



Prevalence of sleep disorders in patients with advanced cancer: a cross-sectional study

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Background: Patients with advanced cancer are more susceptible to develop sleep disorders like insomnia, restlessness, hypersomnolence, and sleep apnea due to a series of stressful events and side effects of chemotherapeutic agents. Poor sleep quality is associated with bad cancer outcomes and substandard quality of life. The authors assessed the prevalence of sleep disorders among advanced cancer patients in a tertiary center in Nepal.

Methods: Patients with stage three and four solid malignancies were enrolled from February 2023 to July 2023 to assess their sleep status. The data were collected using the Pittsburgh Sleep Quality Index (PSQI) questionnaire, analyzed using the Statistical Package for the Social Sciences (SPSS) version 27, and subgroup exploration was done to assess the relationship of poor sleep quality with gender, marital status, malignancy type, and treatment received. An ethical clearance was obtained from the Institutional Review Committee (IRC).

Results: The authors evaluated data from 357 patients in the study. Of them, 58.3% were female and 41.7% were male. The mean age of the patients was 51.1 years. Among total cancer patients, 56% had significant sleep disorders. A significant association was observed between the quality of sleep and gender, type of malignancy, and treatment methods (p value < 0.05). A majority of the patients demonstrated increased sleep latency, struggling to fall asleep swiftly.

Conclusions: More than half of the patients had poor sleep, which has an adverse impact on the prognosis of the disease and quality of life of cancer patients. Therefore, this aspect of cancer management requires special consideration for better quality of life and appropriate end-of-life care.

Keywords: cancer, chemotherapy, quality of life, sleep disorder

Background

Sleep is an important element of life as the quality and quantity of sleep determines well-being and quality of life^[1]. Sound sleep is associated with the optimum functioning of mental and physical health including adequate and proper metabolism, memory, immune functions, cognition, and moral judgements^[2]. The patients once diagnosed with cancer are subjected to a series of events that are related to the diagnosis, hospital admission,

HIGHLIGHTS

- Patients with advanced cancer are more susceptible to develop sleep disorders.
- The prevalence of sleep disorder in these patients was evaluated.
- Among 357 patients with cancer, 56% had significant sleep disorder.
- Sleep quality requires special consideration for better quality of life.

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surgery, chemotherapy, and radiation that cause psychological stress^[1,3]. These stressful events as well as the usage of chemotherapeutic agents are related to sleep disorders like insomnia, restlessness, hypersomnolence, and sleep apnea^[4,5]. In addition, the patients with advanced cancer are exposed to different medications like opioids, which on chronic use are responsible for causing sleep disorders like disturbed sleep, fatigue, and daytime sleepiness^[6]. Therefore, sleep disorders are twice as prevalent in patients with advanced cancer in comparison to the general population^[5].

Sleep disorder leads to physical and psychological impairments like increased fatigability, mood changes, irritability, cognitive impairment, poor coordination, psychomotor retardation, decreased pain tolerance, weakened moral judgments, impaired immune function, and reduced host defenses^[2,3]. These effects due to the disruption of qualitative and quantitative sleep are

more pronounced in patients with advanced cancer because of associated psychological distress that occurs along with sleep disturbances, pain, fatigue, and anxiety, together in a phenomenon termed “symptom clusters”^[3]. Moreover, there are negative impacts of sleep disorders on the progression of cancer itself. Sleep disorders are independent risk factors associated with a higher risk of earlier death, rapid progression, and poor treatment response^[7]. On the other hand, group-based interventions helping patients with cancer to cope with their mental stress and sleep disorders are found to have a positive impact on the progression of the disease^[8].

Sleep disorder is one of the least studied and less prioritized aspects in cancer patients. Though studies across the globe have detected sleep disorders among cancer patients, no such studies have been conducted in Nepal^[5]. Thus, we targeted in estimating the prevalence of poor sleep quality among patients with advanced cancer at a tertiary center of Nepal and detecting the factors behind it.

Methods

Patients and data collection

This was a quantitative descriptive cross-sectional study conducted in a tertiary center of Nepal. An approval for the study was obtained from the Institutional Review Committee (IRC) (reference number 514 (6-11) E2). Informed consent was taken from the respondents after a complete explanation of the purpose and outcome of the research. Patients with advanced solid cancer (stage three and four) visiting the outpatient department (OPD) of Department of Medical Oncology of the center were enrolled. Patients who were critically ill enough to alter their mental status were not included in the study. The participants were selected by a convenient sampling method. Sample size was calculated as:

$$\begin{aligned} \text{Sample size } (n) &= Z^2 \times p \times (1-p)/e^2 \\ \text{or, } n &= (1.96)^2 \times 0.366 \times 0.634 / (0.05)^2 \\ \text{or, } n &= 357 \end{aligned}$$

where,

$$Z = 1.96 \text{ at } 95\% \text{ CI}$$

p (the proportion of the population with positive values as shown in the previous study) = 36.6%^[9].

$$q = 1 - p$$

$$e \text{ (margin of error)} = 5\%$$

The study has been reported in line with the Strengthening the Reporting of Cohort Studies in Surgery (STROCSS) criteria^[10].

Study variables

The aim and the method of study were explained to the patients and consent was taken. They were provided the form including the details like age, sex, address, type of malignancy, and the treatment methods received. Those unable to fill the form themselves were helped by researchers. Nineteen questions of the PSQI questionnaire related to sleep disorders were asked to the patients in simple terms in Nepali language. The remaining five questions were asked to the bed partner or a roommate (if available).

Statistical methods

The scoring system of the answers was based upon the guideline provided by a study on the PSQI instrument by Buysse *et al.*^[11] according to which only the questions answered by the patients

themselves are included in the scoring. The 19 questions responded by the patients were combined to form seven component scores, each of which has a range of 0–3 points. The score ‘0’ refers to no difficulty in sleep, while the score of ‘3’ refers to the most severe difficulty as perceived by the patients. The seven components used in the component scoring include subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction^[11]. The sum of each component’s score gave the global score which ranged from 0 to 21 points. The global PSQI score of more than five indicates that the patient is having severe difficulties in at least two areas or moderate difficulties in more than three areas, and was considered positive for having a sleep disorder in our study.

The collected data were entered into the Statistical Package for the Social Sciences (SPSS) version 27 for analysis. Verification, coding, and decoding of data were done; results were presented as frequencies and percentages; and subgroup analysis of different variables was done to assess the relationship of poor sleep quality with gender, marital status, malignancy type, and treatment received. In addition, subgroup analysis of the participants with good sleep and bad sleep was done under different categories, namely gender, marital status, malignancy type, and treatment received using a chi-square test, considering significant association for p value less than 0.05 at 95% CI.

Results

We enrolled 357 patients with advanced solid malignancies in the study. Of them, more than a half were female (58.3%), and 41.7% were male. The mean age of the patients was 51.1 years with the (standard deviation 3.53). We also evaluated the type of malignancy and treatment modality received by the patients. Our study depicted that malignancies affecting gastrointestinal (GI) system (31.4%) were most common followed by lung cancer (27.7%). More than two-thirds of total respondents (70.6%) received only chemotherapy, and 27.7% of them received combined treatment involving two or more among chemotherapy, surgery, and radiotherapy (Table 1).

Evaluation of the patients based on seven components of sleep, as mentioned above showed that 200 (56%) had significant sleep disorder. The mean global score was 7.1, and minimum and maximum scores were 0 and 20, respectively. Analysis of subgroup components of the PSQI questionnaire was done, which showed that increased sleep latency was the most common problem among cancer patients with an average score of 1.8. Similarly, the least number of patients used sleep medication (average score 0.3) (Table 2, Fig. 1).

Subgroup analysis of the participants using a χ^2 test, showed statistically significant association between quality of sleep and gender, type of malignancy, and treatment methods (p value < 0.05). However, no significant association was detected between sleep quality and marital status (Table 3).

Discussion

We evaluated patients with advanced solid malignancies based on the seven components including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction

Table 1
Demographic and tumor characteristics of patients. (N = 357).

Variables	Number, N (%)
Sex	
Male	149 (41.7)
Female	208 (58.3)
Education	
Illiterate	137 (38.4)
Primary	74 (20.7)
Lower secondary	14 (3.9)
SLC	51 (14.3)
Higher secondary	42 (11.8)
Graduate	39 (10.9)
Marital status	
Married	279 (78.2)
Single	51 (14.3)
Widower/widow	27 (7.6)
Religion	
Hindu	295 (82.6)
Buddhist	39 (10.9)
Christian	6 (1.7)
Muslim	8 (2.2)
Others	9 (2.5)
Caste	
Brahmin/Chhetri	161 (45.1)
Gurung/Magar	98 (27.5)
Newar	48 (13.4)
Others	50 (14.0)
Occupation	
Unemployed	187 (52.4)
Unskilled worker	99 (27.7)
Semi-skilled worker	35 (9.8)
Skilled worker	12 (3.4)
Clerical, shop-owner/farm	12 (3.4)
Semiprofessional	6 (1.7)
Professional	6 (1.7)
Living condition	
Living alone	18 (5.0)
Living with family	339 (95.0)
Monthly income of family (NRS)	
Less than 14 885	126 (35.3)
14 885–44 590	161 (45.1)
44 590–74 322	70 (19.6)
Mental illness	
Yes	3 (0.8)
No	354 (99.2)
Category	Number (%)
Cancer type	
Gastrointestinal	112 (31.4)
Lung	99 (27.7)
Breast	92 (25.8)
Urogenital	30 (8.4)
Others	24 (6.7)
Treatment methods	
Chemotherapy	252 (70.6)
Radiotherapy	3 (0.8)
Surgery	3 (0.8)
Combined	99 (27.7)

SLC, School Leaving Certificate.

using the PSQI questionnaire. The mean age of the participants was 51.1 years. This mean age of cancer diagnosis is low as compared to the global average age of cancer incidence, which is 65.7 years^[12]. Lower value of sex ratio (41.7% male and 58.3%

Table 2
Component score analysis of cancer patients. (N = 357).

Variable	Mean	SD	Minimum	Maximum
PSQI global score	7.1	0.7	0	20
Subjective sleep quality	1.4	0.8	0	3
Sleep latency	1.8	0.8	0	3
Sleep duration	0.5	0.7	0	3
Habitual sleep efficiency	0.5	0.5	0	3
Sleep disturbance	1.3	0.7	0	3
Use of sleep medication	0.3	0	0	3
Daytime dysfunction	1.1	1.4	0	3

PSQI, Pittsburgh Sleep Quality Index.

female) was seen in the current study. This sex distribution concurs with the national cancer burden of Nepal according to which 55% of total cancer patients in Nepal are female^[13].

It was detected that 200 (56.0%) of the total patients in the present study had significant sleep disorder with a global PSQI score more than five. A study by Chandra A. *et al.*^[14] among 206 adults illustrated that the prevalence of insomnia in Nepalese adult population is 36.9%. This suggests that the prevalence of poor sleep is higher among cancer patients in comparison to the general population of Nepal. In addition, the finding of this study is in line with similar studies conducted previously, illustrating a higher prevalence of sleep disorders among cancer patients^[1,5,15,16]. However, the evaluation of sleep status among cancer patients in Turkey depicted that 40.4% had bad sleep which is lower than the finding of this study^[16]. This disparity might be because of the fact that we recruited only the patients having cancer at advanced stages, most of whom were on chemotherapy. Both of these factors (advanced stage and chemotherapy) have a negative impact on the mental health of patients, leading to poor sleep habits^[4].

On analyzing the individual components of the PSQI questionnaire, the study showed that the most common sleep disorder was increased sleep latency, that is most of the poor sleepers had difficulty in falling asleep. It might be because of associated anxiety and stress in these patients, which increase the duration of sleep latency^[17]. In contrast, a similar study showed that habitual sleep efficiency was the most common sleep disorder component among cancer patients^[5].

We analyzed the relationship between poor sleep and the demographic characteristics of the respondents. Out of 200

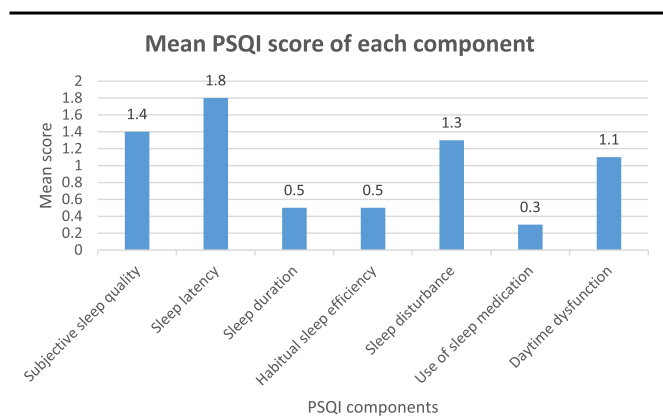


Figure 1. Bar graph. PSQI, Pittsburgh Sleep Quality Index.

Table 3
The relationship between sleep status and patient characteristics.
(N = 357).

Categories	Bad sleep (N= 200)	Good sleep (N= 157)	Total	P
Sex				< 0.05
Male	96	53	149	
Female	104	104	208	
Marital status				0.21
Married	149	130	279	
Single	24	27	51	
Widower/widow	27	0	27	
Malignancy				< 0.05
Gastrointestinal	50	62	112	
Lung	75	24	99	
Breast	42	50	92	
Urogenital	15	15	30	
Others	18	6	24	
Treatment				< 0.05
Chemotherapy	162	90	252	
Radiotherapy	3	0	3	
Surgery	3	0	3	
Combined therapy	32	67	99	

patients with poor sleep quality, 96 were male and 104 were female with a significant relationship (p value <0.05) between sleep quality and the sex of the patients. In contrast, sleep quality did not have a significant association with the sex of the patients in a similar study by Akman and colleagues conducted in a similar setting. Similarly, of total 279 married individuals, 149 had bad sleep and 130 were good sleepers. Our study showed that abnormal sleep patterns did not have any association with marital status (p value <0.05). This finding corresponds with the finding in the study by Akman *et al.*^[16].

The present study pictured that the most common malignancy among bad sleepers was lung ($n = 75$), and in good sleepers was gastrointestinal cancers ($n = 62$). The poor sleep patterns had a significant association with the type of malignancy (p value <0.05). This finding corresponds with a previous study that demonstrated the prevalence of poor sleep in 56% of patients with lung cancer^[3]. Additionally, in comparison to patients with breast cancer, patients with lung cancer had worse sleep in a study by Silberfarb *et al.*^[18], which showed that lung cancer patients slept as poorly as insomniacs did. In addition, the analysis of the cancer patients on treatment methods illustrated a significant association between the treatment approach used and sleep quality (p value <0.05). This finding agrees with a previous similar study by Nishiura *et al.*^[3] conducted among patients with lung cancer. Thus the present study depicted that except for marital status, other demographic features and cancer characteristics had a significant impact on the sleep status of cancer patients.

In this study, we analyzed the association between cancer at an advanced stage with the sleep pattern of the patients. Studies have proven that the burden of poor sleep is associated with poor quality of life in patients with cancer affecting their physical, psychological, emotional, and social health. This increases the number and duration of hospital admissions and lays a further burden upon the national economy^[19]. As this study shows a higher burden of sleep disorders in patients with advanced solid

malignancies, we suggest that this aspect of cancer management needs proper attention and utmost treatment to achieve quality of life, good prognosis, and appropriate end-of-life care in cancer patients.

However, there are certain limitations of this study. As we included only cases of solid malignancies, which are more common at older ages, the finding is not generalizable to all age groups. Other potential factors to affect the sleep quality of patients like the type of chemotherapeutic agent received, analgesics used, and metastasis site(s) were not taken into account for subgroup analysis. This study was conducted only in a tertiary center of Nepal, therefore, it does not reflect the actual scenario of sleep disorders among patients with advanced cancer in Nepal. Therefore, we suggest a multicentral study with a longitudinal design to assess the subjective and objective aspects of sleep disorder among cancer patients and to determine other associated facets of sleep disorder in them.

Conclusions

In this study we determined the prevalence of sleep disorder in patients with advanced cancer at a tertiary center of Nepal. The present study showed that sleep disorder is an issue of paramount importance, which is present in more than half of the patients with advanced cancer irrespective of cancer type and treatment modality. Most of the participants had difficulty falling asleep with an increased sleep latency period. To detect the associated factors of sleep disorder among cancer patients, we recommend a multicentral study with a longitudinal design encompassing the subjective and objective aspects.

Ethical approval

Ethical approval for study was provided by the Institutional Review Committee (IRC), Institute of Medicine (IOM) on May 12, 2023 (reference number 514 (6-11)E2).

Consent

Written informed consent was obtained from the patient for publication and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

S.G.: conceptualization, data curation, formal analysis, investigation, methodology, project administration, resources, software, supervision, validation, visualization, writing—original draft, writing—review and editing. S.T.: data curation, formal analysis, investigation, methodology, project administration, resources, software, writing—original draft, writing—review and editing. G.S.S.: data curation, formal analysis, investigation, methodology, writing—review and editing. B.P.: data curation, formal analysis, investigation, methodology, writing—review and editing. A.U.: data curation, formal analysis, investigation,

methodology, writing—review and editing. B.P.: data curation, formal analysis, investigation, methodology, writing—review and editing. B.G.: data curation, formal analysis, investigation, methodology, writing—review and editing. P.K.: data curation, formal analysis, investigation, methodology, writing—review and editing. R.S.: data curation, formal analysis, investigation, methodology, writing—review and editing. B.P.: formal analysis, investigation, methodology, writing—review and editing, supervision, validation.

Conflicts of interest disclosure

The authors declares no conflicts of interest.

Research registration unique identifying number (UIN)

This study is registered at <http://www.researchregistry.com>. The unique identifying number is researchregistry10097. Hyperlink to the registration: <https://www.researchregistry.com/browse-the-registry#home/>.

Guarantor

Dr Siddinath Gyawali.

Data availability statement

Data are available upon reasonable requests.

Provenance and peer review

My paper was not invited.

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