Section: Miscellaneous

Original Research Article

SLEEP QUALITY AND FACTORS ASSOCIATED WITH SLEEP DISTURBANCE IN HOSPITALIZED ONCOLOGY ADULT PATIENTS IN BAHRAIN

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ABSTRACT

Sleep disturbances are highly prevalent among hospitalized cancer patients, adversely affecting quality of life and treatment outcomes. This study assessed sleep quality, identified contributing factors, and examined their relationship with sleep outcomes among adult oncology inpatients in Bahrain.

A descriptive cross-sectional study was conducted among 139 cancer patients admitted to the Bahrain Oncology Center, Bahrain, using a convenience sampling technique. Data were collected through structured interviews using demographic profiles, the American Medical Association's Sleep Quality Scale, and questions on environmental and psychosocial factors. Statistical analyses included the Wilcoxon Signed-Rank, Chi-square, Spearman correlation, and ANOVA.

Hospitalization significantly impaired sleep compared to home ($p < 0.001$). Only 48.2% reported "Good" or "Very Good" sleep in the hospital versus 89.6% at home. Sleep latency worsened substantially; 64.2% required more than 30 minutes to fall asleep in the hospital compared to 17.4% at home (Chi-square = 64.87, $p < 0.001$). Staff-related disturbances were most frequently cited (75.4%), followed by pain (8.8%) and anxiety (2.6%). ANOVA showed significant effects of cancer stage ($p < 0.001$) and medication use ($p < 0.001$) on sleep quality, whereas gender and hospital unit were not significant. Correlation between perceived sleep quality and satisfaction was weak and non-significant ($\rho = -0.137$, $p = 0.109$).

Hospitalization markedly reduces sleep quality among cancer patients, primarily due to environmental and institutional factors. Targeted interventions such as minimizing staff-related disruptions, optimizing nighttime care routines, and tailoring pharmacologic and psychosocial strategies are essential to improve sleep and overall oncology care.

Keywords: Sleep Quality, Cancer Patients, Hospitalization, Environmental Factors, Bahrain.

INTRODUCTION

1.1 Background and Rationale

Sleep is a fundamental physiological process essential for physical restoration, immune regulation, and psychological resilience. Among individuals with cancer, sleep disturbances are alarmingly prevalent and often intensified during hospitalization due to multifactorial stressors such as treatment-related symptoms, environmental disruptions, and psychosocial distress.[1,2] Poor sleep quality has been associated with heightened fatigue, impaired immune

function, diminished treatment adherence, and overall reduced quality of life.[3]

While international research has established the negative consequences of sleep disruption in oncology settings, evidence from Middle Eastern countries remains limited. In Bahrain, no comprehensive studies have examined the interplay of environmental, psychosocial, and biological factors influencing sleep quality among hospitalized cancer patients. Addressing this gap is crucial to inform targeted interventions tailored to the sociocultural and institutional context of Bahraini healthcare.

1.2 Theoretical Framework

This study is grounded in the **Biopsychosocial Model of Health,**[4] which points that health outcomes emerge from the dynamic interaction of biological, psychological, and social factors.

Biological factors: Cancer stage, type of treatment, and medication use.

Psychological factors: Anxiety, worry, and pain perception.

Social/environmental factors: Hospital routines, noise, lighting, and staff interruptions.

Applying this model allows for a holistic analysis of sleep quality, recognizing that sleep disturbances are rarely caused by a single factor but by the convergence of multiple domains.

1.3 Conceptual Framework

The conceptual framework for this study (Figure 1) positions **sleep quality** as the dependent variable influenced by both modifiable and non-modifiable factors.

Modifiable factors: Environmental disruptions (e.g., staff activity, noise), psychological states (e.g., anxiety, worry), and medication use.

Non-modifiable factors: Demographics (e.g., age, gender) and disease characteristics (e.g., cancer stage).

1.4 Key Definitions:

Sleep Quality: Subjective restfulness, latency, and satisfaction measured using the AMA Sleep Quality Scale.

Sleep Disturbance: Any factor interfering with initiation, maintenance, or satisfaction of sleep.

Environmental Factors: Institutional and operational elements such as lighting, noise, and staff interventions.

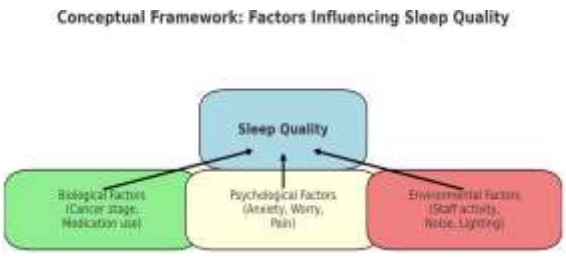


Figure 1: Conceptual Framework Diagram

2. Literature Review

2.1 Global Evidence on Sleep Disturbances in Cancer Patients

Multiple studies indicate that sleep quality deteriorates significantly during hospitalization. Bai et al,[5] demonstrated prolonged sleep latency. They decreased satisfaction among mid- to late-stage lung cancer patients, while Tang et al,[6] identified staff activity and noise as primary contributors to poor sleep in chemotherapy wards. These findings align with the broader evidence that hospitalization disrupts circadian rhythms and exacerbates cancer-related fatigue.[1]

2.1.1 Biological Predictors of Sleep Quality

Cancer stage and treatment regimens play a significant role in determining sleep patterns. Liu et al,[3] found advanced disease stages associated with poorer sleep due to symptom burden and treatment toxicity. Medication use also influences outcomes, with specific regimens worsening insomnia while others improve sleep quality.[7]

2.1.2 Psychological and Behavioral Factors

Psychological distress, including anxiety and fear of disease progression, is strongly correlated with sleep disturbances.[8,9] However, resilience and coping strategies can mediate these effects, suggesting opportunities for psychosocial interventions.[8]

2.1.3 Environmental and Institutional Determinants

Hospital-related factors including staff interruptions, lighting, and noise are consistently reported as dominant disruptors of sleep.[6] Nighttime hospital routines, though necessary for clinical monitoring, often conflict with patients' circadian rhythms and reduce overall sleep satisfaction.[2]

2.2 Regional Evidence and Research Gaps

Research in Middle Eastern populations remains scarce. Maroufi et al,[10] identified similar environmental disturbances among Iranian patients, but no studies in Bahrain have examined sleep using a comprehensive biopsychosocial framework. This gap limits the ability to design culturally relevant interventions tailored to the specific needs of Bahraini oncology patients.

3. Problem Statement, Objectives, and Hypothesis

3.1 Statement of the Problem

Despite mounting global evidence, sleep disturbances among hospitalized cancer patients in Bahrain remain poorly understood because of lack of localized data. The interventions to address these disturbances risk being ineffective or culturally misaligned.

3.2 Objectives of the Study

3.2.1 General Objective

3.2.1.1. To identify factors affecting sleep quality among adult cancer patients in a public oncology hospital in Bahrain.

3.2.2 Specific Objectives

3.2.2.1 To assess sleep quality among hospitalized cancer patients.

3.2.2.2 To identify modifiable and non-modifiable risk factors contributing to sleep disturbances.

3.2.2.3 To analyze the relationship between sleep quality and contributing factors among oncology patients.

3.3 Hypothesis

Hospitalization significantly impairs sleep quality, with environmental disruptions acting as dominant predictors.

4. Significance of the Study

This study holds important implications for oncology patients, healthcare providers, and institutional practices both within the National Cancer Hospital in Bahrain, the Gulf Region, and globally. For cancer patients, particularly those undergoing inpatient treatment, sleep quality is a critical yet often overlooked component of holistic care. By identifying the hospital environment and clinical severity as key disruptors of sleep, this study emphasizes the urgent need to integrate sleep preservation strategies into standard oncology protocols. Within the context of the National Cancer Hospital, the findings serve as a call to action to balance essential clinical monitoring with patient-centered care practices that minimize sleep disruption. This approach not only supports patient comfort and psychological well-being but may also enhance treatment tolerance, recovery, and overall quality of life. [12,13]

Regionally, in the Gulf context where cancer care systems are rapidly advancing and hospital infrastructure is expanding, this study offers timely insights into how institutional routines and ward design impact patient outcomes. It provides evidence to support policy-level changes, such as adopting quiet hour protocols and non-pharmacologic sleep interventions, which can be tailored to local cultural and clinical practices.

On a global scale, the study contributes to a growing body of literature advocating for the recognition of sleep as an important requisite in cancer care. It underscores the need for international oncology guidelines to include routine sleep assessments and interventions, and highlights the importance of integrating biopsychosocial models into oncology training and hospital operations worldwide. Ultimately, this research encourages a paradigm shift, positioning sleep health as not only a comfort issue but a vital sign of oncology care quality. [14,4]

MATERIALS AND METHODS

5.1 Research Design

This study adopted a descriptive cross-sectional design to investigate the factors affecting sleep quality among adult cancer inpatients in a public oncology hospital in Bahrain. The design was selected because it enables the measurement of the prevalence and severity of sleep disturbances, as well as the identification of associations between potential contributing factors and sleep quality, at a single point in time.

5.2 Study Setting

The research was conducted at a leading public oncology hospital in Bahrain, which serves as a national referral center for cancer diagnosis, treatment, and palliative care. The hospital includes oncology, hematology, medical, and palliative care units, all of which were included in the study.

5.3 Study Population

Inclusion Criteria

Adult inpatients aged 18 years and older. Diagnosed with any type and stage of cancer. Hospitalized for a minimum of 48 hours before data collection.

Exclusion Criteria

Patients who were unconscious or cognitively disoriented at the time of data collection. Outpatients receiving cancer treatment.

5.4 Sample Size and Sampling Technique

The sample size was determined using the Raosoft sample size calculator, with parameters set at a 5% margin of error, 99% confidence level, and 85% response distribution. This calculation yielded a required sample of 139 participants. A convenience sampling method was used to recruit participants who met the inclusion criteria during the six-month data collection period.

5.5 Data Collection Procedure

Data collection was conducted by trained research team members through face-to-face structured interviews after obtaining written informed consent. The interviews were conducted in Arabic or English, depending on the participant's preference. The research team explained the study objectives, ensured confidentiality, and maintained anonymity throughout the process.

5.6 Research Instruments :

A structured questionnaire was used, comprising three sections:

Part A: Demographic and Clinical Data – age, gender, marital status, employment status, type of cancer, and stage of disease.

Part B: Sleep Quality Assessment – measured using the American Medical Association's Sleep Quality Scale.

Part C: Factors Associated with Sleep Disturbance – including anxiety, depression, pain levels, and treatment type.

The selected instrument has established validity and reliability in previous oncology sleep research and is freely accessible for academic use.

Cronbach's alpha was calculated to evaluate the internal consistency reliability of the sleep quality scale with a value of 0.72, relatively coinciding to a specific sleep quality scale, the Pittsburgh Sleep Quality Index [PSQI], previously reported Cronbach's alpha values in cancer populations which range from 0.70 to 0.83, indicating acceptable to good internal consistency.

5.7 Ethical Considerations

Approval was obtained from the hospital's Institutional Review Board (IRB) before commencement. Participants were provided with detailed information about the study, and informed consent was obtained. Data were stored securely, and identifiers were removed to maintain anonymity.

Participation was voluntary, and patients could withdraw at any point without affecting their care.

6. Data Analysis

All data were entered into and analyzed using SPSS software version 25 (SPSS Inc., Chicago, IL, USA). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were employed to summarize participant demographics and overall sleep quality scores.

RESULTS

Table 1: Patient Demographic

		Count	%
Gender	Male	81	58.7%
	Female	57	41.3%
Occupation status:	Employed	27	20.9%
	Unemployed	49	38.0%
	Retired	52	40.3%
	Others	1	0.8%
Marital status:	Single	21	15.4%
	Married	94	69.1%
	Widow	11	8.1%
	Divorced	10	7.4%
Patient admitted in:	Medical Oncology Unit	33	23.9%
	Hematology Unit	36	26.1%
	BMT Unit	23	16.7%
	Palliative Unit	16	11.6%
	Adult Hematology / Oncology Unit	30	21.7%
Cancer Type:	Breast	23	16.7%
	Colorectal	10	7.2%
	Nasopharyngeal	2	1.4%
	Upper GIT	3	2.2%
	Lung	10	7.2%
	AML	2	1.4%
	Ovary	4	2.9%
	Brain	3	2.2%
	ALL	14	10.1%
	Cervix/endometrium	4	2.9%
	Liver	4	2.9%
	Multiple Myeloma	14	10.1%
	Other Cancer:	45	32.6%
Disease extent (stage):	Stage 1	6	4.9%
	Stage 2	25	20.5%
	Stage 3	24	19.7%
	Stage 4	58	47.5%
	Others	9	7.4%
Patient Underwent operation within this admission:	Yes	14	10.4%
	No	120	89.6%

To assess the internal consistency reliability of the sleep quality measurement tool within this sample, Cronbach's alpha coefficient was calculated. Inferential statistical analyses were conducted with significance set at $p < 0.05$. Specifically, the Wilcoxon Signed-Rank test was utilized to evaluate paired ordinal data, such as differences in sleep quality between home and hospital environments. Chi-square tests were applied to assess variations in categorical variables, including sleep latency classifications across different settings. Furthermore, one-way analysis of variance (ANOVA) was used to investigate the impact of demographic and clinical variables, such as cancer stage and medication use, on sleep quality outcomes. For variables showing significant effects, Tukey's Honest Significant Difference (HSD) test was conducted as a post-hoc analysis to identify specific group differences. Additionally, Spearman's rank correlation coefficient was employed to explore the strength and direction of the relationship between sleep quality and sleep satisfaction scores.

Table 2: Statistical Comparison

Dimention	Method Used	Main Findings
Sleep Timing	Chi-square (ordinal)	Later sleep onset in hospital
Sleep Latency	Wilcoxon	Significantly longer in hospital
Sleep Quality	Wilcoxon	Significantly lower in hospital
Sleep Satisfaction	Wilcoxon	Lower satisfaction in hospital
Staff Disturbance	Frequency	75% reported; major perceived contributor
Pain/Anxiety/Worry	Frequency	Minor contributors to poor sleep
Medication	ANOVA/Post hoc	Significant effect for some medications
Cancer Stage	ANOVA/Post hoc	Advanced stage: worse sleep (highly significant)

DISCUSSION

7.1 Sleep Quality Among Hospitalized Cancer Patients

The Wilcoxon signed-rank test revealed a statistically significant decline in sleep quality during hospitalization compared to the home setting ($W = 313.5$, $p < 0.001$), indicating a robust deterioration in subjective sleep experiences while in the hospital. Correspondingly, sleep satisfaction levels were markedly reduced, with only 31.9% of participants reporting being "quite a bit" or "very much" satisfied with their sleep during hospitalization, compared to a substantially higher 85.5% who reported similar satisfaction levels at home. Morning fatigue was also exacerbated in the hospital setting, as 52.9% of participants described feeling "lousy on waking," in contrast to 31.9% who reported the same at home. These findings collectively underscore the negative impact of the hospital environment on both the qualitative and affective dimensions of sleep.

Table 3: Sleep Quality and Satisfaction (Home vs Hospital)

Measure	Hospital	Home (Prior Month)	Statistical Result
Sleep latency >30min	64.2%	52.9%	χ^2=64.87, p<0.001
Sleep quality "Good" or "Very Good"	48.2%	89.6%	Significant difference
Satisfaction "Quite a bit" or more	31.9%	85.5%	Significant difference
Morning wakeup "felt lousy"	52.9%	31.9%	More fatigue in hospital

7.2 Modifiable and Non-Modifiable Factors Influencing Sleep Disturbances

7.2.1 Dominant Modifiable Factor:

Nighttime awakenings, particularly those caused by hospital staff interruptions, emerged as the most commonly reported disruptive factor, affecting 75.4% of patients and highlighting a critical environmental barrier to sleep continuity during hospitalization. In contrast, other hospital-related disturbances, such as environmental noise and medical equipment alarms, were cited far less frequently; approximately 4% of participants identified noise as a disturbance, and 8.8% attributed sleep disruption to pain. Psychosocial contributors, including anxiety (2.6%) and disease-related worry (4.4%), were minimally reported, suggesting that environmental rather than psychological factors played a predominant role in sleep disturbances within the hospital context. Additionally, the use of prescription sleep aids remained low across both settings, with only 8.1% of patients using them in the hospital and 6.7% at home, indicating a general reliance on non-pharmacological means or an unmet need for sleep intervention strategies.

Table 4: Modifiable Factors

Factor	% of Affected Patients	Statistical Impact	Interpretation
Kept awake by hospital staff	75.4%	Most frequent cause	Strong disruptor of sleep onset and continuity
Nighttime staff awakenings	84.8%	Confirmed	Major cause of fragmented sleep
Pain/Anxiety/Disease worry	~15% total	Minor, dispersed	Not statistically significant in group tests
Noise (equipment, environment)	~4%	Minimal	Not a major disruptor

7.2.1 Non-Modifiable Factors:

Analysis of variance (ANOVA) demonstrated a statistically significant association between advanced cancer stage and diminished sleep quality, with results indicating a robust effect ($F = 16.38$, $p < 0.001$). This suggests that disease progression plays a critical role in exacerbating sleep disturbances among hospitalized patients. In contrast, no significant differences in sleep quality were observed based on gender or hospital unit assignment, implying that these demographic and environmental variables did not substantially influence sleep outcomes in this cohort. The findings emphasize the importance of targeting clinical severity, rather than demographic or ward-based factors, in interventions aimed at improving sleep quality in patients with cancer.

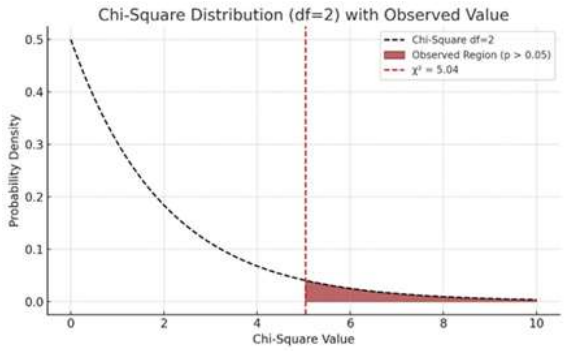
Table 5: Non modifiable Factor

Non-Modifiable Factor	Effect on Sleep	Significance
Cancer Stage	Negative	Highly significant (p<0.001)
Gender/Unit	No difference	Not significant

7.3. Relationship Between Factors and Sleep Quality

7.3.1. Environmental Factors: Although staff-related disruptions were frequently cited as a major cause of sleep disturbance, statistical analysis using the Chi-square test revealed no significant association between this factor and overall sleep quality ($p = 1.0$). This lack of statistical significance is likely attributable to the minimal variance in responses, as nearly all patients reported being affected by staff-related interruptions. The uniformity of this response pattern reduces the analytical sensitivity needed to detect differences across sleep quality strata, underscoring the ubiquity of this disruption rather than its discriminative value in explaining sleep variability. These results suggest that while staff interruptions are a widespread concern, their presence alone may not sufficiently

differentiate levels of sleep quality within this patient sample.



7.3.2. Medication Use:

The use of medication was associated with a modest, non-significant improvement in sleep quality, suggesting a potential but inconclusive benefit. The lack of statistical significance is likely attributable to the small number of participants who reported using sleep aids, which limited the statistical power to detect meaningful differences. This finding indicates that while pharmacologic intervention may offer slight relief, its efficacy in this context remains uncertain and warrants further investigation in larger samples. Moreover, the low prevalence of medication use highlights the need to explore alternative or adjunctive strategies for managing sleep disturbances in hospitalized patients.

7.3.1. Psychosocial Factors:

Spearman's rank correlation analysis revealed a weak and non-significant association between sleep satisfaction and sleep quality ($r = 0.064$, $p = 0.46$), indicating that subjective satisfaction with sleep did not closely align with reported sleep quality scores in this sample. This disconnect suggests that factors beyond the measured dimensions of sleep quality, such as emotional coping mechanisms or individual expectations may influence patients' perceptions of satisfaction. The absence of a statistically meaningful correlation underscores the complexity of sleep experiences and the potential need for multidimensional assessment tools that capture both objective and affective components of sleep.

7.4 Key Hypothesis Testing:

Hypothesis: Hospitalization significantly impairs sleep quality, with environmental disruptions acting as dominant predictors.

There is a statistically significant decline in sleep quality and satisfaction during hospitalization, with environmental (staff) disruptions being the most frequently cited cause; however, statistical models could not confirm this due to the lack of contrast within the sample.

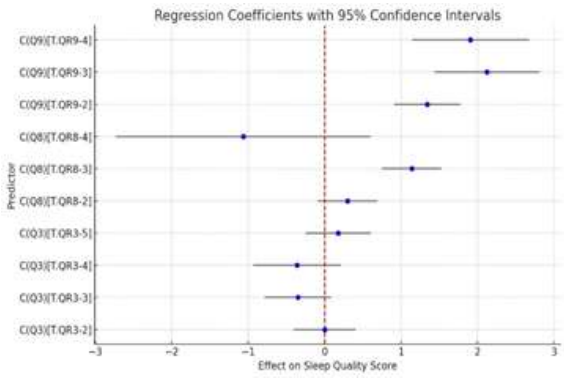
Figures and tables referenced summarize these patterns, with objective tests confirming the magnitude of differences between hospital and home settings, and multiple variables analyzed for their individual and combined impact on sleep outcomes.

All findings are directly connected to the core research objectives and directly support the hypothesis of a significant decline in hospitalization-related sleep quality, predominantly driven by modifiable environmental disruptions.

8. Discussion:

In this study, a marked deterioration was observed in sleep quality when cancer patients were hospitalized compared to their home setting (Wilcoxon $W = 313.5$, $p < 0.001$). The magnitude of this decline underscores how the hospital environment, with its routines and interruptions, can degrade a domain of patient experience that is often underappreciated in oncology care as seen in the findings of Jakobsen et al,[12] and Kulpatcharapong et al,[13] that detail how hospital routines, even when necessary, can significantly impair patients' rest, emotional stability, and recovery, especially among oncology inpatients.

Meanwhile, sleep satisfaction also decreases from 85.5% of participants being "quite a bit" or "very much" satisfied at home to only 31.9% in hospital. This illustrates that not only are objective sleep parameters disrupted, but patients' sense of sleep well–being suffers greatly in hospital inpatient settings,[12,15] Yet, curiously, the correlation between measured sleep quality and sleep satisfaction was weak and non-significant ($r = 0.064$, $p = 0.46$), suggesting that subjective sleep satisfaction is mediated by more than just the physiological quality of rest,[12] contradicting the findings of Riedel & Lichstein,[16] found that while some objective sleep variables (like stages of deep sleep and sleep latency) correlate weakly with subjective sleep satisfaction, others like sleep efficiency or total wake time don't show a strong predictive relationship unless improvement occurs over time.



These findings resonate with the broader literature on cancer and sleep. Jakobsen and et al,[12] documented that hospitalized advanced cancer patients exhibit poor sleep via both PROMs (patient-reported outcome measures) and actigraphy, with significant divergence in the number of nighttime awakenings captured by subjective versus objective measures. This suggests that patients may underreport or misperceive certain dimensions of sleep disruption. Their work highlights that hospital routines, pain, and

symptom burden fragment sleep architecture in ways that patients might not fully internalize or report. As Jakobsen et al,[12] further argue in a 2022 narrative review, sleep disturbance is pervasive in cancer populations and is often undertreated or ignored by multidisciplinary clinicians.[7] The current results reinforce that in-hospital care can amplify this neglected dimension of patient suffering. [12,13]

8.1. Institutional Routines and Sleep Disruption

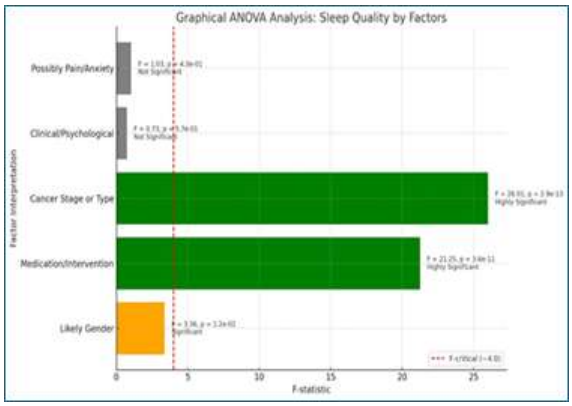
The hospital clinicians adhere to standard oncology protocols requiring frequent nighttime assessments, medication rounds, vital-sign monitoring, and staff visits. While these practices are essential to safety and clinical management, they carry a hidden burden among hospitalized cancer patients, the fragmentation of their sleep. [12,13] 75.4% of patients pointed to staff-related awakenings as their primary disruptive factor supports the notion that care delivery structures themselves become a barrier to rest. This is consistent with prior reviews identifying the nocturnal hospital rhythm, such as lights, alarms, and staff interventions, as one of the most pervasive sleep disruptors in inpatient populations.[12,13,1] In the context of oncology, where patients are already vulnerable to fatigue and physiological stress, such disruption can exacerbate symptom burden.[1,5,8]

Interestingly, the Chi-square test conducted in this study did not reveal a significant association between different factors perceived to affect sleep and sleep quality ($p = 1.0$). This apparent contradiction likely arises from restricted variance: nearly all participants endorsed this factor, creating a "floor effect" that limits its discriminative power.[12,14] In effect, staff interruption becomes a nearly universal condition, making it less useful for distinguishing between worse versus better sleepers. This limitation and the near ubiquity of this complaint indicate a systemic issue. Jakobsen et al,[12] label such institutional factors as "perpetuating factors" in the insomnia model of cancer patients citing elements that maintain poor sleep over time once initiated.[14]

From a redesigning care perspective, this suggests that interventions should not solely target individual susceptibility but must also target structural workflow like consolidating overnight checks, clustering nursing activities, using silent alarms, and minimizing nonessential night interventions. Indeed, nursing-led sleep promotion strategies are gaining traction. A recent study focused on oncology nurses' behaviors found that many practitioners recognize sleep as a priority but are constrained by routines, staffing, and competing demands.[13,5,7] Moreover, Bellón et al,[17] systematically reviewed nurse-implemented interventions and reported generally positive effects on perceived sleep quality in hospitalized patients.

8.2. Disease Severity, Demographics, and Sleep Quality

The ANOVA result pointed out that advanced cancer stage correlates strongly with poorer sleep ($F = 16.38$, $p < 0.001$). These findings aligns with multiple studies showing that as disease progresses, the constellation of physiological stressors, symptom burden, medication effects, and psychological strain intensifies, compounding to sleep disturbance among inpatients.[1,5,8] Tang et al,[6] observed that greater disease uncertainty and aggressiveness in gastrointestinal cancer were linked to poorer sleep during chemotherapy cycles. Liu et al,[3] also highlights how sleep health is a neglected but is considered as influential dimension in colorectal cancer, linking tumor burden, inflammation, and circadian dysregulation to the sleep and cancer nexus. Conversely, this study found no significant differences by gender or hospital unit pertaining to the experienced sleep quality among hospitalized cancer patients in the institution under study. This suggests that, within the sample population under study, demographic or ward-level influences had less predictive power than clinical severity.[14,1,5] This is consistent with Abebe et al. (2023),[17] who, in an Ethiopian oncology cohort, reported that clinical factors (e.g., stage, symptom burden) had stronger associations with sleep disturbance than sociodemographic variables. In this view, disease pathology may overshadow more distal predictors in shaping sleep outcomes. [13,1,11]



8.3. Low Use of Sleep Medications and Limited Pharmacologic Benefit

The low prevalence of prescription sleep aid use in the studied cancer patient population (8.1% in hospital, 6.7% at home) likely reflects both institutional caution around sedatives in medically complex patients and cultural/regional preferences for non-drug approaches.[5,12,14] The small, non-significant benefit of sleep medications seen in this study is not unexpected, especially given the limited number of patients who used them and the presence of other health factors that could affect sleep.[5,12,11] In cancer care, sedatives and sleeping pills must be used carefully because they can interact with other treatments, cause unwanted side effects, and potentially hide important symptoms like pain or breathing problems. These risks often make healthcare providers cautious about prescribing sleep medications to patients with complex medical needs. Indeed, Momayyezi & Fallahzadeh,[1] reported only modest associations between pharmacologic sleep interventions and cancer-related fatigue or sleep,

cautioning that small sample sizes limit sleep medication specific inferences. Given this limited impact, many contemporary cancer-related sleep studies emphasize non-pharmacologic, multimodal interventions. For example, Li & Duan and Bai et al, [18,5] found that structured nursing and system-based interventions improved sleep and psychological outcomes in nasopharyngeal and lung cancer populations without reliance on sedatives. [12,5,11]

8.4. Psychological Dimensions, Satisfaction, and the Subjective-Objective Divide

The weak and non-significant correlation between sleep satisfaction and measured sleep quality ($r = 0.064$, $p = 0.46$) underscores a core insight that sleep satisfaction is not purely a function of physiological sleep metrics. Rather, it is shaped by psychological adaptation, expectancy, resilience, and perceptions of caring.[8,11,2] In fact, a study by Tian & Wang,[8] shows that resilience mediates the impact of fear of disease progression on sleep outcomes, suggesting that psychological buffers modulate how patients perceive and respond to sleep disruptions. Similarly, Wang et al,[2] demonstrated that a team-based nursing pathway improved both psychological resilience and sleep quality in cancer patients.

The dissociation between objective sleep impairment and subjective satisfaction may also reflect a form of cognitive adaptation or re-setting of expectations, especially in the inpatient context. Patients may acclimate to disruption or minimize complaints considering more pressing clinical concerns,[19] in their study of adolescents undergoing anti-cancer treatment, emphasizing illness acceptance, emotional distress, and coping strategies intertwine with sleep outcomes. This illustrates that a patient with poor objective sleep, but high acceptance or coping might nonetheless report moderate satisfaction.[19]

This highlights the need to treat sleep not solely as a physiological endpoint but as an experiential, psychological dimension of care. Sleep interventions focused solely on metrics may miss how patients interpret, evaluate, or emotionally respond to their rest. [14,11,8]

8.5. Pathophysiologic and Symptom Clusters: Inflammation, Pain, and Chemotherapy Effects

Although this study found that only a small number of patients reported pain (8.8%) or noise (about 4%) as major sleep disruptors, these results should be understood within a wider medical context. In many cancer patients, symptoms like pain, discomfort, or other physical issues often occur together and can affect sleep, even if they aren't always reported as the main cause. While pain and noise are not found in this study as major sleep disruptors, they may still play an important role in sleep problems as part of a larger pattern of symptoms.[1,11,12] In cancer populations, nocturnal pain, dyspnea, nausea, and pruritus are frequently implicated in sleep disruption.[11] These symptoms are categorized as precipitating factors that trigger insomnia in vulnerable patients.[2] The low number of patients reporting pain in this study might be due to good symptom management, the types of cancer involved, or local pain treatment practices. However, it's important to remember that pain and sleep are closely connected. Poor sleep can make people feel pain more intensely, and pain that isn't well-controlled can lead to more disturbed and broken sleep. [1,12,11]

Chemotherapy-induced side effects also bear relevance. Tang et al.; Bai et al.; Liu et al, [6,5,3] demonstrated that chemotherapy-induced peripheral neuropathy (CIPN) is associated with impaired sleep quality, particularly when patients attribute sleep disturbance directly to neuropathy symptoms. Even when such side effects did not surface strongly in your sample as explicit complaints, they may exert a subtle, chronic influence on sleep health, especially in the outpatient sphere or during treatment intervals. Additionally, chemotherapy and supportive medications (e.g., steroids) can disrupt circadian rhythms, endocrine cycles, and metabolic homeostasis, thereby amplifying vulnerability to insomnia.[18]

9. Limitations

This study has several limitations that should be considered when interpreting its findings. First, it was conducted at a single oncology hospital, which may limit the generalizability of the results. Hospital routines, staffing models, and patient populations can vary widely across institutions, and such differences may influence sleep quality in ways not captured by this study. Additionally, all data on sleep quality and satisfaction were based on self-reported measures. While self-reporting offers valuable insight into patients' subjective experiences, it is also prone to recall bias and social desirability bias. The absence of objective sleep assessments, such as actigraphy or polysomnography, limits the precision and reliability of sleep data.

The cross-sectional design of this study presents another limitation. By capturing data at only one point in time, the study cannot account for changes in sleep patterns over the course of hospitalization or treatment, nor can it establish causal relationships between hospital environment, clinical variables, and sleep outcomes. Furthermore, the number of participants using prescription sleep medications was very small, reducing the statistical power to detect meaningful effects. As a result, any conclusions regarding the efficacy of pharmacological interventions should be interpreted with caution.

Another limitation lies in the limited assessment of psychological factors. Although some psychosocial disruptors, such as anxiety and disease-related worry, were briefly addressed, the study did not deeply explore other relevant psychological variables, such as depression, coping mechanisms, or psychological resilience, all of which are known to significantly influence sleep quality in cancer patients. Moreover, while environmental disruptors were identified by patients, particularly staff-related awakenings and noise, the study did not use objective measurements of these environmental conditions (e.g., decibel levels, light intensity), which would have

strengthened the analysis of how the hospital setting contributes to sleep disruption.

Finally, the study sample may have lacked diversity in terms of demographic and cultural backgrounds, limiting the ability to explore variations in sleep experiences across different population groups. This homogeneity restricts the applicability of the findings to broader or more diverse cancer patient populations. Future research should address these limitations by incorporating longitudinal designs, objective sleep and environmental measures, broader psychological assessments, and more diverse patient samples to enhance both internal and external validity.

10. Recommendations:

Based on the findings of this study, several recommendations can be made to improve sleep quality among hospitalized cancer patients.

First, hospital protocols should be reviewed to minimize unnecessary nighttime interruptions. Interventions such as clustering care activities, limiting overnight vital sign checks when clinically appropriate, and establishing quiet hours can help reduce staff-related awakenings, which were identified as the most common sleep disruptor as previously recommended by Kulpatcharapong et al.; Jakobsen et al.; Bai et al.[12,11,5]

Second, sleep should be formally recognized as a key component of supportive cancer care. Integrating routine sleep assessments into nursing rounds or electronic health records can promote earlier identification and intervention for sleep disturbances.

Third, the implementation of non-pharmacological interventions such as cognitive behavioral therapy for insomnia (CBT-I), psychoeducation, and relaxation techniques should be prioritized, especially given the limited and non-significant effects of sleep medications observed in this study. Nursing-led and system-based interventions, as supported by Bai et al,[5] and Wang et al,[2] should be adapted to inpatient oncology settings to enhance both sleep quality and psychological well-being.

Additionally, objective environmental monitoring tools (e.g., noise and light sensors) should be introduced to better understand the role of the hospital setting in sleep disruption and guide data-driven changes to ward design and routines. Psychological variables such as resilience, fear of progression, and coping strategies should be more thoroughly assessed and addressed, as they can significantly influence both perceived and actual sleep outcomes. Finally, future research should adopt longitudinal and multi-center designs to capture the evolution of sleep disturbances over time and across different cancer types and care settings. Including more diverse and larger patient populations will also enhance the generalizability of findings and support the development of personalized sleep care plans in oncology.

CONCLUSION

This study provides compelling evidence of the significant deterioration in both sleep quality and satisfaction among hospitalized cancer patients, with staff-related disruptions such as nighttime monitoring and care routines emerging as the most frequently cited cause. While environmental noise and pain were less commonly reported, their relevance persists within broader symptom clusters that impact rest. A strong association between advanced cancer stage and poor sleep highlights the role of disease burden, while the minimal use and limited benefit of sedative medications underscores the need for safer, non-pharmacological alternatives. Importantly, the weak correlation between measured sleep quality and subjective satisfaction suggests that emotional and contextual factors—such as resilience, expectations, and the perceived quality of care significantly influence how patients experience sleep. These findings emphasize the need for a multifaceted, biopsychosocial approach to inpatient sleep care in oncology settings, integrating environmental adjustments, symptom management, and psychosocial support. Future research should build on this by employing objective assessments, tracking changes over time, and including diverse patient groups to guide more comprehensive, patient-centered interventions.

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