

REVIEW ARTICLE

The Complex Relationship Between Sleep Disorders and Cancer Risk: A Brief Note for Researchers

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Abstract

Background and objective: Sleep disorders, including obstructive sleep apnea (OSA), chronic insomnia, and circadian rhythm disruption, are increasingly recognized as potentially modifiable risk factors for cancer. This review synthesizes current evidence linking poor sleep with cancer risk and highlights preventive opportunities.

Materials and Methods: A narrative synthesis of epidemiologic studies was conducted to examine associations between sleep disorders and cancer, with attention to factors such as obesity and shift work.

Results: Intermittent hypoxia, chronic inflammation, hormonal dysregulation, and immune dysfunction may connect sleep disturbances to carcinogenesis. Epidemiological findings indicate higher risks of breast, prostate, and colorectal cancers among individuals with OSA. Chronic insomnia may further contribute through hypothalamic-pituitary-adrenal axis dysregulation and impaired antitumor immunity.

Conclusion: Sleep disorders may represent important targets for cancer prevention. Interventions such as continuous positive airway pressure therapy, cognitive-behavioral therapy for insomnia, and workplace-level circadian protection may reduce risk. Integrating sleep health into public health cancer prevention strategies is warranted.

Keywords: Sleep Wake Disorders; Neoplasms/etiology; Circadian Rhythm Disruption; Inflammation/metabolism; Hypoxia-Inducible Factor 1; Melatonin/therapeutic use.

1. Introduction

This review intends to address an increasingly pertinent topic in the field of health research: the intricate and multifaceted relationship between sleep disorders and cancer risk. As our understanding of sleep physiology and oncology continues to evolve, it becomes evident that the quantity and quality of sleep may play a significant role in cancer incidence and progression (1). This brief review is written to synthesize recent findings, explore potential biological mechanisms, and advocate for further research and public health initiatives to address this critical intersection of health by responsible stakeholder.

Sleep is a cornerstone of overall well-being, essential for physical restoration, cognitive function, and immune regulation. Yet, sleep disorders, such as obstructive sleep apnea (OSA), chronic insomnia, and circadian rhythm disruptions, are alarmingly prevalent in modern society. These conditions are not merely inconveniences; they are associated with serious health complications, including cardiovascular disease, metabolic disorders, and mental health challenges. Emerging evidence now suggests that sleep disturbances may also contribute to an elevated risk of certain cancers, adding urgency to the need for greater awareness and research in this area (2).

2. Obstructive Sleep Apnea and Cancer Risk

Obstructive sleep apnea, characterized by repeated episodes of airway obstruction during sleep, evidently leads to intermittent hypoxia and fragmented sleep. A growing body of research has linked OSA to an increased risk of cancers such as breast, prostate, and colorectal cancers (3). However, the mechanisms underlying this association

are complex and likely involve multiple pathways.

One of the primary pathways is chronic inflammation, because the cyclical hypoxia and reoxygenation experienced by individuals with OSA can trigger systemic inflammation, a known contributor to tumorigenesis (4). Additionally, OSA disrupts hormonal balance, particularly affecting insulin and cortisol levels (5), which may create a metabolic environment conducive to cancer development. Another critical factor is immune dysfunction. Sleep is vital for maintaining robust immune surveillance, and disruptions in sleep quality can impair the body's ability to detect and eliminate cancerous cells. This compromised immunity may allow malignancies to proliferate, highlighting the importance of addressing sleep disorders as part of comprehensive cancer prevention strategies.

3. Insomnia and Its Implications

Chronic insomnia, marked by persistent difficulty falling or staying asleep, has also been implicated in cancer risk. Studies suggest that individuals with insomnia may face a heightened likelihood of developing certain cancers, possibly due to hormonal imbalances, immune suppression, and elevated psychological stress. Evidently, insomnia often coincides with elevated cortisol levels, which can suppress immune function and promote inflammation, both of which are implicated in cancer progression. Furthermore, poor sleep quality is associated with metabolic dysregulation, obesity, and insulin resistance (6), all of which are established risk factors for various cancers. Addressing insomnia through behavioral and pharmacological interventions may thus have far-reaching implications for cancer prevention.

4. Circadian Rhythm Disruption and Carcinogenesis

The disruption of circadian rhythms, particularly among shift workers, has been classified by the International Agency for Research on Cancer (IARC) as “probably carcinogenic to humans” (7). This designation underlines the potential dangers of chronic misalignment between internal biological clocks and external environmental cues. In addition, shift work and irregular sleep patterns can lead to reduced melatonin production (8), a hormone with potent antioxidant and immune-regulating properties. Lower melatonin levels may diminish the body’s ability to combat oxidative stress and inflammation, both of which are key drivers of cancer development. Moreover, circadian disruption often coincides with poor lifestyle choices, such as irregular eating habits and reduced physical activity, further compounding cancer risk.

Another consequence of sleep disturbance is chronic stress that can critically link it to cancer risk. Stress activates the hypothalamic-pituitary-adrenal (HPA) axis, leading to elevated cortisol levels (9), which can impair immune function and promote inflammation. Over time, this can create an environment that favors tumor growth and progression. Other behavioral consequences of stress include unhealthy eating, sedentary lifestyles, and substance use, that can exacerbate cancer risk in the long run. Thus, stress management and improved sleep hygiene may serve as dual interventions to mitigate both sleep disorders and cancer susceptibility. Similarly, obesity constitutes a well-established risk factor for numerous cancers, and sleep disorders often contribute to weight gain through hormonal imbalances (e.g., ghrelin and leptin dysregulation) (10). Conversely, obesity can worsen sleep disorders, creating a vicious cycle. Addressing sleep quality may therefore be a

key strategy in breaking this cycle and reducing cancer risk.

5. Conclusion

The evidence linking sleep disorders to cancer risk is compelling but complex, involving intertwined biological, hormonal, and lifestyle factors. While significant progress has been made, further research is needed to clarify causal relationships and identify targeted interventions. In fact, public health initiatives must prioritize sleep hygiene education, particularly for high-risk populations such as shift workers and individuals with chronic sleep disturbances. By integrating sleep health into broader cancer prevention strategies, we can take meaningful steps toward improving long-term health outcomes. In conclusion, the relationship between sleep disorders and cancer risk underscores the importance of viewing sleep not as a luxury but as a vital component of health. Continued research and proactive public health measures are essential to unraveling this complex interplay and safeguarding the well-being of individuals worldwide.

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Author Contributions

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Conflict of Interest

The authors declare no conflicts of interest regarding this review.

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