

# Cancer-Related Dysfunctional Beliefs about Sleep May Influence Insomnia of Cancer Patients Regardless of Depressive Symptoms

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**Background and Objective** Depression is one of the major causes of insomnia among cancer patients, and should be explored among cancer patients who are suffering from insomnia. The objective of this study was to explore whether dysfunctional beliefs about sleep among cancer patients were associated with insomnia independent of depression.

**Methods** Medical records of patients who visited Asan Medical Center sleep clinic for cancer were reviewed retrospectively from January to November of 2017. The data included the patient's psychiatric symptoms and assessment of sleep disorders Insomnia Severity Index (ISI), Patient's Health Questionnaire-9 (PHQ-9), State-Trait Anxiety Inventory (STAI), Fear of Progression (FoP), and Cancer-related Dysfunctional Beliefs about Sleep (C-DBS) and a clinical interview.

**Results** Results indicated that ISI score was significantly correlated with PHQ-9, FoP, and C-DBS scores, and C-DBS score was significantly correlated with ISI, PHQ-9, and FoP scores all,  $p < 0.01$ . The ISI and C-DBS scores were not significantly correlated with age and the STAI-State scale. Linear regression analysis revealed that C-DBS ( $\beta = 0.40$ ,  $p < 0.001$ ) and PHQ-9 scores ( $\beta = 0.30$ ,  $p < 0.01$ ) predicted ISI scores among all participants. Among participants who were not depressed (PHQ-9 score  $\leq 9$ ), C-DBS scores were the only predictor for ISI scores ( $\beta = 0.46$ ,  $p < 0.001$ ).

**Conclusions** Dysfunctional beliefs about sleep in cancer patients were significantly associated with severity of insomnia, independent of depression. **Sleep Med Res 2019;10(1):31-35**

**Key Words** Insomnia, Cancer, Sleep, Sleep-related cognition.

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## INTRODUCTION

Sleep disturbance is a common symptom in cancer patients in all stages [1]. Patients suffer from sleep disturbance when they are diagnosed with cancer and undergo treatment such as chemotherapy, radiation therapy, and hormonal therapy [2]. Physical symptoms of cancer such as nausea, pain, vomiting, or hot flush can also cause insomnia. When cancer patients have difficulty sleeping, they often worry about the negative effects of insomnia. Many cancer patients believe that their disease could progress or metastasize because of their poor sleep quality [3,4]. They also have rigid beliefs about sleep timing (usually around 10 pm–2 am) and believe it is necessary to maintain good immune functioning. These beliefs are often maintained because they are supported by medical evidence. For example, one study reported the association between short sleep duration and high risk of cancer [5]. Sleep disturbance may in fact influence immune dysfunction via melatonin [6]. However, despite being true, these beliefs could still be dysfunctional, and can precipitate and perpetuate insomnia symptoms.

In one of our previous studies, we developed two items that directly address cancer-related dysfunctional beliefs about sleep (C-DBS) in cancer patients in addition to general dysfunctional

beliefs about sleep that are usually held by insomnia patients [3]. The cancer-specific items were “(Q1) My immune system will suffer if I don’t go to sleep at a certain time.” and “(Q2) If I don’t sleep well at night, my cancer may recur or metastasize.” In our previous study, Q1 item scores were significantly related with the severity of insomnia and fear of disease progression. Additionally, Q2 item scores were significantly associated with young age and insomnia severity, depression, and fear of disease progression. Dysfunctional beliefs about sleep were correlated not only with insomnia but also depression among cancer patients.

Depression is very common among cancer patients, and the prevalence of depression ranges from 5.6–24.0% among cancer patients [7-10]. Depression further exacerbates physical symptoms and functional impairment of cancer patients, which could result in poor treatment adherence [11]. For example, depression increases the distress of fatigue, cognitive dysfunction, and anxiety in cancer patients. Depression also causes physical pain, and has negative effects on immune function and survival of cancer patients [12].

Depression and insomnia significantly influence each other bidirectionally [13,14]. Insomnia is included in the diagnostic criteria of depression based on the Diagnostic and Statistical Manual, fifth version (DSM-5) [15], and insomnia can be a predictor of depression [14]. Patients who suffer from depression usually have cognitive distortions which may be related with sleep-related dysfunctional beliefs [16]. For primary insomnia patients, the degree of dysfunctional beliefs about sleep was associated with depression [17] and mediated the relationship between depression and sleep quality [18]. One of our previous studies reported that dysfunctional beliefs about sleep was associated with depression among cancer patients [3]. From those reports, we can speculate that depressive symptoms in cancer patients may influence dysfunctional beliefs about sleep, and may, in turn, aggravate insomnia symptoms. Since depression is one of the major causes of insomnia in cancer patients [19], it is important to explore the existence of depression among cancer patients. The objective of this study was to explore whether dysfunctional beliefs about sleep among cancer patients was associated with insomnia, independent of depression.

## METHODS

The protocol of this retrospective medical records review study was approved by the Asan Medical Center Institutional Review Board (2018-0130), which waived the requirement for informed consent. During their first visit, participants were routinely evaluated for psychiatric symptoms with the Insomnia Severity Index (ISI) [20], Patient’s Health Questionnaire-9 (PHQ-9) [21], state subcategory of the State-Trait Anxiety Inventory (STAI) [22], Fear of Progression (FoP) [23], and C-

DBS [3], and psychiatric diagnosis was established by clinical interview with psychiatrists. Sleep disorders were assessed with clinical interview by psychiatrists who were trained in sleep medicine (S. C. & S. Y.).

Medical records of patients who visited Asan Medical Center sleep clinic for cancer patients were reviewed retrospectively from January to November of 2017. We included a total of 264 subjects that met the following criteria: 1) self-report questionnaire scores were completely recorded in medical records, 2) never diagnosed with major psychotic disorders such as schizophrenia or bipolar disorders, 3) never diagnosed with organic brain disorders or brain metastasis, 4) no other sleep disorders such as restless legs syndrome or suspicious of obstructive sleep apnea, and 5) cancer types were gradable using the TNM staging system.

## Statistical Analysis

Statistical analyses were performed using SPSS version 21.0 for Windows (IBM Corp., Armonk, NY, USA). Correlation and regression analyses were performed, and the level of signifi-

**Table 1.** Clinical characteristics of the study subjects

Variable	Subjects (n = 234)
Female, n (%)	157 (67.1)
Age (years)	54.0 ± 11.2
Cancer type (%)	
Breast	113 (48.3)
Lung	28 (12.0)
Pancreatic and biliary tract	26 (11.1)
Gastro-esophageal	26 (11.1)
Colorectal	15 (6.4)
Urinary tract	8 (3.4)
Kidney	6 (2.6)
Liver	5 (2.1)
Thyroid	4 (1.7)
Others	3 (1.3)
Cancer stages (%)	
Stage 0	5 (2.1)
Stage I	52 (22.2)
Stage II	72 (30.8)
Stage III	45 (19.2)
Stage IV	60 (25.6)
Psychiatric diagnosis (%)	
No diagnosis	22 (9.4)
Acute stress reaction/adjustment disorder	12 (5.1)
Major depressive disorder	94 (40.2)
Insomnia	75 (32.1)
Anxiety disorder/somatic symptom disorder	29 (12.4)
Others	2 (0.9)

cance was defined as  $p < 0.05$  in two-tailed tests.

## RESULTS

The mean age of participants was  $54.0 \pm 11.2$  years old, and 67.1% were female. The most common cancer types were breast (48.3%), lung (12.0%), pancreatic and biliary tract (11.1%), and gastro-esophageal cancers (11.1%) (Table 1). Subjects' cancer stages were 0 (2.1%), I (22.2%), II (30.8%), III (19.2%), and IV (25.6%). The most common psychiatric diagnoses were major depressive disorder (40.2%) and insomnia (32.1%). Based on PHQ-9 score, participants were divided into depressed (PHQ-9 score  $> 9$ ,  $n = 137$ ) and not depressed (PHQ-9 score  $\leq 9$ ,  $n = 97$ ) [24]. When comparing the two groups, all scores on self-report questionnaires were significantly higher in depressed subjects than not depressed subjects (Table 2). Among all subjects, ISI score was significantly correlated with PHQ-9, FoP, and C-DBS scores, and C-DBS score was significantly correlated with ISI, PHQ-9, and FoP scores. The ISI and C-DBS scores were not

**Table 2.** Clinical characteristics of patients who were depressed or not

	Depressed (n = 137)	Not depressed (n = 97)	p-value
Male/female, n (%)	54 / 95 (36.2/63.8)	28 / 87 (24.3/75.7)	0.04
Age (years)	$54.4 \pm 11.6$	$53.6 \pm 10.7$	0.58
Rating scales score			
ISI	$17.5 \pm 5.8$	$13.6 \pm 5.7$	$< 0.01$
FoP	$41.1 \pm 10.8$	$30.8 \pm 9.8$	$< 0.01$
State subcategory of STAI	$41.3 \pm 10.0$	$38.5 \pm 9.2$	0.03
C-DBS	$12.7 \pm 5.4$	$11.0 \pm 5.8$	0.02

ISI: Insomnia Severity Index, FoP: Fear of Progression, STAI: State-Trait Anxiety Inventory, C-DBS: Cancer-related Dysfunctional Beliefs about Sleep.

**Table 3.** Pearson's correlation analysis of insomnia and dysfunctional beliefs with age and self-report questionnaires scores

	ISI	C-DBS
Age	0.004	-0.09
Self-report questionnaires		
ISI	-	0.47*
PHQ-9	0.38*	0.20*
FoP	0.20*	0.35*
C-DBS	0.47*	-
State subcategory of STAI	0.03	-0.01

\* $p < 0.01$ .

ISI: Insomnia Severity Index, C-DBS: Cancer-related Dysfunctional Beliefs about Sleep, PHQ-9: Patient's Health Questionnaire-9, FoP: Fear of Progression, STAI: State-Trait Anxiety Inventory.

significantly correlated with age and the STAI-state scale (Table 3).

Linear regression analysis results indicated that when age and symptoms rating scales scores (such as ISI, PHQ-9, STAI, FoP, and C-DBS) were included as covariates, C-DBS and PHQ-9 scores significantly predicted ISI scores ( $F = 48.6$ ,  $p < 0.001$ ) (Table 4). Among subjects who were not depressed (PHQ-9 score  $\leq 9$ ), the C-DBS score was the only predictor for ISI scores ( $F = 25.9$ ,  $p < 0.001$ ).

## DISCUSSION

In this study, C-DBS and depressive symptoms were significantly associated with severity of insomnia. Higher C-DBS score were also significantly associated with the severity of insomnia among cancer patients who did not report depressive symptoms. Thus, this indicates that cancer-related dysfunctional beliefs about sleep were significantly associated with severity of insomnia, independent of depressive symptoms.

Among patients with primary insomnia, dysfunctional beliefs about sleep are associated with insomnia symptoms [25], and reduction in those beliefs may improve insomnia [26]. However, dysfunctional beliefs are also associated with patients' depressive symptoms [27]. Depressed mood may be related with negative beliefs, and it is important to tease apart the relationship between dysfunctional beliefs and insomnia, regardless of depression. One study reported that even after controlling for the effects of depressive symptoms, beliefs about sleep in patients with major depressive disorder or fibromyalgia were as dysfunctional as those of primary insomnia sufferers and were even more dysfunctional than those of good sleepers [27].

In this study, dysfunctional beliefs about sleep were significantly associated with insomnia regardless of depression in cancer patients. C-DBS seems to have strong association with depressive symptoms in cancer patients. Patients suffering from depression usually have cognitive distortions, which may be related dysfunctional beliefs about sleep [16]. This study was to

**Table 4.** Results of linear regression analysis of clinical predictors for the severity of insomnia

	Model	$\beta$	SE	p-value
All subjects (n = 234)				
C-DBS	$F = 48.6$ ,	0.40	0.06	$< 0.001$
PHQ-9	$p < 0.001$	0.30	0.06	$< 0.001$
Not depressed (n = 97)*				
C-DBS	$F = 25.9$ ,	0.46	0.09	$< 0.001$
	$p < 0.001$			

Regression analysis was adjusted for age, symptoms rating scales scores (such as Insomnia Severity Index, Patient's Health Questionnaire-9, State-Trait Anxiety Inventory, Fear of Progression, C-DBS). \*PHQ-9 score  $\leq 9$ .

SE: standard error, C-DBS: Cancer-related Dysfunctional Beliefs about Sleep, PHQ-9: Patient Health Questionnaire-9.

explore whether C-DBS is associated with insomnia independent of depression, and it showed meaningful relationship between C-DBS and insomnia even in the patients who did not have depression.

Dysfunctional beliefs can also be influenced by available knowledge. The modern era makes it possible for patients to easily access information about insomnia and its adverse effects. This could lead to an increased possibility of conceiving negative belief about insomnia and its negative effects on health and life [28].

However, it is still remains controversial whether correcting dysfunctional beliefs could improve sleep quality. One study reported that improvement in dysfunctional beliefs following cognitive-behavioral therapy for insomnia (CBT-I) did not result in improvement in insomnia [29]. However, this evidence is not sufficient to question the efficacy of CBT-I. Findings from another study suggest that improvement in negative beliefs after CBT-I could result in considerable and maintained improvements in symptoms of insomnia and psychosocial deterioration [26]. Although the total score of DBAS does not tend to be correlated with total sleep time and total wake time variables [17], change in dysfunctional beliefs seems to have positive effect on general perceptions about sleep quality, distress, and daytime functioning. In this respect, we can still think of dysfunctional beliefs as an essential target of insomnia treatment.

This study is a retrospective study assessing cancer patient's symptoms. One limitation of the study was that objective sleep data, such as polysomnography or actigraphy were not measured, and other sleep disorders such as periodic limb movement disorder or obstructive sleep apnea were not completely ruled out. Finally, individual subjects of the study sample had different cancer sites, stages, and each of them received different treatment. This could be the reason why many studies on insomnia of cancer patients show inconsistent results, and future studies should consider sample heterogeneity as one of the confounding variables.

In conclusion, cancer-related dysfunctional beliefs about sleep were useful in predicting insomnia severity regardless of depression. Further study is needed whether improvement of this cancer-related dysfunctional belief has positive effect on sleep problems.

#### Conflicts of Interest

The authors have no financial conflicts of interest.

#### Authors' Contribution

Conceptualization: Chung S. Data curation: Chung S, Youn S, Yeo S, Lee J. Formal analysis: Chung S, Suh S. Investigation: Chung S, Youn S, Suh S. Methodology: Chung S, Youn S, Suh S. Project administration: Chung S. Resources: Chung S, Youn S. Software: Chung S, Yeo S. Supervision: Chung S, Suh S. Validation: Chung S, Yeo S, Lee J. Writing—original draft: Yeo S, Chung S. Writing—review & editing: Chung S, Youn S, Lee J, Suh S.

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