conclusions regarding causality. Smartphone usage and sleep quality were assessed using self-reported questionnaires, which may be subject to recall or social desirability bias. Potential confounding factors such as psychological stress, caffeine intake, and physical activity levels were not evaluated. Additionally, the study population was restricted to a specific age group and geographical location, which may limit the generalizability of the findings.

IMPLICATIONS AND RECOMMENDATIONS

The findings underscore the need for increased awareness regarding excessive smartphone use and its potential health consequences among young adults. Regular monitoring of blood pressure and body mass index in frequent smartphone users may aid in early identification of cardiometabolic risk. Health education initiatives promoting digital well-being, sleep hygiene, and physical activity should be encouraged in academic institutions. Future research employing objective measures of sleep and physical activity, as well as longitudinal and interventional study designs, is warranted to further elucidate causal mechanisms and assess the effectiveness of preventive strategies.

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