Examine Sleep Deprivation among Adolescents: Evidence from a Selected Chinese High School in Johor, Malaysia

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DOI: https://doi.org/10.51244/IJRSI.2025.120800383

Received: 02 September 2025; Accepted: 09 September 2025; Published: 16 October 2025

ABSTRACT

Sleep is a fundamental biological need essential for health and well-being. Adolescents are especially vulnerable to the effects of sleep deprivation due to rapid developmental changes and increasing academic demands. This study aims to examine sleep deprivation problems among adolescents in a selected Chinese high school in Johor, Malaysia. The study employs a quantitative approach using the Pittsburgh Sleep Quality Index (PSQI). data were collected from 254 students aged 13 to 17. The findings revealed that 65.7% of the students were affected by sleep deprivation as measured by a Pittsburgh Sleep Quality Index (PSQI) global score >5. Key contributing factors include academic workload, screen time, irregular sleep patterns, and psychological stress. The study underscores the importance of school-based and family-level interventions to promote healthy sleep behaviours among adolescents.

Keywords: Sleep deprivation, adolescents, academic stress and secondary school

INTRODUCTION

Sleep is a fundamental human physiological need and a basic requirement for physical and cognitive functioning. According to Bruce, J., Lunt, L., & McDonagh, J. (2017), scientific studies have demonstrated that sleep plays a crucial role in promoting growth, re-energising the body's cells, supporting healthy brain function, and facilitating cognitive development. According to them, inadequate sleep can have negative effects on bodily functions such as increasing blood pressure or the risk of heart disease. Furthermore, it reported that inadequate sleep can cause mental impairments such as emotional and mental handicaps, and cognitive functions such as poor concentration and memory.

Furthermore, sleep is also vital for the body to recover from strains during waking hours. During sleep, the body undergoes non-rapid eye movement sleep stages, which are characterised by a slowing of heart rate, a drop in blood pressure, and stabilized breathing. Sufficient sleep is essential for maintaining health and well-being, particularly for adolescents and young adults in a critical phase of growth and development. Their busy school and life schedules increase the demand for adequate rest, as emphasized by Short et al. (2018).

Problem Statement

Today, poor sleep health has become a common problem for many adolescents and has received attention from researcher and public health professionals. Recognizing its critical role, the Healthy People 2020 (HP2020) initiative incorporated "Sleep Health" as a thematic priority to promote awareness of the importance of adequate sleep. Good quality sleep is now widely acknowledged to be as vital as nutrition and physical activity in maintaining normal physical and mental functioning, including endocrine, metabolic, and neurological processes (People, 2022).

Extensive research shows that sleep deprivation is prevalent across all age groups and occurs on a global scale. Chronic insufficient sleep has been consistently associated with a wide range of negative health outcomes and psychological distress (Kreager, D. A., Fagan, A. A., & O'Connell, D., 2019). The rapid digitalization of society has further exacerbated the problem, making sleep deprivation among adolescents and young adults a growing

concern worldwide over the past two decades. Numerous studies have documented the seriousness of this issue. For example, a study by the Centers for Disease Control and Prevention in the United States, based on data collected between 2007 and 2013 highlighted the pervasive issue of insufficient sleep among American high school students (Basch, C. E., 2014). In England, a 2014 report found that 30% of 15-year-old boys and 49% of girls experienced sleep difficulties, and 36% reported that sleep deprivation adversely affected their ability to concentrate on schoolwork (Brooks, F., 2015).

In Canada, national statistics indicated that millions of adolescents experienced sleep deprivation, which contributed to reduced focus, academic stress, and excessive daytime sleepiness (McCue, 2019). A large-scale study in Japan, analyzing 545,285 adolescents across six waves of data collection between 2004 and 2017, revealed an increasing trend toward later sleep onset, shorter sleep durations, and deteriorating mental health among adolescents (Otsuka et al., 2021). In Hong Kong, research identified a progressive increase in the prevalence of insomnia symptoms among adolescents, which were significantly associated with behavioral problems, poor mental health, and compromised physical health (Zhang et al., 2016).

In Australia, the Sleep Health Foundation, commissioned by VicHealth in 2017, conducted a rapid review on sleep patterns and their effects on mental well-being. Findings revealed that adolescents in Victoria and South Australia were averaging between 6.5 and 7.5 hours of sleep per school night. It far below the recommended duration. Moreover, Australian adolescents were found to be losing sleep at a rate of approximately 12 minutes per year (Kate Bartel, 2018). There is the consensus recommendation that adolescents require between 8 and 10 hours of sleep per night, these figures underscore a growing and concerning trend.

On the other hand, in Malaysia, a 2018 National Sleep Survey by Am Life International Sdn Bhd reported that Malaysians, including adolescents, averaged 6.3 hours of sleep per night, it below the 8–10 hours recommended for adolescents (Jaafar, 2018; Short et al., 2018). This aligns with findings from Malaysian adolescent-specific studies indicating prevalent sleep issues (Jalil et al., 2021).

In Malaysia's Chinese secondary schools, adolescents face a higher risk of sleep deprivation due to intense academic pressures from rigorous curricula and preparation for examinations like the Unified Examination Certificate (UEC) and Sijil Pelajaran Malaysia (SPM) (Tan & Cheong, 2019). These students are subjected to rigorous curricula, extended school hours, numerous tuition sessions, and participation in co-curricular activities. In addition, stringent entrance examinations are required for admission, and students are expected to excel in national and international accreditation examinations, such as the UEC and Sijil Pelajaran Malaysia (SPM). The cumulative demands of academic performance and heavy coursework, combined with preparation for high-stakes examinations, significantly contribute to sleep deprivation among the students.

Given the substantial body of global and local evidence pointing to the growing problem of adolescent sleep deprivation, and considering the unique academic pressures faced by students in Chinese high schools in Malaysia, there is an urgent need for targeted investigation. Therefore, this study seeks to explore the prevalence of sleep deprivation among adolescents in a selected Chinese high school in Johor, Malaysia.

LITERATURE REVIEW

Sleep deprivation among adolescents has become a growing concern globally, with numerous studies highlighting its negative effects on physical, mental, and cognitive health. Adequate sleep is essential for adolescents as it plays a crucial role in promoting growth, consolidating memories, and supporting emotional and physical health (Suni, 2021). However, many adolescents around the world, including in Malaysia, are not achieving the recommended 8 to 10 hours of sleep per night, resulting in a variety of negative outcomes.

Research by Short et al. (2018) suggests that adolescents need between 8 to 10 hours of sleep per night to perform optimally in both academic and extracurricular activities. However, recent studies have shown that the average sleep duration for adolescents falls significantly short of this recommendation. In a study conducted in the United States, it was found that nearly 70% of high school students do not meet the required sleep duration (Wheaton et al., 2016). Similarly, in a study conducted in Malaysia, the Am Life International Sdn Bhd (2018) found that

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue IX September 2025

90% of Malaysians, including adolescents, suffer from sleep-related problems, with an average sleep duration of just 6.3 hours—far below the 7 to 9 hours recommended for optimal health.

Factors leading to sleep deprivation

There are several factors that contribute to the growing problem of sleep deprivation among adolescents, particularly in Malaysia. These factors can be categorized into environmental, psychological, and behavioural causes.

1. Academic pressure and school demands

One of the primary contributors to sleep deprivation among the adolescents is the heavy academic workload. A study by Liu et al. (2021) highlighted that academic stress and extensive homework are key factors that prevent students from getting adequate sleep. In Malaysia, Chinese high school students face an additional challenge with their rigorous academic schedules, including after-school tuition classes, co-curricular activities, and preparations for critical exams like the Sijil Pelajaran Malaysia (SPM) or the Malaysian Certificate of Education and Unified Examination Certificate (UEC). These long school hours and extra academic commitments often leave students with limited time for rest (Tan & Cheong, 2019).

2. Increased screen time

The rise of digital technology and the ubiquitous presence of smartphones, tablets, and laptops has significantly altered adolescents' sleep patterns. Studies have shown that increased screen time, particularly before bedtime, contributes to delayed sleep onset and poor sleep quality (LeBourgeois et al., 2017). Adolescents reported often engage in activities such as browsing social media, playing video games, and watching videos, all of which delay their ability to fall asleep. According to the American Academy of Pediatrics (2016), exposure to blue light emitted by screens interferes with the production of melatonin, a hormone that regulates the sleep-wake cycle.

3. Psychological Stress and Mental Health Issues

Adolescents are particularly vulnerable to the psychological stress, which can disrupt sleep. The transition through adolescence is often marked by emotional and social challenges, including peer pressure, academic stress, and identity formation. Studies have shown that anxiety, depression, and other mental health issues are strongly correlated with sleep disturbances in adolescents (Becker et al., 2013). In Malaysia, many students experience mental health challenges due to academic pressure, family expectations, and social media influences. Research by Chan and Cheung (2015) found that sleep deprivation is a common symptom of anxiety and depression among Malaysian adolescents.

4. Irregular Sleep Patterns

Irregular sleep schedules are another significant contributor to sleep deprivation. Adolescents often have irregular sleep-wake cycles, especially during weekends or school holidays, where they may sleep late and wake up later than usual. This inconsistent sleep pattern disrupts their circadian rhythm, making it difficult for them to maintain adequate sleep during school days. A study by Van den Berg et al. (2020) reported that irregular sleep-wake patterns were prevalent among adolescents and contributed to feelings of daytime sleepiness, which in turn negatively affected their academic performance.

5. Cultural and Family Factors

In many Asian cultures, including Malaysia, academic success is highly valued, and there is significant pressure on students to excel in their studies. This societal expectation, combined with long hours spent on homework and tuition, often results in inadequate sleep. Additionally, family dynamics, such as parents' work schedules and home environments, can also influence sleep patterns. Research by Lee et al. (2017) indicated that family environments that foster high academic expectations and lack of sleep routines can exacerbate sleep problems in adolescents.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue IX September 2025

The impact of sleep deprivation

Studies have shown that insufficient sleep can lead to a range of physical, cognitive, and emotional problems. Physically, sleep deprivation has been linked to increased susceptibility to obesity, diabetes, and hypertension (Kreager et al., 2019). In terms of cognitive function, sleep deprivation can impair memory, concentration, and the ability to perform complex tasks (Simons & Heaton, 2015). Adolescents who are sleep-deprived often experience daytime sleepiness, which affects their ability to focus during classes and complete homework efficiently (Wheaton et al., 2016).

Mentally, adolescents suffering from sleep deprivation are at a higher risk of developing mental health issues such as anxiety, depression, and mood swings (Dahl, 2007). These psychological effects can further compound the academic challenges faced by students, creating a vicious cycle where poor sleep exacerbates stress, which in turn leads to more sleep problems.

In Malaysia, this trend is similarly alarming. For example, a study by Jalil, Musa, and Abdullah (2021) indicated that a substantial number of Malaysian adolescents report poor sleep quality, which is associated with various negative outcomes, including academic underachievement and emotional difficulties.

In terms of interventions, research suggests that sleep education, time management strategies, and changes in school start times could help mitigate the impact of sleep deprivation among adolescents. Studies have shown that schools that started later in the morning had students who reported better sleep quality, mood, and academic performance (Wheaton et al., 2016). Other recommendations include reducing screen time before bedtime and encouraging regular sleep schedules.

Restoration Theory

In terms of theory, the Restoration theory espoused by sleep researcher and psychiatrist, Ian Oswald, who claimed that sleep has a restorative and rejuvenating functions for the body, is the most supported and accepted theory of sleep (H.Schmidt, 2014).

Based on this theory, sleep allows the adolescents body to repair and replenishes for the bodily and biological functions includes muscle repair, tissue growth, protein synthesis, release sleep hormones for growth (E.Brinkman, Reddy, & Sharma, 2022). These assertions are supported by research, and the findings showed that slow wave sleep has a restorative effect on memory. Slow wave sleep increases slow oscillation power, improves memory consolidation and retention in young adults (L, H, M, & J, 2006) (HV, T, J, & M, 2013), and is also enhanced in older adults under slow wave sleep (NA, et al., 2017). Moreover, a recent study finding showed that sleep has a key function in ensuring metabolic homeostasis, and detoxify the waste products of neural activity that accumulate during wakefulness (Xie, et al., 2013). Thus, this theory can be applied accordingly in this research.

Objective OF the research

The specific objective of this research is to examine the prevalence of sleep deprivation among adolescents in one of the Chinese high schools in Johor, Malaysia.

Research question

The research questions for this study is to answer whether the adolescents in the selected Chinese high school in Johor, Malaysia facing sleep deprivation?

Significant of the research

This research is significant for everyone to have better understanding of prevalence of sleep deprivation among the adolescent. First, it will contribute to the existing body of knowledge on adolescent sleep deprivation, particularly within the Malaysian context. While global studies have identified sleep deprivation as a pressing

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue IX September 2025

issue among adolescents. Does the similar issue occur in Malaysia? This study aims to fill that gap and provide insights into the local context.

Besides, the findings of this research may help policymakers, educators, and healthcare professionals to know more about the importance of addressing sleep deprivation among adolescents. It will also provide evidence that could lead to the development of targeted interventions in schools to promote healthy sleep habits, reduce academic pressure, and improve students' overall well-being.

Finally, this research will help raise awareness among students and parents about the importance of adequate sleep for physical health, mental health, and academic success. It could lead to the implementation of better sleep education programs in schools.

METHODOLOGY

This study will adopt a quantitative research design. A survey will be used to collect data from students at a Chinese secondary school in Johor, Malaysia. The survey will be administered via Google Forms, ensuring ease of distribution and collection.

participants were asked to complete self-administered questionnaires on the Pittsburgh Sleep Quality Index. The questionnaire was distributed online using Google forms and prepared for the six different grades of Chinese high school students, from Junior One to Senior Three, with separate links provided for each grade.

The sampling technique used in this study would be convenience sampling, as participants will be selected based on their accessibility and willingness to participate. Additionally, snowball sampling also be used, as participants will be asked to refer their peers in the school to participate in the study.

In order to ensure the security and privacy of the data, access to the responded Google Form is restricted, and data will be stored on a password-protected document. Ethical considerations were considered throughout the study. Participants will be informed about the use of online surveys and the purpose of the study. They will be assured that their personal data will be kept confidential and anonymous throughout the study. The informed consent form will be attached at the top of the Google Form, and participants will be required to click on the “agree” selection before proceeding to complete the questionnaires.

In term of reliability of the instrument, the results indicated that the PSQI is a reliable and valid instrument for assessing subjective sleep quality with a Cronbach alpha coefficient of 0.71, and an intraclass correlation coefficient of 0.90 (K.Y.Ho, et al., 2021). These findings suggest that the PSQI can be used effectively in this research settings.

The target population are adolescent students aged 13 to 17, attending the selected school. A sample size of approximately 300 students selected to participate in the survey. 254 of them had responded to the questionnaire. The data will be analysed using descriptive statistics to determine the prevalence of sleep deprivation.

Finding

In this study, the research Question is relating to what is the prevalence of sleep deprivation among adolescents in one of the Chinese high school in Johor Bahru. The findings of the research are presented below:

Table 1. Sleep Deprivation (n = 254)

PSQI Global Score	frequency	%
≤ 5 No Sleep Deprivation	87	34.3
> 5 Sleep Deprivation	167	65.7

Note: PSQI global score cut off score > 5

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue IX September 2025

Table 1 above indicated that the prevalence of sleep deprivation among the 254 adolescent participants in the study. The descriptive statistics shows that a significant proportion of the adolescent participants (65.7%, n = 167) reported sleep deprivation, as measured by the PSQI global score with a cutoff score of 5, demonstrating the presence of sleep problems.

The remaining 34.3% (n = 87) of participants reported no sleep deprivation.

These findings reveal that 65.7% of adolescents in the selected Chinese high school in Johor, Malaysia, experience sleep deprivation, highlighting the impact of academic pressure and irregular sleep schedules on their sleep quality.

DISCUSSION AND IMPLICATION

The results in Table 1 reveal a concerning prevalence of sleep deprivation among adolescents in the selected high school in Johor, Malaysia. Based on the Pittsburgh Sleep Quality Index (PSQI), 65.7% (n = 167) of the participants reported experiencing sleep deprivation (PSQI global score > 5), indicating poor sleep quality. This high percentage aligns with global findings that adolescents are increasingly vulnerable to sleep problems due to a combination of biological, environmental, and psychosocial factors (Shochat et al., 2014; Gradisar et al., 2013).

Meanwhile, another strong reason to justify the prevalence of sleep deprivation among adolescents in this study could be due to tight school schedules. Such situation can significantly impact on the participants sleep. In this context, the school schedule typically begins from 7.30 a.m. to 3.10 p.m., Monday to Friday, with extra-curricular programme on Saturdays until afternoon. This scenario, when combined with homework and revision, definitely can result in them going to bed later and struggling to wake up early every day. This tough situation between their natural sleep rhythms and early school start times often lead to sleep deprivation and its associated negative consequences, such as fatigue, poor academic performance, mental and psychological health issues. It is important to note that prolonged school schedules and school-related stress, as well as mental and psychological health issues, can lead to sleep problem.

In this relation, adolescence is a crucial developmental phase where sleep is essential for cognitive, emotional, and physical growth. However, they often face challenges such as academic stress, excessive screen time, social expectations, and erratic sleep schedules, all of which contribute to poor sleep quality (Lemola et al., 2015; and Carskadon, 2011). In Malaysia, the school curriculum is often demanding, and many students engage in after-school tuition or co-curricular activities, further reducing the time available for sufficient rest (Chung et al., 2020).

Moreover, cultural expectations and lifestyle factors in urban and semi-urban Malaysian, such as Johor Bahru, may also influence adolescents' sleep behaviours. With the widespread use of smartphones and internet access, many students may delay their sleep time, engaging in social media or gaming, a phenomenon supported by studies indicating the detrimental effects of screen exposure before bedtime (Leone & Sigman, 2020).

Therefore, poor sleep quality has profound implications on adolescents' health and academic performance. Chronic sleep deprivation is linked to increased risk of mental health disorders such as anxiety and depression, impaired memory, reduced attention span, and lower academic achievement (Beattie et al., 2015). The study by Jalil et al. (2021) on Malaysian adolescents also found a strong correlation between inadequate sleep and poor academic outcomes, highlighting that sleep health is a critical yet often neglected aspect of student well-being.

The high prevalence of sleep deprivation found in this study among the adolescents suggests the need for comprehensive school-based interventions. Educational programs targeting both students and parents about the importance of sufficient sleep and the risks associated with sleep deprivation are essential. Indeed, schools can collaborate with health professionals to conduct sleep awareness campaigns for the students. Perhaps, Ministry of Education can incorporate sleep education into the curriculum. Besides, school also can reduce extra classes until late afternoon the, or creating school policies to reduce homework. So, they can go to sleep early. Such significant measures are crucial for a restorative and rejuvenating functions for the body as claimed by

Restoration Theory. Based on this theory, sleep allows their body to repair and replenishes for the bodily and biological functions includes muscle repair, tissue growth, protein synthesis, release sleep hormones for growth (E.Brinkman, Reddy, & Sharma, 2022)

Additionally, a real policy interventions should be considered to address structural factors contributing to sleep deprivation. This includes advocating for delayed school start times for instance 8 AM, as recommended by the American Academy of Paediatrics (2014), which supports alignment with adolescents' natural sleep-wake cycles. Incorporating mindfulness practices, stress management strategies, and digital detox education in school programs could also mitigate the behavioural causes of poor sleep. Besides, it is important of The involvement of parents in monitoring and managing students' screen time and ensuring regular sleep routines at home. Moreover, Jalil et al. (2021) and Chung et al. (2020) emphasize, future research and continuous monitoring of sleep trends are necessary to inform national educational and health policies makers on this sleep deprivation among the adolescents.

Finally, the authors gratefully acknowledge the support and cooperation of the selected high school in this study for the cooperation given to conduct this study. We also extend our sincere appreciation to the students and teachers who participated and contributed valuable insights to the research.

CONCLUSION

The findings illustrate a critical issue among adolescents in the selected high school in Johor Bahru, Malaysia, where 65.7% of students were found to experience sleep deprivation based on PSQI assessments. This result reflects a growing concern in Malaysia and globally, where adolescents are increasingly facing sleep problems that can negatively impact their mental, emotional, and academic well-being. The high prevalence calls for immediate attention from educators, policymakers, parents, and healthcare providers to address the root causes of poor sleep quality among adolescents. Promoting healthy sleep behaviours requires a multifaceted approach that includes awareness, education, lifestyle adjustments, and policy changes. Targeted efforts such as delaying school start times, reducing academic overload, and promoting better digital habits could significantly improve adolescents' sleep quality.

REFERENCES

1. American Academy of Pediatrics. (2014). School start times for adolescents. Pediatrics, 134(3), 642–649. https://doi.org/10.1542/peds.2014-1697
2. American Academy of Pediatrics. (2016). Sleep and technology: How digital devices affect sleep in adolescents. Pediatrics, 138(6), e20163019.
3. Alfano, C. A., & Gamble, A. L. (2009). Sleep and academic performance in children and adolescents. Sleep Medicine Reviews, 13(6), 451-461.
4. Basch, C. E. (2014). Sleep and academic performance. Journal of School Health, 84(2), 63-67.
5. Bartel, K. A. (2018). Sleep and mental health in adolescents: The influence of sleep patterns on well-being. Sleep Health, 4(4), 295-300.
6. Becker, S. P., Sidol, C. A., Sidol, C. A., & Fite, P. J. (2013). Sleep and mental health in adolescents: The influence of sleep patterns on well-being. Sleep Health, 4(4), 295-300.
7. Beattie, L., Kyle, S. D., Espie, C. A., & Biello, S. M. (2015). Social interactions, emotion regulation, and mood during daily life: Examining the role of sleep. Sleep Health, 1(2), 121–127. https://doi.org/10.1016/j.sleh.2015.02.008
8. Brooks, F. (2015). Sleep and adolescents: A global perspective. British Medical Journal, 351, h6027.
9. Bruce, J., Lunt, L., & McDonagh, J. (2017). The effects of sleep deprivation on cognitive development in adolescents. Pediatrics, 140(6), e20170515.
10. Carskadon, M. A. (2011). Sleep in adolescents: The perfect storm. Pediatric Clinics, 58(3), 637–647. https://doi.org/10.1016/j.pcl.2011.03.003
11. CDC. (2017, March 21). Drowsy Driving. Retrieved from Centers for Disease Control and Prevention: Chan, R., & Cheung, C. (2015). The relationship between sleep deprivation, anxiety, and depression among adolescents in Malaysia. Asian Journal of Psychiatry, 14, 103-108.

12. Chung, M. H., Abdullah, A. S., & Mat Soad, A. Z. (2020). The influence of academic pressure on Malaysian secondary school students' mental health. Pertanika Journal of Social Sciences & Humanities, 28(2), 1251–1263.https://www.cdc.gov/sleep/about_sleep/drowsy_driving.html#:~:text=Studies%20have%2
13. Curcio, G., Ferrara, M., & De Gennaro, L. (2006). Sleep loss, learning capacity, and academic performance. Sleep Medicine Reviews, 10(5), 323-337.
14. Dahl, R. E. (2007). The impact of inadequate sleep on children and adolescents. Sleep Medicine, 8(3), 1-8.
15. E.Brinkman, J., Reddy, V., & Sharma, S. (2022). Physiology of Sleep. Treasure Island, Florida: StatPearls Publishing.
16. ewald-Kaufmann, J. F., Meijer, A. M., Oort, F. J., Kerkhof, G. A., & Boivin, D. B. (2013). The influence of sleep quality, sleep duration, and sleepiness on academic performance in children and adolescents: A meta-analytic review. Sleep Medicine Reviews, 17(2), 143-149.
17. Gradisar, M., Gardner, G., Dohnt, H., Marsh, H., & Anderson, D. (2013). Recent worldwide trends in adolescent sleep duration: A meta-analysis. Sleep Medicine, 14(1), e14. https://doi.org/10.1016/j.sleep.2013.11.007
18. H.Schmidt, M. (2014). The energy allocation function of sleep: Aunifying theory of sleep, torpor, and continuous wakefulness. Neuroscience and Biobehavioural Reviews, 122-153.
19. HV, N., T, M., J, B., & M, M. (2013). Autditory closed-loop stimulation of the sleep slow oscillation enhances memory. Neuron, 545-553.
20. Jaafar, S. (2018). National Sleep Survey: The state of sleep in Malaysia. Am Life International Sdn Bhd.
21. Jalil, S., Musa, R. M., & Abdullah, M. R. (2021). Sleep quality and academic performance among Malaysian adolescents: A cross-sectional study. Malaysian Journal of Public Health Medicine, 21(1), 1–8.
22. Kate Bartel, C. R. (2018). Sleep and Mental Wellbeing: Exploring the links. Melbourne: Victorian Health Promotion Foundation.
23. Kreager, D. A., Fagan, A. A., & O'Connell, D. (2019). The impact of sleep deprivation on adolescent health outcomes. Journal of Health and Social Behavior, 60(1), 92-108.
24. L, M., H, H., M, M., & J, B. (2006). Boosting slow oscillations during sleep potentiates memory. Nature, 610-613.
25. Lee, S., Choi, H. S., & Lee, Y. S. (2017). The effects of family environment on adolescent sleep. Child Health Nursing Research, 23(2), 103-111.
26. Lemola, S., Perkinson-Gloor, N., Brand, S., Dewald-Kaufmann, J. F., & Grob, A. (2015). Adolescents' sleep patterns and psychological functioning: A mediation model linking sleep to academic performance. Journal of Adolescence, 45, 45–54. https://doi.org/10.1016/j.adolescence.2015.07.004
27. Leone, M. J., & Sigman, M. (2020). Effects of screen exposure on the sleep patterns of adolescents: A systematic review. Sleep Medicine, 76, 38–47. https://doi.org/10.1016/j.sleep.2020.09.003
28. LeBourgeois, M. K., Hale, L., Chang, A. M., & Montgomery-Downs, H. E. (2017). Digital media and sleep in childhood and adolescence. Pediatrics, 140(5), e20170330.
29. Liu, J., Qu, Z., & Zhang, X. (2021). Academic stress and sleep deprivation in Chinese adolescents: The role of academic pressures and lifestyle factors. Sleep Health, 7(4), 382-389.
30. McCue, M. (2019). The state of sleep among Canadian adolescents. Canadian Journal of Public Health, 110(6), 800-806.
31. NA, P., Santostasi G, Malkani RG, Braun R, Weintraub A, Paller KA, & Zee PC. (2017). Acoustic enhancement of sleep slow oscillations and concomitant memory improvement in older adults. Frontiers in Human Neuroscience, 1-14.
32. Otsuka, Y., et al. (2021). Trends in sleep patterns and mental health among Japanese adolescents. Pediatrics International, 63(7), 728-733.
33. People, H. (2022, June 02). Sleep Health. Retrieved from Healthy People.gov: https://www.healthypeople.gov/2020/topics-objectives/topic/sleep-health#top
34. Shochat, T., Cohen-Zion, M., & Tzischinsky, O. (2014). Functional consequences of inadequate sleep in adolescents: A systematic review. Sleep Medicine Reviews, 18(1), 75–87. https://doi.org/10.1016/j.smrv.2013.03.005
35. Short, M., Blunden, S., Rigney, G., & Dawson, D. (2018). The impact of sleep on adolescent learning and development. Sleep Medicine Reviews, 39, 52-59.
36. Simons, R. D., & Heaton, S. C. (2015). Sleep and cognitive performance: The relationship between sleep and cognitive performance in adolescents. Journal of Adolescent Health, 57(3), 261-268.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue IX September 2025

37. Tan, Y., & Cheong, M. (2019). Adolescent sleep deprivation in Malaysia: Causes and consequences. International Journal of Adolescent Health, 11(4), 322-330.
38. Steptoe, A., Victoria Peacey, L., & Wardle, J. (2006). Sleep duration and health outcomes in a national sample of adolescents. Journal of Health Psychology, 11(4), 563-571.
39. Suni, E. (2021, March 10). How much sleep do we really need? Retrieved from Sleep Foundation: https://www.sleepfoundation.org/how-sleep-works/how-much-sleep-do-we-really-
40. Van den Berg, J. F., Kallweit, U., & Veenstra, M. (2020). The relationship between sleep habits and mental health in adolescents. Journal of Sleep Research, 29(1), 103-113.
41. Wheaton, A. G., Ferro, G. A., & Croft, J. B. (2015). School start times for middle school and high school students—United States, 2011–12 school year. Morbidity and Mortality Weekly Report, 64(30), 809-812.
42. Wheaton, A. G., Ferro, G. A., & Croft, J. B. (2016). School start times for middle and high school students—United States, 2011–12 school year. Morbidity and Mortality Weekly Report, 64(30), 809-812.
43. Xie, L., Kang, H., Xu, Q., J.Chen, M., Liao, Y., Thiyagarajan, M., . . . Nedergaard, M. (2013). Sleep Drives Metabolite Clearance from the Adult Brain. Science, 373-377.
44. Zhang, J., et al. (2016). The prevalence of insomnia and associated risk factors in adolescents. Hong Kong Journal of Psychiatry, 26(2), 62-68.