

# Association between chronic pruritus, depression, and insomnia: A cross-sectional study



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**Background:** Skin diseases that cause chronic pruritus can have negative effects on a patient's quality of life.

**Objective:** We evaluated the associations between chronic pruritus and psychological conditions including insomnia and depression.

**Methods:** This study included responses from 91 participants with chronic pruritus (response rate: 74.6%). A survey including questionnaires regarding data on demographic characteristics, intensity of pruritus using the visual analog scale (VAS) and the 4-item itch questionnaire, and the degrees of insomnia and depression measured by the Insomnia Severity Index and Beck Depression Inventory, respectively.

**Results:** Patients with symptoms of insomnia or depression had significantly more intense pruritus than patients without psychological symptoms (insomnia, VAS median [interquartile range]: 7.0 [5.0-8.25] vs. 5.0 [3.0-7.5]; depression, VAS median [interquartile range]: 7.5 [5.0-8.25] vs. 5.0 [3.0-7.0]). Multivariable analyses revealed that patients with moderate to severe pruritus were more likely to have depression than those with mild pruritus (odds ratio: 10.95; 95% confidence interval: 2.24-53.06). There were no differences in the severity of insomnia and depression among skin diseases.

**Limitations:** This study had a cross-sectional design and limited generalizability.

**Conclusion:** Chronic pruritus is significantly associated with insomnia and depression, regardless of the etiology. (JAAD Int 2021;3:54-60.)

**Key words:** chronic pruritus; depression; insomnia; visual analog scale.

## INTRODUCTION

Pruritus is an uncomfortable sensation that causes itchiness.<sup>1</sup> Chronic pruritus is defined as pruritus lasting  $\geq 6$  weeks<sup>2</sup> and is a common symptom in individuals with a variety of skin diseases, including atopic dermatitis,<sup>3</sup> psoriasis,<sup>4</sup> and chronic urticaria.<sup>5</sup> The prevalence of chronic pruritus has been reported as 13%-17%<sup>6-8</sup> and the lifetime prevalence has been reported as 22%-26%.<sup>6,8</sup> A patient's functional, psychological, and social behaviors can be severely affected by pruritus,<sup>5,9,10</sup> and psychological symptoms, including depression and anxiety, have been

reported to be closely related to chronic pruritus.<sup>9-11</sup> However, the occurrences of psychological symptoms among individuals with various pruritic skin diseases have not been well investigated. Furthermore, most previous studies referred to specific pruritic diseases or specific patient groups, rendering the findings difficult to directly compare.<sup>3-5</sup> The evaluation of pruritus is important in clinical practice and research; however, an appropriate assessment method has not yet been established. There are currently several devices that can be used to objectively measure pruritus, such as a vibration

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transducer attached to the leg of a bed, which can record whole body movements at night, and a movement-sensitive meter, which can measure limb movements at night.<sup>12-14</sup> Although potentially effective, these devices are difficult to use in an outpatient setting. The visual analog scale (VAS) has been used to assess pruritus and a 4-item itch questionnaire has been used in several studies focused on different itch types.<sup>5,15-17</sup> In this study, we evaluated pruritus using the VAS and the 4-item itch questionnaire. We hypothesized that there is a higher prevalence of depression and insomnia among patients with severe chronic pruritus than among patients with mild chronic pruritus. We also investigated the association between chronic pruritus and certain skin diseases.

## MATERIALS AND METHODS

A total of 122 adult patients presenting with chronic pruritus at the Department of Dermatology at the National Medical Center in Seoul, Republic of Korea, between June 12, 2017, and December 21, 2017, were eligible for this study. Chronic pruritus was defined as pruritus lasting  $\geq 6$  weeks. The patients were asked to complete a questionnaire including items regarding demographic characteristics, pruritus intensity (measured using the VAS and the 4-item itch questionnaire), and the degrees of insomnia and depression (measured using the insomnia Severity Index [ISI] and Beck Depression Inventory [BDI], respectively). Among the 122 eligible patients, 91 completed the questionnaire. The severity of the pruritus was assessed using 2 scales: the VAS, with scores ranging from 0 to 10, and the 4-item itch questionnaire, which included items regarding the severity, frequency, and distribution of itching and sleep disturbances because of pruritus.<sup>15</sup> The severity of the pruritus was classified as mild (VAS < 4) or as moderate to severe (VAS  $\geq 4$ ). Insomnia was evaluated using the ISI, which consists of 7 questions assessing the nature, severity, and effects of insomnia.<sup>18</sup> Specifically, the items of the ISI assessed the severity of difficulties falling asleep and maintaining sleep, early morning awakenings, the degree of dissatisfaction with current sleep, the level of interference of these sleep difficulties with daytime functioning, the degree to which others noticed the deterioration of functioning related to sleep

problems, and the level of distress or worry caused by sleep difficulties.<sup>18</sup> Participants rated the items using a Likert-type scale, which consisted of 5 points ranging from 0 (not at all) to 4 (very much), according to the perceived degree of severity.<sup>18</sup> The ISI score was obtained by combining the scores of the 7 items, with possible total scores ranging from 0 to 28.<sup>18</sup>

Patients with a score  $\geq 8$  on the ISI scale were categorized as having insomnia.<sup>18</sup> A higher ISI score indicated more severe insomnia.

Depression was evaluated using the BDI, which is a 21-item questionnaire assessing the intensity of the symptoms of depression.<sup>19</sup> The patient was asked to mark the statement most applicable to themselves, and responses were scored from 0 (not at all) to 3 (very much), with a

total score ranging from 0 to 63 points.<sup>19</sup> Patients who scored  $\geq 10$  on the BDI scale were categorized as having depression.<sup>20</sup>

This study was approved by the institutional review board at the National Medical Center and was performed in accordance with the relevant regulations. Written informed consent was obtained from all participants.

## Statistical analysis

Categorical variables are presented as numbers and percentages and continuous variables are presented as means with standard deviation (SD) or medians with interquartile range (IQR). The correlation between the scores of the VAS and the 4-item itch questionnaire was determined using Pearson correlation test. The associations between variables, including age, duration, the VAS score, and the 4-item itch questionnaire score, and measurements of insomnia and depression, such as ISI and BDI, were assessed using univariable linear regression analyses with ISI or BDI as the dependent variable. The differences in the ISI and BDI scores for each categorical variable were assessed using the Mann-Whitney U test or the Kruskal-Wallis rank sum test. Differences in the severity of pruritus between patients with insomnia or depression and those without insomnia or depression were analyzed using the Mann-Whitney U test. A logistic regression analysis was used to evaluate the differences in the incidence of depression and insomnia between patients with mild pruritus or moderate to severe pruritus. An adjusted logistic regression analysis was

## CAPSULE SUMMARY

- Chronic pruritus owing to several different skin diseases is significantly associated with insomnia and depression.
- Dermatologists may consider referring patients with severe chronic pruritus and symptoms of insomnia or depression to mental health professionals for multidisciplinary care.

*Abbreviations used:*

BDI:	Beck Depression Inventory
CI:	confidence interval
IQR:	interquartile range
ISI:	Insomnia Severity Index
OR:	odds ratio
SD:	standard deviation
VAS:	visual analog scale

conducted using multivariable models including the following variables: age, sex, smoking habits (current vs past), and alcohol consumption (current vs past). *P* values of  $<.05$  were considered statistically significant. All statistical analyses were performed using SPSS software (version 20.0, IBM Corp).

## RESULTS

### Demographics

A total of 91 patients (63 males [69.2%] and 28 females [30.8%]) completed the survey, resulting in a response rate of 74.6%. The most commonly reported cause of pruritus was eczema ( $n = 32$ ; 35%), followed by idiopathic itching ( $n = 22$ ; 24.2%), chronic urticaria ( $n = 19$ ; 20.9%), and atopic dermatitis ( $n = 10$ ; 11%). Two (2.2%) patients had liver cirrhosis and 5 (5.5%) patients had chronic renal disease (Table I).

### Pruritus characteristics

The median VAS score was 6.0 (IQR: 4.0-8.0), and the median 4-item itch questionnaire score was 11.0 (IQR: 7.0-14.5). Pearson correlation coefficient between the VAS score and the 4-item itch questionnaire score was 0.61 ( $P < .0001$ ). Most patients reported pruritus at multiple locations ( $n = 58$ ; 63.7%), whereas some reported generalized pruritus ( $n = 26$ ; 28.6%) or pruritus at a single location ( $n = 7$ ; 7.7%). Nearly half of the patients ( $n = 43$ ; 47%) reported total restlessness because of pruritus, whereas 23 (25.3%) reported pruritus accompanied by excoriation, 11 (12.1%) complained of pruritus that was unrelieved by scratching but without excoriation, 6 (6.6%) complained of pruritus with the need to scratch but without excoriation, and 8 (8.8%) complained of pruritus without the need to scratch. Continuous pruritus was reported by 26 (28.6%) patients. The mean daily counts of short ( $<10$  min) and long ( $\geq 10$  min) episodes of pruritus were 3.0 and 1.6, respectively, among patients who reported noncontinuous pruritus. The mean number of waking-up events reported by the patients was 1.3 per day. There were no differences in the severity of pruritus between patients with different reported causes of pruritus.

**Table I.** Patient demographics and clinical characteristics

Characteristics	Value
Age, median (IQR), years	58.0 (41.0-69.5)
Sex, n (%)	
Male	63 (69.2%)
Female	28 (30.8%)
Duration of chronic pruritus	
Median (IQR), weeks	52.0 (25.0-254.0)
Liver cirrhosis, n (%)	2 (2.2%)
Chronic kidney disease, n (%)	5 (5.5%)
Skin disease, n (%)	
Eczema	32 (35.0%)
Essential pruritus	22 (24.2%)
Chronic urticaria	19 (20.9%)
Atopic dermatitis	10 (11.0%)
Prurigo simplex	7 (7.7%)
Others	1 (1.1%)
Smoking, n (%)	
Current smoker	19 (21.0%)
Drinking, n (%)	
Current drinker	39 (43.0%)
Visual analog scale, median (IQR)	6.0 (4.0-8.0)
Four-item itch questionnaire, median (IQR)	11.0 (7.0-14.5)
Insomnia Severity Index, median (IQR)	8.0 (3.0-13.0)
Beck Depression Inventory, median (IQR)	8.0 (2.5-17.5)

IQR, Interquartile range.

### Pruritus and psychological symptoms

**Insomnia characteristics.** The median ISI score was 8.0 (IQR: 3.0-13.0). There were no reports of severe insomnia. Patients reported difficulty while sleeping (mean score [SD]: 1.2 [0.1]), problems waking up too early (mean score [SD]: 1.2 [0.1]), and difficulty falling asleep (mean score [SD]: 1.1 [0.1]).

**Depression characteristics.** The median BDI score was 8.0 (IQR: 2.5-17.5). The most commonly reported symptoms of depression included sleep disturbances (mean score [SD]: 0.79 [0.09]), fatigability (mean score [SD]: 0.73 [0.07]), and lack of satisfaction (mean score [SD]: 0.73 [0.09]).

**Association between pruritus and depression or insomnia.** Both the pruritus index VAS and 4-item itch questionnaire scores showed a statistically significant association with insomnia and depression scores (Table II). However, the type of skin disease, sex, and comorbidities did not affect insomnia and depression (Table III). The VAS and 4-item itch questionnaire scores were statistically significantly higher in patients with insomnia than in those without insomnia ( $P = .026$ ). These scores were also significantly higher in patients with

**Table II.** Associations between clinical parameters and symptoms of insomnia or depression in linear regression analysis

	Insomnia Severity Index		Beck Depression Inventory	
	Beta coefficient	P value	Beta coefficient	P value
	Age	-0.06	.13	-0.05
Duration	0.002	.20	0.002	.48
Visual analog scale	0.98	.0003	1.55	<.0001
Four-item itch questionnaire	0.65	<.0001	0.90	<.0001

**Table III.** Associations between clinical parameters and symptoms of insomnia or depression

	Insomnia Severity Index		Beck Depression Inventory	
	Median (IQR)	P value	Median (IQR)	P value
	Sex			
Male	8.0 (4.0-13.0)	.43	8.0 (3.0-18.0)	.67
Female	7.0 (2.0-12.0)		6.0 (2.0-15.5)	
Skin disease				
Eczema	6.5 (1.75-12.25)		4.0 (1.0-12.5)	
Essential pruritus	8.5 (6.0-11.75)		12.0 (3.5-19.5)	
Chronic urticarial	7.0 (3.0-14.0)	.28	11.0 (4.5-17.5)	.31
Atopic dermatitis	13.0 (8.5-15.75)		9.0 (1.5-15.75)	
Prurigo simplex	2.0 (1.5-9.0)		4.0 (3.5-17.5)	
Liver cirrhosis				
Yes	13.0 (10.0-16.0)	.38	5.0 (4.0-6.0)	.56
No	8.0 (3.0-13.0)		8.0 (2.0-18.0)	
Chronic kidney disease				
Yes	5.0 (2.0-9.0)	.39	12.0 (8.0-14.0)	.43
No	8.0 (3.0-13.0)		7.5 (2.0-17.75)	
Drinking				
Current drinker	8.0 (5.5-12.5)	.69	8.0 (2.0-16.0)	.46
Non-current drinker	8.0 (2.0-13.0)		8.5 (3.0-18.25)	

IQR, Interquartile range.

depression than in those without depression ( $P = .0002$ ) (Table IV). Patients with moderate to severe pruritus were more likely to have depression than those with mild pruritus (odds ratio [OR]: 10.36; 95% confidence interval [CI]: 2.24-48.03). These results remained when the data were adjusted for

**Table IV.** Associations between the intensity of pruritus and symptoms of insomnia or depression

	Visual analog scale		Four-item itch questionnaire	
	Median (IQR)	P value	Median (IQR)	P value
	Insomnia			
Yes	7.0 (5.0-8.25)	.026	12.0 (8.0-17.0)	.0007
No	5.0 (3.0-7.5)		8.0 (6.0-12.0)	
Depression				
Yes	7.5 (5.0-8.25)	.0002	13.5 (11.0-18.0)	<.0001
No	5.0 (3.0-7.0)		8.0 (6.0-11.5)	
Drinking				
Current drinker	5.0 (4.0-8.0)	.21	9.0 (7.0-15.0)	.28
Non-current drinker	6.5 (5.0-8.0)		11.5 (7.75-14.0)	

IQR, Interquartile range.

age, sex, smoking habits, and alcohol consumption (adjusted OR = 10.95; 95% CI = 2.24-53.56). However, insomnia was not significantly associated with the severity of pruritus (OR: 2.54; 95% CI: 0.90-7.13; adjusted OR: 2.54; 95% CI: 0.86-7.53).

**Effect of alcohol consumption on depression, insomnia, and pruritus intensity**

There was no significant difference in ISI or BDI scores between current drinkers and non-current drinkers (ISI:  $P = .69$ , BDI:  $P = .46$ ). The VAS scores were higher in non-current drinkers than in current drinkers (median VAS [IQR], 6.5 [5.0-8.0] vs 5.0 [4.0-8.0],  $P = .21$ ) but this difference was not statistically significant.

**DISCUSSION**

Chronic pruritus is widely accepted as an important condition that can affect a patient's quality of life.<sup>5-7,9,10</sup> In this study, we evaluated the intensity of pruritus as reported by patients using the VAS and 4-item itch questionnaire. A strong relationship between stress and depression and skin inflammation has been reported in patients with psoriasis and atopic dermatitis.<sup>21,22</sup> Furthermore, stress has been reported to have a negative effect on the barrier function of the skin<sup>23,24</sup> and proinflammatory cytokines.<sup>25,26</sup> However, there are no studies that compared the severity of pruritus and psychological symptoms in patients with various pruritic skin diseases. In this study, we found no difference in the severity of pruritus among patients with different skin diseases including eczema, chronic urticaria, prurigo simplex, and essential pruritus. These results

suggested that the characteristic features of each disease do not play an important role in the severity of pruritus. In contrast, our results suggested that pruritus affects the patient's quality of life regardless of overt skin inflammation and acts as a stressor that exacerbates the existing skin diseases.

A previous study that included 1037 patients with chronic pruritus found that female patients have more severe pruritus and a poorer quality of life than male patients.<sup>27</sup> The intensity of pruritus was reported to be more significantly associated with the development of anxiety and depression in female patients than in male patients,<sup>27-30</sup> although the relationship between sex and anxiety remains unclear.<sup>31,32</sup> In this study, we found no difference in the severity of pruritus between male and female patients; however, this study included an unequal proportion of male and female patients, and we cannot conclude whether female patients with chronic pruritus suffered more from insomnia and depression than male patients.

Chronic pruritus was reported to affect multiple sites and evoke continuous itching in a previous study.<sup>33</sup> In this study, 63.7% of patients reported that itchiness occurred on several body sites, and 28% of patients were affected throughout the whole body. In addition, 32% of patients experienced permanent itching. Therefore, the results of this study were similar to those of previous studies, as the distribution of pruritus was mostly at multiple sites or generalized.

Chronic pruritus can lead to exacerbation of the patient's skin disease and negatively affect the patient's psyche. Several previous studies reported that severe pruritus worsened depression and insomnia and decreased the quality of life. The intensity of pruritus was negatively correlated with sleep, quality of life, and coping behaviors in patients with atopic dermatitis,<sup>34-37</sup> and almost 60% of patients with chronic idiopathic urticaria reported being awoken by their pruritus and having difficulty falling asleep.<sup>37</sup> Pruritus was reported to affect mood (60%), sleep (35%), and sexual desire (21%) in patients with psoriasis.<sup>5,38,39</sup> In another study, the severity of pruritus and the degree of depressive symptoms were positively correlated.<sup>40</sup> In our study, patients with severe pruritus had a higher prevalence of insomnia and depression than patients with mild pruritus, which is consistent with previous studies<sup>5,34-40</sup> and suggests that pruritus itself could affect sleep and depression, and that there may be a positive correlation between the severity of pruritus and psychological symptoms. Further, the perception of pruritus has been reported to be directly affected by depression and anxiety in

conditions such as atopic dermatitis and psoriasis.<sup>41</sup> These results showed interconnectivity between the psychological symptoms and pruritus.

The cingulate cortex is considered to be an important area in the brain that is activated with the onset of pruritus and has been reported to be significantly activated in patients with atopic dermatitis and following the administration of histamine.<sup>42</sup> The degree of activation of the cingulate cortex was found to be correlated with the severity of pruritus symptoms.<sup>42</sup> The anterior cingulate cortex is known to be involved in the modulation of emotional and cognitive activities,<sup>43</sup> which may explain how mood and motivation can affect the perception and processing of pruritus.

Several studies reported an association between alcohol-related problems and depression and insomnia.<sup>44,45</sup> However, in our study, there was no significant association between alcohol consumption and depression or insomnia. In addition, various pharmacotherapeutic agents used for depression and anxiety were shown to be effective antipruritic medications.<sup>46</sup> A study showed that psychotherapeutic interventions can improve atopic dermatitis.<sup>47</sup> Hence, antidepressants should be considered for patients with chronic pruritus, especially for those with symptoms of depression.

This study has some limitations. Because of the cross-sectional design of this study, we cannot conclude that generalized pruritus triggers depression or that depression triggers generalized pruritus. This study was a single-center study with a small sample size and did not include a control group, so there was limited generalizability. Large-scale studies that include control groups and different skin diseases are needed to investigate the causal relationship between pruritus and psychological symptoms. In addition, we did not acquire data regarding the specific locations of the pruritus. The association between specific locations of pruritus and other characteristics of pruritus and psychological symptoms should be investigated in a future study. We also did not include some skin diseases that may have independent associations with mental health comorbidities, including prurigo nodularis. Therefore, future studies should include more pruritic skin diseases. Further studies on the types of treatment (ie, phototherapy) that are effective in patients with chronic pruritus are also essential.

In conclusion, we found that chronic pruritus was significantly associated with insomnia and depression. Dermatologists may consider referring patients with severe chronic pruritus who experience symptoms of insomnia or depression to psychologists for multidisciplinary care.

### Conflicts of interest

None disclosed.

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