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Research article

Evaluation of sleep quality among chemotherapy-treated cancer patients

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Abstract

Cancer arises from a variety of diseases, injuries, benign tumors, lifestyle factors, and other issues. Approximately 50% of cancer patients experience sleep disturbances, such as insomnia and abnormal sleep cycles. This study aims to describe the sleep quality of cancer patients undergoing chemotherapy. Methodology: This quantitative research employs a descriptive approach, with consecutive sampling used to select participants. The sample consisted of 41 cooperative cancer patients undergoing chemotherapy who were capable of performing daily activities. Informed consent was obtained from respondents, and data were collected using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The results indicated that of the seven PSQI indicators, 54.4% of patients subjectively reported good sleep quality, 46.3% had a sleep duration of 5-6 hours, and 43.9% experienced a sleep latency of 30-60 minutes. Sleep efficiency of 75%-84% was identified, measuring the time spent in bed before falling asleep and the total sleep duration. Sleep disturbances were reported with scores of 10-18 by 51.2% of participants, and 43.9% consumed sleep medication once a week. Daytime dysfunction was scored at 1-2 by 41.5% of patients, who reported feeling drowsy 1-2 times during daytime activities and exhibited low to moderate enthusiasm while engaging in activities. In conclusion, poor sleep quality was observed among cancer patients undergoing chemotherapy.

INTRODUCTION

Cancer arises from various factors, such as diseases, injuries, benign tumors, or other issues. Treatment options for cancer vary depending on the type and stage of the disease. Notably, approximately half of all cancer patients experience sleep disturbances. The majority suffer from insomnia and abnormal sleep cycles. Several factors contribute to sleep disorders in cancer patients, including physical changes due to cancer, side effects of treatment, stress from the illness, comorbid diseases, and hospital care.[1]

Research indicates that 69.3% of 149 cancer patients report poor sleep quality, which is often exacerbated by stress related to their cancer diagnosis and treatment. This stress can disrupt night-time sleep, causing pain and sensations of increased heat.[2] Patients with prolonged cancer experience continue to face sleep challenges, fearing recurrence, emotional distress, and financial issues.[3]

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Those undergoing chemotherapy and radiotherapy often find it difficult to fall asleep due to residual effects of these treatments, and they frequently struggle to rest well at night.[4] Studies have shown a significant correlation between sleep quality and anxiety, stress, and positive coping in patients. Sleep difficulties can lead to fatigue in cancer patients undergoing chemotherapy.[5]

Sleep, a vital human need, serves to maintain, repair, and regenerate body cells. It encompasses two physiological processes: Non-Rapid Eye Movement (NREM) sleep and Rapid Eye Movement (REM) sleep. During NREM sleep, there is a reduction in activity in the reticular activating system and brain waves slowdown, which is known as deep sleep, providing complete rest and sound sleep. Conversely, REM sleep involves high activity levels and physiological activity comparable to wakefulness.[6] Adequate sleep is crucial for maintaining immune function in cancer patients, who often experience fatigue due to their illness and the treatments they undergo.[7] Poor sleep quality in cancer sufferers can cause fatigue.

The aim of this study was to describe sleep quality in cancer patients undergoing chemotherapy

METHODS

This study employs a quantitative research design with a descriptive approach, focusing on characterizing sleep quality. The dimensions of sleep quality examined include subjective sleep quality, sleep latency and latency scores, sleep duration, sleep efficiency, sleep disturbances, medication use, and daytime dysfunction. The research was conducted at a hospital in Semarang, involving cancer patients during September 2022, with a total of 41 participants. A total sampling technique was utilized.

The Pittsburgh Sleep Quality Index (PSQI) was the instrument used to assess sleep quality. This standardized questionnaire comprises seven components, split into four questions and five statements with Likert scale options, where statement five is further divided into nine sub-statements. Each component's score is derived from specific responses: subjective sleep quality from statement nine, sleep latency and latency scores from question two and statement five(a), sleep duration from question four, sleep efficiency from questions one, three, and four, sleep disturbances from statements five(b) to five(j), medication use from statement six, and daytime dysfunction from statements seven and eight. A PSQI score of five or less indicates good sleep quality, whereas a score above five suggests poor sleep quality.

Ethical clearance for this study was granted by the Health Research Ethics Committee of Universitas Widya Husada Semarang, under approval number 22/EC-LPPM/UWHS/VIII-2022. Participants (cancer patients) were informed about the research's objectives and benefits, and consenting individuals signed an informed consent form. To ensure confidentiality, participants' identities were not disclosed in any reports or publications. Data analysis was performed using univariate analysis, describing the frequency distribution for each component of sleep quality.

RESULT

The respondents are cancer patients presenting with various types of malignancies. According to Table 1, the majority of respondents are patients with ovarian and cervical cancer, each constituting 17.1% of the sample. This is followed by lung cancer. Additionally, the prevalence of endometrial cancer and Sino nasal cancer among the respondents is 2.4% for each type.

The majority of respondents fall within the late adulthood age classification,

comprising 34.1% of the sample, where late adulthood is defined as the age range of 36 to 45 years. This is followed by respondents in the late elderly category, ranging from 56 to 65 years.

Table 1
Frequency Distribution of Cancer Types and Ages (n=41)

Indicators	f	%
Cancer Types		
Abdominal cancer	5	12.2
Colon cancer	4	9.8
Endometrium cancer	1	2.4
Nasopharynx cancer	3	7.3
Ovarium cancer	7	17.1
Lung cancer	6	14.6
Breast cancer	4	9.8
Rectum cancer	3	7.3
Cervical cancer	7	17.1
Sino nasal cancer	1	2.4
Age		
Late adolescence	4	9,8
Early adulthood	4	9.8
Late adulthood	14	34,1
Early Elderly	7	17,1
Late Elderly	12	29,3
Total	41	100,0

The sleep quality of cancer patients undergoing chemotherapy was uniformly categorized as poor, with 100% falling into this category. Notably, the highest score was observed in lung cancer patients, with a total score of 20, while patients with colon and ovarian cancer each scored 6. According to the conclusions drawn from the Pittsburgh Sleep Quality Index (PSQI), a score of 5 or less indicates good sleep quality, whereas scores above 5 denote poor sleep quality.

Table 2 elucidates subjective sleep quality, where patients self-assess their sleep. A total of 54.4% of respondents reported their sleep quality as good. Sleep duration, defined as the interval from sleep onset to waking, shows that 46.3% of respondents sleep between 5-6 hours. Sleep latency, the time taken for a person to fall asleep, relates to an individual's sleep waves. During this phase, 43.9% of respondents take 30-60 minutes to fall asleep after lying down in bed, occurring 1-2 times per week. Sleep efficiency is evaluated based on the percentage of required sleep by assessing both sleep hours and duration, concluding whether sleep needs are adequately met; 61% of respondents have a sleep efficiency of 75-84%.

The results for each of the seven components of sleep quality from the Pittsburgh Sleep Quality Index (PSQI) are detailed below:

Table 2
Frequency Distribution of Sleep Quality (n=41)

Categories	f	%
Subjective Sleep Quality		
Good	21	54,4
Fair	12	27,3
Very poor	8	18,2
Sleep Duration		
6-7 hours	7	17.1
5-6 hours	19	46.3
< 5 hours	15	36.6
Sleep Latency		
1-2	12	29.3
3-4	18	43.9
5-6	11	26.8
Sleep Efficiency		
>85%	10	24.4
75% - 84%	25	61.0
65%-74%	1	2.4
<65%	5	12.2
Sleep Disturbance		
0	1	2.4
1-9	13	31.7
10-18	21	51.2
19-27	6	14.6
Use of Medicine		
Never	14	34.1
1x per week	18	43.9
2x per week	8	19.5
>3x per week	1	2.4
Afternoon Disfunction		
0	1	2.4
1-2	17	41.5
3-4	9	22.0
5-6	14	34.1

Sleep disturbances, which impede the sleep process, such as snoring, movement disorders causing frequent awakenings, and nightmares, were reported by 51.2% of respondents with a sleep disturbance score of 10-18. Common disturbances include

waking up during the night, bathroom visits, difficulty breathing, coughing or snoring, feeling cold or hot at night, experiencing nightmares, and pain from illnesses, occurring about 1-2 times per week. The use of sleep medications reflects the severity of sleep disturbances, prescribed when an individual's sleep pattern is significantly disrupted. About 43.9% of patients use sleep medications once a week. Daytime dysfunction, scored at 1-2, was reported by 41.5% of respondents. This metric assesses the impact of sleep disturbances on daytime activities due to sleepiness and the level of enthusiasm in facing problems. A score of 1-2 indicates frequent sleepiness during activities approximately 1-2 times per week, with either low or moderate enthusiasm.

DISCUSSION

The research findings indicate that a significant portion, specifically 41 cancer patients undergoing chemotherapy, experience poor sleep quality. Numerous factors influence sleep quality in these patients, who frequently suffer from pain associated with the disease process. Supporting this, other studies have highlighted that poor sleep quality among cancer patients undergoing chemotherapy can be attributed to pain, fatigue, anxiety, depression, and inadequate social support.[8] Additionally, sleep quality is recognized as a crucial aspect of cancer patients' well-being, related to various factors such as anxiety, depression, pain, and treatment modalities.[4]

Cancer patients commonly struggle with initiating and maintaining sleep, leading to reduced sleep efficiency and symptoms such as excessive daytime sleepiness. Several factors contribute to poor sleep quality, including frequent awakenings for nursing procedures, pain, and concerns about the disease and its treatment.[9] The research further suggests that anxiety in cancer patients can exacerbate pain and disrupt sleep.[710] Additionally, factors such as pain from surgical procedures can impact the sleep quality of breast cancer patients undergoing chemotherapy.[11]

The duration of sleep reported by cancer patients ranges from 5 to 6 hours, predominantly among late adults and the elderly. According to the Ministry of Health, the sleep requirement for adults aged 18 to 40 years is 7 to 8 hours per day, but this need decreases with age to 7 hours per day. For individuals over 60 years, the sleep requirement further reduces to 6 hours per day.[12] The required sleep duration evolves through each sleep stage as an individual ages. Sleep consists of two main stages, NREM and REM, with a typical cycle lasting between 90 and 110 minutes. Generally, night-time sleep comprises 4 to 5 cycles spanning 7 to 8 hours, starting with NREM and progressing to REM stages. NREM stages 1, 2, and 3 last about 30 minutes, followed by stage 4 for approximately 20 minutes, then reverting through stages 3 and 2 for another 20 minutes, with the REM stage subsequently occurring and lasting for about 10 minutes. Stages 1 and 2 of NREM sleep are considered light sleep, whereas stages 3 and 4 are deep sleep.[13,14] Sleep disturbances are frequent in cancer patients due to various factors that impede achieving the necessary duration of sleep.[15]

Sleep latency refers to the period required for an individual to transition from wakefulness to sleep. On average, healthy individuals typically require between 10 to 20 minutes to reach this state, although sleep latency can vary significantly among different individuals. Instances of sleep latency less than eight minutes may occur due to prior sleep deprivation or underlying sleep disorders. During this phase, the brain produces alpha waves, indicating a state of mental rest and the onset of drowsiness. Alpha waves are generated as the brain transitions from a conscious to an unconscious state.[14]

In cancer patients, sleep latency can extend up to one hour. The physiological condition

of cancer patients can impair the body's responsiveness to stimuli from the Reticular Activating System (RAS), consequently hindering the initiation of sleep and prolonging sleep onset. The RAS, located in the upper region of the brain, is believed to contain specialized cells that maintain alertness and consciousness, and it mediates various stimuli, including visual, auditory, pain, tactile sensations, as well as emotional and cognitive processes.[13,14,16] Sleep latency is an integral component of sleep quality, thus serving as an indicator of whether an individual is achieving adequate sleep quality. Objective measurements of sleep latency provide a more accurate depiction by demonstrating how well an individual's sleep needs are met. Sleep latencies shorter than eight minutes may indicate sleep disorders such as narcolepsy, while sleep latencies exceeding 20 minutes could suggest the presence of insomnia.[17]

Sleep efficiency is generally determined by the percentage of time spent sleeping during the night, calculated as the total sleep time divided by the total time spent in bed. This measure is closely related to sleep latency, with both metrics providing insights into the quality of an individual's sleep. Extended sleep latency can reduce sleep efficiency, but it is not the only factor affecting it. Frequent awakenings during the night can also contribute to low sleep efficiency. For instance, cancer patients not only require more time to fall asleep but also often experience nocturnal awakenings due to various factors such as anxiety about their illness, symptoms, treatments like chemotherapy or radiotherapy, and hospitalization.[17,18]

A sound night's sleep aids in bodily recovery, and sleep disturbances that shorten sleep duration can adversely affect the body's metabolic functions. The transition between wakefulness and sleep involves complex neuronal processes. Various internal and external factors can disrupt the Ascending Reticular Activating System (ARAS), leading to increased wakefulness and decreased likelihood of falling asleep.[19] Sleep disturbances are common among cancer patients, particularly those undergoing chemotherapy. The most frequent causes of sleep disturbances include waking suddenly due to pain in the cancer-affected area, night-time, or early morning bathroom visits, feeling overheated, and experiencing nightmares.[11] Other research indicates that treatment side effects and psychological factors among cancer patients also contribute to sleep disturbances.[20]

CONCLUSION

Based on the seven components of the Pittsburgh Sleep Quality Index (PSQI)—which include sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction—all respondents exhibited poor sleep quality, as indicated by scores greater than 5.

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CONFLICT OF INTEREST

The authors declare no conflict of interest regarding the publication of this research. The study on sleep quality among chemotherapy-treated cancer patients was conducted with the sole aim of contributing to medical knowledge and improving patient care, without any financial or personal relationships that could potentially bias the findings or interpretation of the study results.

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