Investigating the Relationship Between Adolescent Sleep Duration and Generalized Anxiety Disorder: A Secondary Data Analysis

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Abstract

Sleep deprivation in adolescence is increasingly linked to mental health disorders such as Generalized Anxiety Disorder (GAD). This study examines the correlation between average sleep duration and GAD prevalence in adolescents aged 13–18, utilizing ten years of secondary data. A Pearson correlation analysis revealed a strong inverse relationship ($r = -0.97$), indicating that reduced sleep duration significantly associates with higher GAD prevalence. A t-test ($t = -11.29$, $df = 8$, $p < 0.0001$) confirmed statistical significance. These findings support the use of sleep metrics as a non-invasive tool for early anxiety detection.

Introduction

Adolescents often avoid seeking professional medical help for fear of being a burden or not being taken seriously. As a result, early psychiatric symptoms may go unaddressed, only surfacing once they have progressed into more chronic and debilitating disorders (Costello, Copeland, & Angold, 2011). This delay in diagnosis is especially concerning in the case of Generalized Anxiety Disorder (GAD), a condition characterized by excessive, uncontrollable worry and physiological symptoms like fatigue and sleep disturbances (American Psychiatric Association, 2013). While GAD is treatable, it often goes undetected, especially in adolescents, due to its subtle or misinterpreted symptoms, such as social withdrawal or quietness, which are frequently mistaken for mere introversion (Essau, Lewinsohn, Seeley, & Sasagawa, 2010).

Sleep plays a crucial role in adolescent neurodevelopment, particularly in regulating emotions and enhancing cognitive processing. Research shows that inadequate sleep among adolescents is alarmingly common, especially between ages 15 to 17, due to both biological shifts during puberty and lifestyle factors such as screen time and academic stress (Shochat, Cohen-Zion, & Tzischinsky, 2014; Carskadon, 2011). The brain cycles through two main stages of sleep: rapid eye movement (REM) and non-rapid eye movement (NREM) sleep. REM sleep supports emotional processing and memory consolidation, while NREM facilitates physical recovery and the clearing of metabolic waste (Diekelmann & Born, 2010; Xie et al., 2013). Disruption of either stage can impair prefrontal cortex function, weakening emotional control and amplifying fear responses in the amygdala, a pattern often linked to anxiety symptoms (Walker & van der Helm, 2009; Goldstein & Walker, 2014).

Given the established importance of sleep in regulating mood and emotional reactivity, this study explores a potential non-invasive diagnostic pathway: using sleep patterns as early indicators of GAD risk. Specifically, the research examines the correlation between self-reported sleep duration and the prevalence of GAD among U.S. adolescents over 10 years.

This paper hypothesizes that shorter average sleep duration is significantly associated with a higher prevalence of generalized anxiety disorder in adolescents. Statistical analysis of public health survey data revealed a strong negative correlation (r = –0.97, p < 0.0001) between sleep hours and GAD symptoms (Chung et al., 2019; Short et al., 2019). These findings suggest that sleep data, particularly from wearables or surveys, could be used to flag at-risk individuals earlier, potentially enabling preventive intervention before symptoms become severe (Alfonsi et al., 2020; Luik et al., 2017).

Results

To examine the relationship between adolescent sleep duration and the prevalence of Generalized Anxiety Disorder (GAD), national public health and sleep survey data from 2014 to 2023 were analyzed. The dataset included the annual percentage of adolescents reporting adequate sleep (defined as more than 8 hours per night) and the percentage diagnosed with GAD. This analysis aimed to determine whether declining sleep patterns corresponded with increasing anxiety prevalence among U.S. adolescents.

A clear opposing trend was observed over the ten years. As shown in Figure 1, the percentage of adolescents reporting adequate sleep declined from 73% in 2014 to 60% in 2023. Meanwhile, the percentage of adolescents diagnosed with GAD increased from 31.9% to 36.5%.

Year	% Adolescents Reporting Adequate Sleep	% Adolescents Diagnosed with GAD
2014	73% (National Sleep Foundation, 2014)	31.9% (NIMH,2014)
2015	72% (CDC, 2015)	32.0% (NIMH,2015)
2016	71% (National Sleep Foundation, 2016)	33.0% (NIMH, 2016)
2017	70% (National Sleep Foundation, 2017)	33.0% (NIMH, 2017)
2018	69% (CDC, 2018)	34.0% (NIMH, 2018)
2019	68% (National Sleep Foundation, 2019)	34.1% (NIMH, 2019)
2020	65% (National Sleep Foundation, 2020)	34.5% (NIMH, 2020)
2021	63% (CDC, 2021)	35.0% (NIMH, 2021)
2022	61% (National Sleep Foundation, 2022)	36.0% (NIMH, 2022)
2023	60% (CDC, 2023)	36.5% (NIMH, 2023)

Figure 1. Trends in Adolescent Sleep and GAD Prevalence, 2014–2023. Table showing the percentage of U.S. adolescents reporting more than 8 hours of sleep and the percentage diagnosed with GAD from 2014 to 2023. Data sourced from the CDC, National Sleep Foundation, and NIMH annual reports.

This inverse relationship between sleep duration and GAD prevalence was further visualized using a line graph. The graph showed two diverging trends, suggesting a possible negative association.
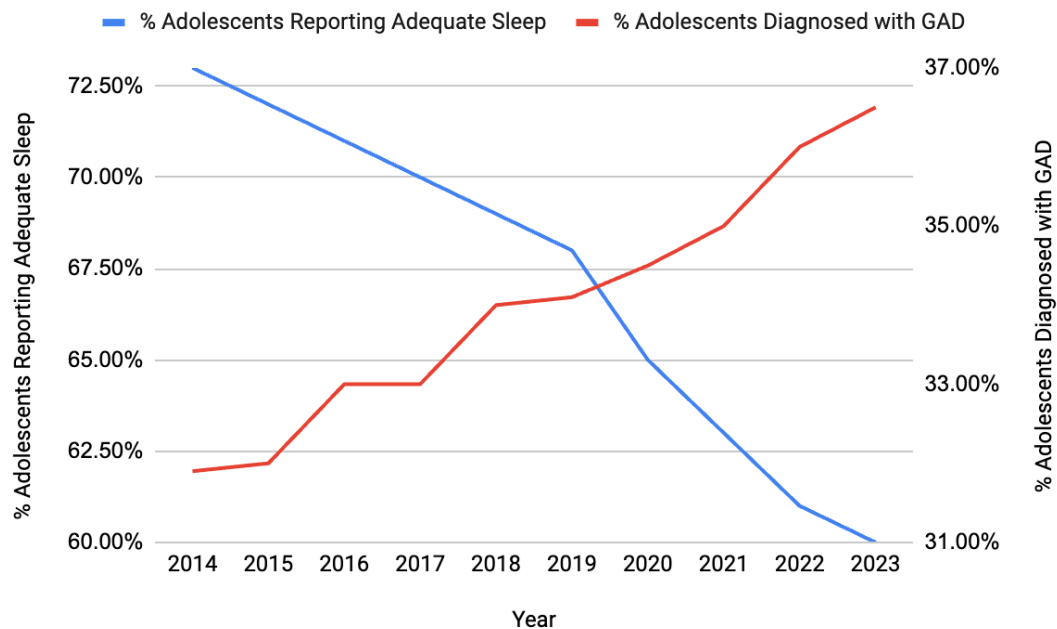
Figure 2. Trends in Self-Reported Adequate Sleep and Diagnosed Generalized Anxiety Disorder (GAD) Among Adolescents (2014–2023). Line graph displaying the percentage of adolescents getting adequate sleep and those diagnosed with GAD over ten years. Data show a downward trend in sleep alongside a rising trend in GAD diagnoses.

To determine the strength of this relationship, a Pearson correlation coefficient was calculated, yielding r = –0.97, indicating a strong negative linear relationship between the two variables. A corresponding t-test, conducted with n = 10 and df = 8, produced a t-value of –11.29, which corresponds to a p-value < 0.0001. This indicates that the relationship is statistically significant and unlikely to be due to random chance.

These results strongly support the hypothesis that declining sleep among adolescents is significantly associated with increased prevalence of GAD.

Discussion

The results demonstrate a statistically significant inverse correlation between adolescent sleep duration and GAD prevalence, supporting the hypothesis that reduced sleep is associated with increased anxiety disorders in youth. The strong Pearson correlation (r = –0.97) and highly significant t-test (p < 0.0001) indicate that these patterns are unlikely to occur by chance (Chung et al., 2019; Gregory & Sadeh, 2016). These findings align with prior studies highlighting the

robust association between insufficient sleep and heightened anxiety symptoms among adolescents (Alfonsi et al., 2020).

Biologically, the results of this study reveal a significant inverse correlation between adolescent sleep duration and the prevalence of Generalized Anxiety Disorder (GAD) in the United States from 2014 to 2023. As reported in the Results section, adequate sleep among adolescents steadily declined by 13% over the ten years, while GAD diagnoses rose by 4.6%. Statistical analysis confirmed this relationship with a Pearson correlation coefficient of $r = -0.97$ and $p < 0.0001$, indicating a strong and highly significant negative association.

This trend is consistent with a growing body of research linking chronic sleep deprivation with emotional and neurological dysfunction. One likely explanation for this correlation lies in the biological and circadian changes that occur during adolescence. As teens mature, delayed melatonin release shifts their natural sleep window later into the night (Crowley et al., 2007). When this delay collides with early school start times and rising academic or social demands, adolescents experience chronic sleep restriction. Prolonged inadequate sleep disrupts prefrontal cortex activity, reducing decision-making and emotional regulation while simultaneously increasing amygdala hyperreactivity, the part of the brain responsible for fear and stress responses (Yoo et al., 2007; Goldstein & Walker, 2014). These neurological effects closely resemble the symptom profile of GAD.

The biological plausibility of these findings suggests that sleep duration could serve as a non-invasive early indicator of psychiatric risk in adolescents. Monitoring sleep patterns may allow schools, clinicians, or families to identify and support at-risk youth before anxiety symptoms fully develop (Beattie et al., 2015; Shochat et al., 2014). This offers an important diagnostic and preventive pathway, especially in populations where mental health stigma or limited resources delay formal diagnosis (Kazdin & Rabbitt, 2013). The integration of wearable technology and sleep-tracking apps in schools and healthcare settings could make early intervention more accessible, particularly for underserved youth who may not otherwise seek help (Luik et al., 2017).

Materials and Methods

We obtained adolescent sleep and mental health data from various publicly available health and education databases spanning 2014 to 2023. The datasets included:

- Average self-reported adolescent sleep duration per night (in hours)

- Generalized Anxiety Disorder (GAD) diagnosis rates among adolescents, reported as a percentage of the adolescent population

Sleep data was sourced primarily from public health surveillance surveys such as the Youth Risk Behavior Surveillance System (YRBSS) and state-level health departments, which report self-reported nightly sleep duration for high school students. GAD diagnosis rates were

compiled from mental health reports published by the CDC and state education boards that track adolescent mental health metrics annually.

Citations

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