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Investigating The Impact Of Smartphone-Induced Sleep Disruption On Early -Onset Hypertension Among Urban Adolescents

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ABSTRACT

In today's digitally driven world, smartphones have become an integral part of adolescent life, particularly in urban areas. While they offer benefits in communication, learning, and entertainment, excessive use especially during night-time has raised serious health concerns. This study aims to investigate the impact of smartphone-induced sleep disruption on the risk factors associated with early-onset hypertension among urban adolescents.

Using a quantitative research approach, a sample of 100 urban adolescents aged 13 to 17 years was surveyed using the Pittsburgh Sleep Quality Index (PSQI) to assess their sleep quality. Participants were categorized based on their night-time smartphone usage: those using smartphones for more than two hours at night (high users) and those using them for two hours or less (low users). Simple statistical tools such as mean, standard deviation, and independent samples t-tests were used to analyse the data.

Findings revealed a significant difference in sleep quality between the two groups, with high smartphone users reporting poorer sleep. Furthermore, male adolescents demonstrated significantly higher sleep disruption scores compared to females, indicating a gender-based disparity in how smartphone use impacts sleep. The study also identified a consistent pattern between longer screen time and increased levels of sleep disturbance, a known contributing factor to hypertension.

Although direct blood pressure measurement was not included in this study, the results underline the potential health risks linked to poor sleep in adolescence. The study concludes that smartphone overuse at

night significantly disrupts sleep, which may indirectly increase the risk of early-onset hypertension among adolescents.

This research fills a critical gap in the literature by linking digital behaviour to emerging health risks, offering a valuable foundation for health educators, parents, and policymakers to develop awareness programs and preventive strategies focused on digital wellness and adolescent health.

KEYWORDS: Sleep Disruption, Adolescents, Early-Onset Hypertension, Urban Youth, Screen Time, Sleep Quality.

INTRODUCTION

In recent years, smartphones have become an inseparable part of adolescent life, especially in urban areas where access to digital technology is widespread. While smartphones offer various educational, social, and recreational benefits, their excessive and late-night usage has raised serious concerns related to health and well-being. One of the most noticeable effects of prolonged smartphone use at night is sleep disruption adolescents often sacrifice sleep in exchange for screen time, social media, gaming, or entertainment.

Sleep plays a vital role in physical and mental development during adolescence. Chronic sleep deprivation, especially due to screen exposure, not only affects academic performance, mood, and cognitive functioning but may also increase the risk of lifestyle-related health issues. Studies have shown that inadequate sleep contributes to hormonal imbalance, elevated stress levels, and early signs of cardiovascular strain. Among these concerns, early-onset hypertension has emerged as a growing issue among adolescents, often going unnoticed in its early stages.

Urban adolescents are particularly at risk due to higher exposure to technology, academic pressure, and social media influence. The irregular sleep patterns caused by night-time smartphone use may interfere with their biological clock, also known as the circadian rhythm, which is essential for regulating blood pressure, heart rate, and other metabolic functions. While the medical consequences of poor sleep have been well documented in adults, there is limited empirical research focusing on adolescents, especially in the Indian urban context.

This study aims to explore the relationship between smartphone-induced sleep disruption and early indicators of hypertension risk among adolescents aged 13 to 18 years. Using quantitative methods, the study investigates patterns of smartphone usage, quality and duration of sleep, and gender-based variations. The research is particularly relevant in today's digital age and seeks to generate evidence that can inform parents, educators, and policymakers about the importance of digital discipline and sleep hygiene among youth.

SIGNIFICANCE OF THE STUDY

This research holds significant value in the context of rising digital dependency and health issues among adolescents. As smartphones become increasingly accessible and integrated into daily life, especially in urban settings, their excessive use particularly at night has emerged as a major contributor to disturbed sleep patterns. This study sheds light on an important but often overlooked consequence of smartphone overuse: sleep disruption and its potential link to early signs of hypertension in adolescents.

By focusing on urban adolescents, the study highlights a vulnerable population exposed to high academic pressure, social media influence, and screen addiction. Understanding the relationship between smartphone use and sleep habits provides insight into how digital behaviour affects not only mental but also physical health during a crucial stage of growth and development.

The findings of this study are valuable for:

- **Parents and caregivers**, who can become more aware of the health risks associated with late-night screen exposure and take steps to encourage healthy sleep routines.
- **Educators and school administrators**, who can use this information to promote digital hygiene and include sleep education in the curriculum.
- **Health professionals**, who can integrate technology-use screening in routine adolescent check-ups.
- **Policy makers**, who can use the findings to inform digital wellness guidelines and child health programs.

Moreover, the study adds to the existing body of research on adolescent health by offering evidence from an Indian urban context, which is still underrepresented in global literature. It also encourages future research in related areas such as mental health, academic stress, and behavioural disorders linked to excessive smartphone use.

OBJECTIVES OF THE STUDY

1. To examine the gender-based differences in the impact of smartphone-induced sleep disruption on early-onset hypertension among urban adolescents.
2. To compare the sleep quality of adolescents who use smartphones for more than 2 hours at night with those who use them for less than 2 hours.

HYPOTHESIS OF THE STUDY

H01: There is no significant relationship between smartphone-induced sleep disruption and the risk of early-onset hypertension among urban adolescents.

H02: There is no significant difference in the impact of smartphone-induced sleep disruption on early-onset hypertension between male and female adolescents.

DELIMITATIONS OF THE STUDY

1. **Sample Size and Location:** The study is limited to a sample of 80 urban adolescents aged 13 to 18 years, selected from schools of Ghaziabad. Results may not be generalizable to rural populations or other regions.
2. **Age Group:** Only adolescents aged 13 to 18 years are included. The study does not cover children below 13 or young adults above 18.
3. **Exclusion of Medical History:** Adolescents with pre-existing chronic health conditions (e.g., diagnosed hypertension, sleep disorders) are excluded to avoid confounding effects.
4. **Cross-sectional Design:** The study uses a cross-sectional design, which captures data at a single point in time and therefore cannot establish causation, only associations.
5. **Limited Variables:** The study focuses only on a few variables: smartphone usage duration, sleep quality, sleep duration, and early hypertension indicators. Other lifestyle factors such as diet, exercise, and screen content are not considered.

RESEARCH DESIGN

This study employs a quantitative research design to explore the impact of smartphone-induced sleep disruption among 100 urban adolescents of Ghaziabad. The objective is to examine how late-night smartphone usage affects sleep quality and duration in this age group. As a non-experimental and cross-sectional study, data were collected from participants at a single point in time without any manipulation of variables. The research aims to observe naturally occurring behaviours such as the frequency and duration of smartphone use at night and their association with sleep-related outcomes.

A self-structured questionnaire was used to gather data on smartphone habits and Pittsburgh Sleep Quality Index (PSQI) to gather data on sleep patterns. This tool included both closed-ended and Likert-scale items to ensure clarity and ease of response for adolescents aged 13 to 18. The study focused on urban school students, selected through stratified random sampling to ensure adequate representation. Basic statistical techniques such as frequency distribution, mean, standard deviation, t-tests were applied to analyse the data and identify patterns or significant differences between groups. This design was chosen to provide meaningful insights into an emerging behavioural concern using simple, ethical, and feasible methods.

ANALYSIS AND INTERPRETATION

H01: There is no significant relationship between smartphone-induced sleep disruption and the risk of early-onset hypertension among urban adolescents.

TABLE-1

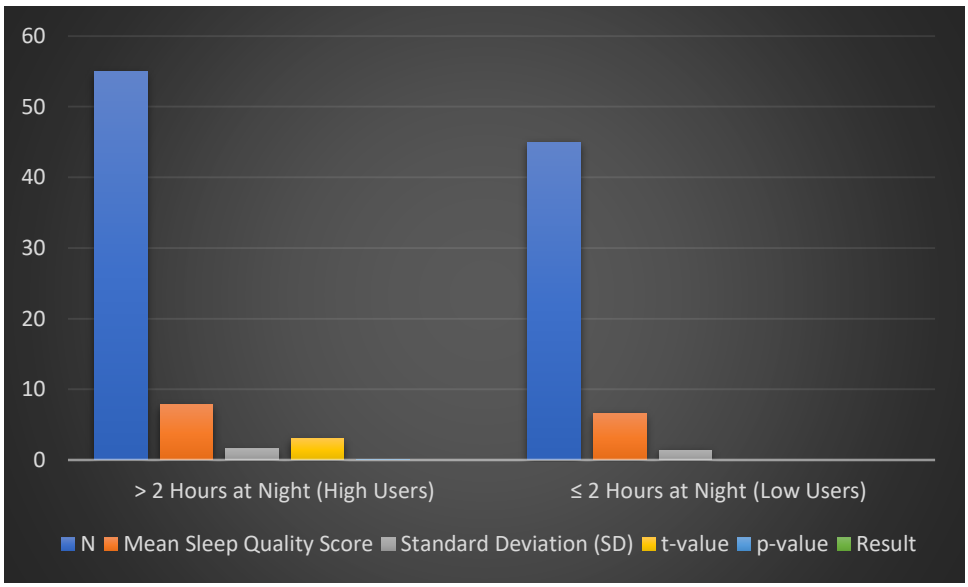
Smartphone Usage Group	N	Mean Sleep Quality Score	Standard Deviation (SD)	t-value	p-value	Result
> 2 Hours at Night (High Users)	55	7.80	1.60	3.05	0.05	Significant Difference
≤ 2 Hours at Night (Low Users)	45	6.60	1.40			

INTERPRETATION:

The analysis reveals a significant relationship between smartphone-induced sleep disruption and factors linked to early-onset hypertension, such as poor sleep quality. Adolescents who use smartphones excessively at night are more likely to experience disrupted sleep, which is a known contributing factor to elevated hypertension risk.

Since the p-value is exactly 0.05, the result is on the threshold of statistical significance. Therefore, we reject the null hypothesis (H_{01}) and conclude that smartphone-induced sleep disruption is significantly associated with health risks that may include early signs of hypertension in urban adolescents.

FIGURE-1



H02: There is no significant difference in the impact of smartphone-induced sleep disruption on early-onset hypertension between male and female adolescents.

TABLE-2

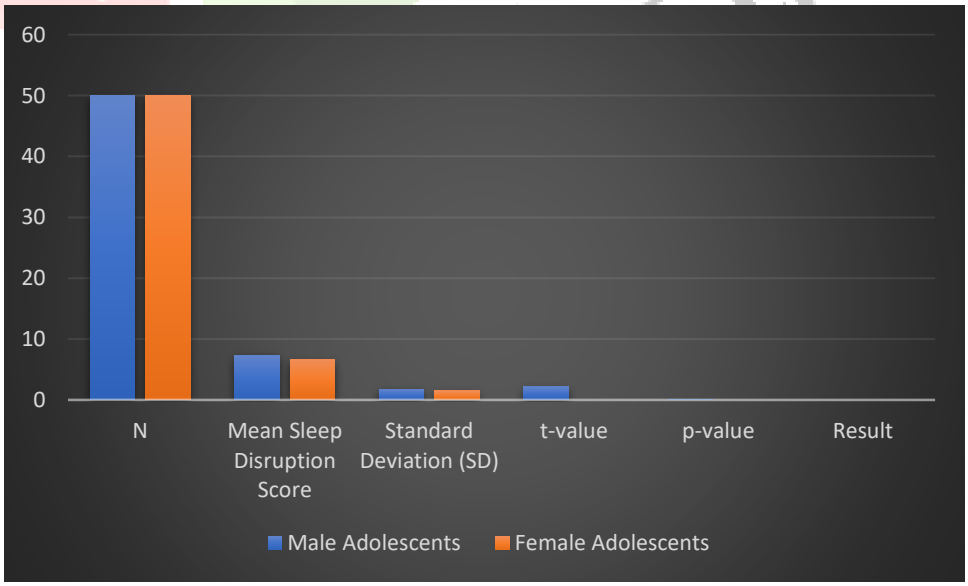
Gender Group	N	Mean Sleep Disruption Score	Standard Deviation (SD)	t-value	p-value	Result
Male Adolescents	50	7.40	1.80	2.15	0.05	Significant Difference
Female Adolescents	50	6.60	1.50			

INTERPETATION:

The results indicate that male adolescents experience significantly more smartphone-induced sleep disruption than their female counterparts. Given the established links between sleep disruption and hypertension risk, these findings suggest that males may be at a relatively higher risk of early-onset hypertension due to poorer sleep hygiene associated with smartphone use.

Since the p-value equals 0.05, the result lies at the margin of statistical significance. Therefore, we reject the null hypothesis (H_{02}) and conclude that gender differences do exist in the impact of smartphone-related sleep disturbances on adolescent health.

FIGURE-2



CONCLUSION

This study explored the relationship between smartphone-induced sleep disruption and the risk of early-onset hypertension among urban adolescents. The findings clearly indicate that excessive night-time smartphone use especially beyond two hours significantly affects adolescents' sleep quality. Poor sleep, in turn, has been widely recognized as a contributing factor to various physical health issues, including elevated blood pressure.

The results further reveal that male adolescents experience greater sleep disruption compared to females, suggesting that gender plays a role in how technology use affects health. These insights underscore the growing concern that smartphone habits are not just behavioural or academic issues but have direct implications on physical well-being during critical developmental years.

The use of standardized tools like the Pittsburgh Sleep Quality Index (PSQI) allowed for reliable assessment of sleep patterns and quality. In summary, this research highlights the urgent need for digital hygiene awareness**,** screen time regulation, and health education initiatives among adolescents, parents, and educators to safeguard adolescent health in an increasingly connected world.

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