Determinants of Sleep Quality in Cancer Patients: A Tertiary Center Experience from Punjab, Pakistan

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Abstract

Background: Cancer diagnosis and treatment can trigger and/or worsen insomnia. This is a double-edged sword as sleep disturbances then exacerbate cancer symptoms.

Objectives: To determine the sleep quality in cancer patients as well as the relationship of sleep quality with socioeconomic status, financial burden, marital status, Eastern Cooperative Oncology Group (ECOG) performance status, pain, use of analgesia, and type of cancer.

Materials and Methods: An analytical cross-sectional study was carried out with 100 adult and pediatric cancer patients presenting to Mayo Hospital, Lahore. The Urdu version of the Pittsburg Sleep Quality Index (PSQI-U), Numerical Rating Scale (NRS), and Eastern Cooperative Oncology Group (ECOG) score were used to determine the quality of sleep, the intensity of pain, and performance status respectively. Statistical analysis was carried out using SPSS software version 26. Binary logistic regression was used to assess factors associated with sleep quality (defined by a cutoff value of ≥5 on the PSQI scale). Variables with p-value <0.25 were used to build the final multivariable regression model.

Results: A total of 100 participants, with a mean age of 40.2 ± 19.7 years, and a male gender predilection (88%) were enrolled in the study. Non-hematological malignancies accounted for 62% of all patients while 80% of the participants were suffering from stage 4 cancer. The mean PSQI score was 11.56 ± 5.70. Sleep quality was associated with increasing age, marital status, employment status, pain incidence, increasing ECOG status, and undergoing chemotherapy on univariate analysis. On the multivariable model, increasing age and increasing ECOG scores were independent predictors of sleep quality.

Conclusion: Cancer patients have poor sleep quality which is linked with advanced disease, aging, pain, and poor performance status. Medical, behavioral, and psychological interventions can help in alleviating the sleep problems faced by these patients.

Keywords: *Cancer, sleep quality, quality of life, sleep-wake disorders, performance status, cancer pain.*

INTRODUCTION

According to Globocan 2018 estimates, there are 18.1 million prevalent cases of cancer worldwide, with an estimated 9.6 million cancer-related deaths occurring each year [1]. The International Agency for Research on Cancer (IARC) has estimated that 173,937 new cases of cancer emerged in Pakistan in the year 2018 [1]. Many elements appear to be the reason for this increase, especially an aging population, as well as ubiquitous exposure to carcinogens due to socio-economic evolution. It is projected that by the year 2030, cancer cases will reach up to 21.7 million, and 13 million people will die of cancer each year [2].

Cancer affects the quality of life of patients in multiple ways, including the quality of sleep. Sleep quality is an index to good health; insomnia and poor sleep are linked with an increased risk of heart and kidney disease, hypertension, and weakened immunity, and can cause pain intolerance, depression, irritability, and easy fatigability [3]. Insomnia can manifest as difficulty in falling asleep; waking up several times during sleep; and difficulty in going back to sleep; all of which result in increased sleepiness during morning hours and impairment in daily activities [4]. Cancer diagnosis and treatment are associated with mental distress which is thought to trigger and worsen insomnia symptoms [5, 6], leading to poor sleep adequacy, early rising, and excessive morning sleepiness [7].

Multiple factors associated with cancer diagnosis and treatment can affect sleep: for instance, the frequency and severity of cancer symptoms, or cancer pain can all cause sleep disturbances [8]. Poor sleep can also influence the progression and outcome of cancer: for instance, breast cancer patients with sleep disturbances have been found to have a poor prognosis [9]. This dilemma is a double-edged sword: cancer symptoms may cause poor sleep which may exacerbate cancer

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symptoms [10, 11]. Factors such as cancer diagnosis, effects of therapy, psychological problems, and financial burdens play a major role in this [12].

The purpose of this study was to determine the sleep quality in patients diagnosed with advanced cancer presentations at a tertiary care center using the Pittsburgh Sleep Quality Index-Urdu scale (PSQI-U) and to find the prevalent factors associated with poor sleep, to adapt cancer care and palliative management strategies to improve the quality-of-life indicators for cancer patients.

MATERIALS AND METHODS

In this cross-sectional study, data were collected prospectively from patients presenting in the outpatient department (OPD) as well as from inpatients in the Oncology and Pediatric Oncology departments of Mayo Hospital Lahore, over 6 months from June to November 2019. Mayo Hospital is a tertiary care 3000-bedded hospital in the center of Lahore with a robust oncology department providing medical and radiation oncology services for both adult and pediatric patients, with the availability of diagnostic and imaging modalities, as well as multidisciplinary care.

Cancer patients with previously diagnosed mental health or sleep disorder or patients using prescribed sleeping pills, anti-depressants, or anti-anxiety medications were excluded from the study. Non-probability convenience sampling was used to enroll one hundred cancer patients from both adult and pediatric populations who fit the inclusion criteria throughout the study; due to the lower frequency of admissions in the Pediatric Oncology ward, the majority of the participants were adult patients. Ethical approval for data collection was taken from the Institutional Review Board of King Edward Medical University, Lahore (172/RC/KEMU), and informed consent was taken from all patients before enrollment in the research.

The quality of sleep was determined through the Pittsburgh Sleep Quality Index-Urdu scale (PSQI-U); a standardized, self-administered survey form that determines sleep disturbances [13]. From a global maximum score of 21, a threshold score of >5 can distinguish between good and poor sleep [14]. To establish the components associated with poor sleep, demographic and patient data including socioeconomic status, family burden, prior hospitalizations, comorbid diseases, staging of disease, awareness of prognosis, type of treatment protocol, and family support were assessed separately. The pain was assessed on a numerical rating scale (NRS) from 0-10, with 0 defined as no pain; 1-3 defined as mild pain; 4-6 defined as moderate pain; 7-9 defined as severe pain; and 10 as the worst imaginable pain. The Eastern Cooperative Oncology Group (ECOG) score was used to assess the performance status of patients.

Data were entered and analyzed through Statistical Product and Service Solutions (SPSS) software version 26.0. Descriptive statistical methods were used to analyze the recorded data, with quantitative variables presented as mean ± SD, and qualitative variables presented as frequency and percentages. Binary logistic regression was used to assess factors associated with sleep quality (defined by a cutoff value of ≥5 on the PSQI scale). Variables with p-value <0.25 were used to build the final multivariable regression model. The assumption of multi-collinearity was assessed for a multivariable model calculating variance inflation factor (VIF). VIF values of more than 10 were considered as an indication of multi-collinearity. None of the variables showed VIF >10, and hence there was no multi-collinearity in the study. P-values less than or equal to 0.05 were taken as statistically significant on the final regression model.

RESULTS

Table **1** highlights the key demographic characteristics of the patients. Nearly half of the patients (n=46, 46%) were either newly diagnosed or diagnosed with cancer within the preceding 6 months; 80 (80%) presented with stage 4 cancer. Only 5 (5%) of the patients had presented with a disease recurrence, with the average disease-free period being 0.31 ± 1.6 months. 47 (47%) of the patients were facing disablement, with poor ECOG performance status scores of 3 (30%) and 4 (17%). In 55 (55%) of the patients, the first symptom of cancer was present 1 month before the diagnosis, with 90% of the patients contacting an oncologist within 6 months of the diagnosis. Among the 79 (79%) who were aware of their diagnosis, only 61 (61%) had awareness of the final prognosis of their disease. In 78 (78%) of the patients, the treatment intention was only palliative.

Table 1: Demographic and patient characteristics.

Demographic and Patient Variable	Frequency (percentage) or Mean ± SD
Age	40.20 ± 19.7 years
Gender	Male = 88 (88%) Female = 12 (12%)
Marital status	Married = 71 (71%) Unmarried = 29 (29%)
Employment status at the time of study	Employed = 17 (17%) Unemployed = 83 (83%)
Frequency of tumors	Solid (breast, gastric, colorectal, lung, head, and neck, urogenital cancers, and sarcomas) = 62 (62%) Hematological = 38 (38%)
The average number of hospital visits per month	2.54 ± 2.10 days
Average time spent in hospital per month	7.0 ± 6.81 days
Source of funding for treatment	Family = 64 (64%) Self-funded = 20 (20%) Bait-ul-Maal* = 3 (3%) Hospital = 7 (7%) Other = 6 (6%)

* The Bait-ul-Maal is a government repository for helping needy people.

Among 70 (70%) of the patients, the pain was a major complaint, with the average pain score on the Numerical rating scale (NRS) being 5.85 ± 2.32. 31 (31%) patients reported pain lasting more than 50% of the day, with 28 (28%) describing the intensity of pain over 24 hours duration as severe. The mainstay of pain management was morphine and its derivatives (n=49; 49%). Of the patients included, 71 (71%) were receiving chemotherapy at the time of the study, mostly with alkylating agents (n=29; 29%) and alkaloids (n=12; 12%). Subjective improvement was reported by 59 (59%) of the patients, with 26 (26%) getting worse after treatment.

The mean PSQI score was 11.56 ± 5.70. Almost three-fourths of the studied sample encountered poor sleep quality (76%). Table **2** shows the association of various factors with sleep quality. On univariate analysis, the likelihood of poor sleep quality was associated with increasing age (OR=1.07, 95% CI: 1.04-1.12). Odds of poor sleep quality were significantly higher among married than unmarried (OR=5.69, 95% CI: 2.12-15.30); unemployed than employed (OR=7.04, 95% CI: 2.28-21.66); and patients reporting pain incidence (OR=3.22, 95% CI: 1.24-8.41). Increasing ECOG status was also associated with an increased risk of poor sleep quality (OR=3.52, 95% CI: 2.04-6.09). On the multivariable model after adjusting with other covariates, increasing age (OR=1.07, 95% CI: 1.01-1.13) and ECOG status (OR=2.79, 95% CI: 1.45-5.37) were found to be independent predictors of sleep quality.

Table 2: Factors associated with poor sleep quality of univariate and multivariable analysis.

Variables	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age(in years)	1.07(1.04-1.12)	**<0.001	1.07(1.01-1.13)	*0.027
Gender				
Male	2.59 (0.74-9.09)	0.137	-	-
Female	Ref		-	-
Marital status				
Married	5.69 (2.12-15.30)	**0.001	0.46 (0.06-3.24)	0.438
Unmarried	Ref		Ref	
Current employment status				
Unemployed	7.04 (2.28-21.66)	**0.001	1.28 (0.27-5.98)	0.751
Employed	Ref		Ref	
Patients is aware of disease diagnosis				
Yes	0.69 (0.21-2.31)	0.551	-	-
No	Ref		-	-
Cancer stage				
Stage 0-2	0.45 (0.07-2.88)	0.401	-	-
Stage 3-4	Ref		-	-
Patient was newly diagnosed				
Yes	2 (0.76-5.22)	0.157	1.77 (0.47-6.58)	0.393
No	Ref		Ref	
Do you have pain				
Yes	3.22 (1.24-8.41)	*0.017	1.54 (0.42-5.55)	0.509
No	Ref		Ref	
ECOG status	3.52 (2.04-6.09)	**<0.001	2.79 (1.45-5.37)	**0.002
Patient is receiving chemotherapy				
Yes	0.41(0.12-1.32)	0.135	1.22(0.25-5.72)	0.805
No	Ref		Ref	

CI: Confidence interval, OR=odds ratio,

aOR: adjusted odds ratio, Ref: Reference category

*Significant at p<0.05, **Significant at p<0.01

DISCUSSION

Sleep disturbances in cancer patients are linked to dire physical and psychological consequences. These include low quality of life, depression, impaired functional status, and early mortality [15-17]. Our study reported a significantly high frequency of poor sleep among cancer sufferers in the Pakistani population, with a Global Sleep Quality score of 11.56 ± 5.70 derived from the PSQI questionnaire. This indicates that cancer patients have poor sleep quality, using a value ≥5 as a cutoff value [14]. Previously, Owen also used PSQI to study sleep quality in cancer patients and reported similar results regarding poor sleep quality [18].

Studies have shown that elderly patients had difficulty initiating and maintaining sleep [19]. This is following our results which show that the elderly had poorer PSQI scores than children and middle-aged patients, and that increasing age was an independent predictor of sleep quality on multivariate analysis (OR=1.07, 95% CI: 1.01-1.13).

Fatigue has previously been linked with poor sleep quality in cancer survivors [20]; in our study, PSQI worsened with increased ECOG scores, with patients experiencing more trouble sleeping at night and increased daytime drowsiness. ECOG status was found to be an independent predictor of sleep quality in our study (OR=2.79, 95% CI: 1.45-5.37), highlighting the importance of physical and functional limitations on sleep quality.

Pain has previously been shown as one of the major causes of poor sleep quality [21-23]. Presence and frequency of pain both resulted in higher PQSI scores and thus poor sleep quality according to our study. The co-existence of pain and sleep disturbance harms the quality of life in cancer patients [24]. In our study patients who reported pain had higher odds of having poor sleep quality on univariate analysis (OR=3.22, 95% CI: 1.24-8.41), highlighting the potential importance of adequate cancer pain control.

Symptoms of cancer can influence sleep, *i.e.*, hot flushes, cough, frequent nocturnal urination, *etc.*, are all linked with disturbed sleeping. Although no significant association was reported between cancer symptoms

and sleep quality in our study, this can be attributable to a relatively low sample size and wide heterogeneity among presenting symptoms. Studying sleep in cancer patients and the factors which affect it can help oncologists to modify certain factors and make improvements in the standard of care being provided to patients. Behavioral psychotherapy and other psychological interventions have been found to improve sleep quality and cancer-related fatigue [25].

There are certain limitations in our study: the sample size is limited to an adult, male predilection. The PSQI is a subjective measure and does not objectively measure actual sleep disturbances in cancer patients. Moreover, some studies question its sensitivity in measuring sleep quality in cancer patients as it does not detect the increase in sleep problems with radiotherapy and chemotherapy, which have been shown by more objective measures [26]. Using a combined objective assessment with polysomnography would provide a more direct view of the sleep problems prevalent among terminally ill cancer patients. Nevertheless, the study clearly shows a significant correlation between pain and performance status with sleep quality and delineates modifiable factors which can improve sleep quality.

CONCLUSION

Our study showed a significant incidence of poor sleep quality among advanced cancer patients determined by the Pittsburg Sleep Quality Index (PSQI) scale. Increasing age and ECOG status were found to be independent predictors of sleep quality in our study, and an association was found between poor sleep and pain, marital, and employment status. We recommend that in patients with advanced cancer, screening for sleep disorders should be carried out on initial presentation, and a multidisciplinary approach with behavior modifications, pain management, and psychological counseling should be carried out in such patients.

ETHICAL APPROVAL

Ethical approval for data collection was taken from the Institutional Review Board of King Edward Medical University, Lahore (172/RC/KEMU). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the Helsinki declaration.

CONSENT FOR PUBLICATION

Written informed consent was taken from the participants.

AVAILABILITY OF DATA

Data is available from the corresponding author on a reasonable request.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR'S CONTRIBUTION

All the authors contributed to the publication of this article.

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