Descriptors of Insomnia among Patients with Heart Failure

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Objective: *Explore the characteristics of insomnia in persons with heart failure and identify the predictive factors of insomnia in patients with heart failure.*

Marital and Method: *A predictive correlational research design was used. Three hundred forty heart failure patients followed-up at heart clinics, outpatient departments of 10 tertiary hospitals from all regions in Thailand, were selected by multi-stage random sampling. Data were collected between July 2009 and January 2010. Research instrument included demographic questionnaire, state-trait anxiety inventory questionnaire, Center for Epidemiologic Studies Depression Scale, dyspnea questionnaire, Berlin Questionnaire, hygiene awareness and practice scale, and dysfunctional beliefs and attitudes about sleep and insomnia severity index. Data were analyzed by using descriptive statistic, Chi-square test, and logistic regression.*

Results: *Thirty-two percent of heart failure patients had insomnia. Eighty-one patients had moderate insomnia (23.8%), and 28 patients had severe insomnia (8.2%). Most heart failure patients had insomnia of mixed types (73.40%), including difficulty falling asleep, difficulty staying asleep, and waking up too early. Correlated factors of insomnia included the predisposing factors, anxiety and depression, the precipitating factors, marital status, dyspnea, sleep disorder breathing, and the perpetuating factors, sleep hygiene and dysfunctional beliefs and attitudes about sleep. After using logistic regression analysis, the predictive factors of insomnia were anxiety, depression, marital status (separated, divorced, and widowed), dyspnea, and dysfunctional beliefs and attitudes about sleep with a 95% confidence level ($\alpha = 0.05$). However, age, gender, sleep disorder breathing, and sleep hygiene were not significant predictors of insomnia.*

Conclusion: *Insomnia is a significant problem in heart failures patients. Therefore, healthcare providers need to pay attention to this sensitive outcome. Several factors should be considered for further management.*

Keywords: *Insomnia, Characteristics of Insomnia, Predictor of insomnia, Heart failure*

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Insomnia is a significant problem in patients with heart failure, who have chronic, progressive condition that the heart muscle is unable to pump enough blood throughout the body to meet the need for blood and oxygen[1]. Approximately 31.3 to 44% of patients with heart failure reported symptoms of insomnia[2-4]. Insomnia has been defined as complaints of disturbed sleep in the presence of adequate opportunity and circumstances for sleep. The disturbance may consist of one or more of three features, (1) difficulty in initiating sleep, (2) difficulty in maintaining sleep, or (3) waking up too early[5].

Prior research studies in patients with heart failure revealed that heart failure patients suffered from various problems, such as difficulty in initiating sleep, 19 to 63%[6-8], difficulty in maintaining sleep, 23 to 69%[6-8], and waking up too early, 15 to 39%[6,7,9]. Insomnia can occur because the pathophysiology of heart failure can contribute to heart failure symptoms which affect their sleep[4,10]. Insomnia can elevate the heart rate and increase heart rate variability, which is suggestive of increased sympathetic and decreased parasympathetic activity, adverse hemodynamic consequences for the failing heart, and the potentially debilitating symptoms of heart failure[10-13]. Moreover, poor sleep can reduce cognitive function, and the reduced health-related quality of life in all dimensions is also a concern[9,14]. Prior research found only two factors that are related to insomnia, including paroxysmal nocturnal dyspnea and the New York Heart Association status classification[4]. However, there are other factors based on the 3P Model of Insomnia (predisposing factors, precipitating factors,

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and perpetuating factors)[15] that might be associated with insomnia in patients with heart failure.

Thus, the purpose of the present study is to describe the characteristics of insomnia and to identify the predictive factors of insomnia in patients with heart failure at the out-patient departments in Thailand in order to build up the knowledge on insomnia and to provide information for the further development of intervention to prevent or reduce insomnia in this population.

Material and Method

A predictive correlational research design was used in the present study. The participants were 340 Thai patients with heart failure who regularly had been follow-up at a heart clinic, out-patient department in 10 tertiary hospitals. Data were obtained by using multi-stage random sampling from public tertiary hospitals from all regions of Thailand. Data were collected between July 2009 and January 2010. The inclusion criteria included 1) diagnosed with heart failure stable condition, and 2) age equal to or greater than 18 years up to 80-years-old. The exclusion criteria were 1) unstable condition heart failure, and 2) serious physical and psychiatric disease. After providing written informed consent, each patient completed all questionnaires within 30 minutes.

The permission for patients' interviews was obtained from The Ethical Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University. Permission was also obtained from 10 hospitals before approaching any patients. The researcher also gained the patients' informed consent and explained the objective of the study.

To collect demographic data and measure independent variables, seven instruments were used. Demographic data were collected by a demographic questionnaire, and anxiety was measured by the State-Trait Anxiety Inventory (STAI)[16], which was adapted by Tepa-Amorndech[17]. The scores for state anxiety vary from a minimum of 20 to a maximum of 80. The higher score indicates a high anxiety level. Depression was assessed by the Center for Epidemiologic Studies Depression Scale (CES-D Scale)[18], which was adapted by Buran[19]. This instrument contains 20 items, and a total score equal or greater than 16 reflects depression. To explore dyspnea, the Dyspnea Questionnaire of Kheawwan[20] adapted by Yodchai[21], was used. A score between 0 and 39 represents mild dyspnea, 40 to 60 represents moderate dyspnea, and 61 to 100 indicates extreme dyspnea. Sleep disorder breathing was measured by using the Berlin Questionnaire[22] to provide a determination of "high-risk" (high pretest probability) or "lower-risk" (low pretest probability).

To measure sleep hygiene, the Sleep Hygiene Awareness and Practice Scale (SHAPS)[23] was used. The total hygiene practice is scored on a range from 0 to 133, with higher scores indicating less healthy sleep hygiene practice. Dysfunctional beliefs and attitudes about sleep were assessed by the Dysfunctional Beliefs and Attitudes about Sleep scale (DBAS-16)[24]. The total score ranges from 0 to 160, with higher scores indicating more dysfunctional beliefs and attitudes about sleep. To measure insomnia, the Insomnia Severity Index (ISI)[25], which was translated into Thai by Keawphang[20], was used. The ISI comprises of seven items assessing the severity of sleep-onset (initial), sleep maintenance (middle), early morning awakening (terminal) problems, satisfaction with current sleep patterns, interference with daily functioning, noticeable impairment of ability attributed to the sleep problems, and the level of distress caused by the sleep problems. The total score ranges from 0 to 28, with high scores indicating greater insomnia severity. A score between 0 to 7 indicates no clinically significant insomnia, 8 to 14 indicates sub-threshold insomnia, 15 to 21 indicates clinical insomnia (moderate severity), and 22 to 28 indicates clinical insomnia (severe).

Data analysis

The descriptive statistics identified the demographic, clinical characteristics, characteristics of insomnia and basic features of selected factors of insomnia for the patients in the present study with frequencies, percentages, standard deviation, and range. A Chi-square test and Contingency coefficient was used to explore the relationships between predisposing factors, precipitating factors, perpetuating factors, and insomnia in patients with heart failure. Multiple logistic regressions were used to examine predictability among the predisposing factors, precipitating factors, perpetuating factors, and insomnia in patients with heart failure.

Results

The demographic and clinical characteristics of patients

Table 1, there were 164 male patients (48.2%) and 176 female patients (51.8%). Mean age was 59.22, with most being married 69.7%. The predominant education level was primary school, with the largest

Table 1. The frequency, percentage, means and standard deviation for demographics and clinical characteristic of patients with heart failure (n = 340)

Characteristics	Frequency	Percent
Gender		
Female	176	51.8
Male	164	48.2
Age (years)		
20 to 40	33	9.7
41 to 60	140	41.2
61 to 80	167	49.1
Mean = 59.22 years, SD = 12.98		
Marital status		
Married	237	69.7
Widowed	50	14.7
Single	34	10.0
Separated	13	3.8
Divorced	6	1.8
Educational level		
Non-education	43	12.6
Primary school	213	62.6
Secondary school	54	15.9
High school	19	5.6
Certificate/bachelor's degree	9	2.6
Master's degree	2	0.6
Occupation		
Unemployed	159	46.8
Employee	60	17.6
Agriculturalist	60	17.6
Merchant	34	10.0
Government officer	16	4.7
Business person	9	2.6
Student	2	0.6
Time since initial diagnosis		
3 months to 4 years	222	65.3
5 to 10 years	99	29.1
>10 years	19	5.6
Mean = 4.24 years, SD = 4.22		
Etiology		
Valvular heart disease	161	47.4
Hypertension	93	27.4
Coronary artery disease	93	27.4
Cardiomyopathy	90	26.5
Cardiac arrhythmia	75	22.1
Diabetes	49	14.4
Left ventricular ejection fraction		
<40%	96	28.2
40 to 54	57	16.8
55 to 70	73	21.5
>70	17	5.0
Mean = 46.60 years, SD = 17.10		

percentage being unemployed (46.8%). Most studied patients had heart failure for three months to four years 65.3%, and the most etiology was valvular heart disease (42.6%).

The characteristics of insomnia in patients with heart failure

Table 2, 109 patients with heart failure reported clinical insomnia (32%). Eighty-one patients had moderate insomnia (23.8%), and 28 patients had severe insomnia (8.2%).

Table 3, the 109 patients (32%) reported clinical insomnia, most heart failure patients had mixed types (73.40%).

The relationship between selected factors and insomnia in patients with heart failure

The correlated factors of predisposing factors included anxiety ($\chi^2 = 63.909$, C = 0.398, $p<0.05$), and depression ($\chi^2 = 59.781$, C = 0.387, $p<0.05$). However, age and gender were not related to insomnia ($\chi^2 = 3.238$, C = 0.097, $p = 0.198$, $\chi^2 = 0.134$, C = 0.020, $p = 0.714$ respectively). The correlated factors of precipitating factors included marital status ($\chi^2 = 14.15$, C = 0.200, $p<0.05$), dyspnea ($\chi^2 = 34.212$, C = 0.302, $p<0.05$), and sleep disorder breathing ($\chi^2 = 4.252$, C = 0.111, $p<0.05$). The correlated factors of perpetuating factors included sleep hygiene ($\chi^2 = 20.744$, C = 0.240, $p<0.05$), and dysfunctional beliefs and attitudes about sleep ($\chi^2 = 12.008$, C = 0.185, $p<0.05$).

Predictors of insomnia in patients with heart failure

Table 4, there were five significant predictive factors of insomnia with a 95% confidence level ($\alpha = 0.05$). 1) Separated, divorced and widowed marital status was determined to be significant ($p = 0.003$) with an odds ratio of 7.051. 2) Anxiety at a moderate level was determined to be significant ($p = 0.001$) with an odds ratio of 3.133. 3) Depression was determined to be significant ($p = 0.009$) with an odds ratio of 2.519. 4) Dyspnea at a severity level was determined to be significant ($p = 0.005$) with an odds ratio of 9.114. Finally, 5) Dysfunctional beliefs and attitudes about sleep at a high level were determined to be significant ($p = 0.002$) with an odds ratio of 4.156.

Discussion

The results of the representative sample of heart failure patients who were followed-up at a heart clinic or out-patient department in tertiary hospitals in Thailand showed a high prevalence rate of insomnia in

patients with heart failure. One hundred nine patients with heart failure (32%) reported clinical insomnia. This result was congruent with a previous study of heart failure patients in other countries[2,4]. The result from the present report was higher than the general population and higher than in cancer patients in various studies[26,27]. Focusing on the clinical insomnia group, there were 74.3% had moderate insomnia, and 25.7% had severe insomnia. The problem was difficult to manage, especially in the case of severe insomnia. Almost all heart failure patients had a combination of the various types of insomnia, (1) difficulty in falling asleep, (2) difficulty in staying asleep, and (3) waking up too early. Only 1.8% had only one type of insomnia. Forty-three patients (12.65%) have taken sleeping pills. However, 15 patients (4.41%) still had clinical insomnia, so the problem should be of concern.

The predictive predisposing factors were anxiety and depression. There were high rates of anxiety and depression in this group, 100% and 30.59% respectively. Anxiety and depression are linked to insomnia because both of them can cause hyperactivity of the hypothalamic-pituitary-adrenal axis (HPA)[28],

Table 2. The frequency and percentage for severity of insomnia as measured by Insomnia Severity Index (ISI) (n = 340)

Severity of insomnia	Frequency	Percent
None (0 to 7)	131	38.5
Sub-threshold insomnia (8 to 14)	100	29.4
Moderate insomnia (15 to 21)	81	23.8
Severe insomnia (22 to 28)	28	8.2
Moderate-severe (clinically significant insomnia) (15 to 28)	109	32.0

Table 3. The frequency and percentage of 3 types and combination type of insomnia in heart failure patients who had clinically significant insomnia (n = 109)

Type	Frequency	Percent
Difficulty falling asleep (1)	3	2.75
Difficulty staying asleep (2)	2	1.80
Waking up too early (3)	1	0.92
(1) & (2)	16	14.68
(1) & (3)	3	2.75
(2) & (3)	4	3.67
(1) & (2) & (3)	80	73.40

Table 4. Multiple logistic regression analysis for the relationship between selected factors and insomnia (n = 340)

Factors	B	SE	Wald	Df	Exp (B)	95% CI lower to upper
Marital status						
Single (reference)						
Married	1.094	0.614	3.169	1	2.985	0.895 to 9.952
Separated, divorced, or widowed	1.953	0.658	8.804	1	7.051*	1.940 to 25.617
Anxiety						
Mild (reference)						
Moderate	1.142	0.357	10.211	1	3.133*	1.555 to 6.311
Severe	2.213	1.147	3.722	1	9.146	0.965 to 86.648
Depression						
No (reference)						
Yes	0.924	0.355	6.773	1	2.519*	1.256 to 5.051
Dyspnea						
Mild (reference)						
Moderate	0.163	0.414	0.155	1	1.177	0.450 to 2.385
Severe	2.210	0.716	9.526	1	9.114*	2.240 to 37.083
Dysfunctional beliefs and attitudes about sleep						
Low (reference)						
High	1.424	0.636	5.012	1	4.156*	1.194 to 14.462
Constant	-4.158	0.863	23.202	1	0.016**	

* $p<0.05$, ** $p<0.001$

which responds to stress with cortisol secretion and readiness for fight or flight. These responses can predispose individuals toward insomnia[15]. Previous study in Thailand at out-patient in the family medicine department, found that anxiety was a predictive factor of insomnia in patients with anxiety three times more likely to suffer from insomnia than patients with no anxiety[29], while the present study found that the patients with moderate anxiety were approximately three times more likely to have insomnia than the patients who had mild anxiety. Depression was not a predictor of insomnia in patients at out-patient in the family medicine department because few patients had depression[29]. However, the result of present study was consistent with the study in patients with invasive ovarian cancer; depressed patients were 1.8 times more likely to have insomnia than the patients who have no depression. The present study found that they were 2.5 times more likely to develop insomnia.

Age and gender were not related to insomnia in heart failure patients. This result was consistent with the previous study of patients with heart failure and cancer patients[6,20]. However, this result was different from the general population[30]. Based on the previous research, insomnia should be related to age, but in patients with heart failure and other chronic diseases it cannot be concluded to be the same as previous study. One research study compared sleep disorders between the elderly and the younger heart failure patients found that the sleep disorders of heart failure patients is disease-specific, rather than a matter of age[31].

The predictive precipitating factors were dyspnea and marital status (separated, divorced, or widowed). One hundred percent of heart failure patients had dyspnea. From prior research on heart failure patients, it was revealed that paroxysmal nocturnal dyspnea is related to insomnia, and the present study found that dyspnea is related to insomnia as well and could be a predictive factor. Moreover, the results showed that the patients who had severe dyspnea were approximately nine times more likely to suffer from insomnia than the patients having mild dyspnea. Separated, divorced, or widowed marital status was also a predictor of insomnia. This result is consistent with a study in breast cancer patients[32]. Sleep disorder breathing was not a significant predictor of insomnia. This can be explained by the fact that there were a low number of patients who had sleep disorder breathing. However, in the present study, a questionnaire was used to measure sleep disorder breathing, therefore, the problem of their own snoring during sleep could not be recognized.

The predictive perpetuating factors were dysfunctional beliefs and attitudes about sleep. Most heart failure patients who have insomnia had a high level of dysfunctional beliefs and attitudes about sleep. There were 31.18% from 32% of heart failure patients who have both insomnia and a high level of dysfunctional beliefs and attitudes about sleep. This means that when the patients experienced insomnia, they tried to help themselves to get more sleep. However, they often maintained the incorrect beliefs and attitudes about sleep, which ultimately perpetuate their sleep difficulties[15]. This result was consistent with previous studies of cancer patients[20,33]. The present study also found that those with high level of dysfunctional beliefs and attitudes about sleep were approximately 4.2 times more likely to have insomnia. Sleep hygiene was not correlated with insomnia in heart failure patients. The result is inconsistent with the study of cancer patients[33]. This can be explained that most heart failure patients in the present study had good sleep hygiene. There were also lower rates of patients who drank alcohol, beverages containing caffeine, smoked, or took sleeping pills.

Conclusion

Insomnia is a sensitive outcome in heart failure patients as they need good sleep to maintain their heart function. Healthcare providers should develop a program for prevention or improvement of insomnia in this population through manageable predictive factors.

What is already known on this topic?

Previous studies in western country revealed that patients with heart failure reported symptoms of insomnia approximately 31.3 to 33%. The New York Heart Association status classification and paroxysmal nocturnal dyspnea were correlated with insomnia.

What this study adds?

The prevalence rate of insomnia in patients with heart failure in Thailand was 32%. Most of them suffered from difficulty falling asleep, difficulty staying asleep, and waking up too early. Significant predictors of insomnia in this population were anxiety, depression, marital status (separated, divorced, and widowed), dyspnea, dysfunctional beliefs, and attitudes about sleep.

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Potential conflicts of interest

None.

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อาการนอนไม่หลับในผู้ป่วยหัวใจล้มเหลว

จรรยา ฉิมหลวง, ยุพิน อังสุโรจน์, ชนกพร จิตปัญญา

วัตถุประสงค์: *เพื่อศึกษาลักษณะของอาการนอนไม่หลับและหาปัจจัยทำนายอาการนอนไม่หลับในผู้ป่วยหัวใจล้มเหลว*

วัสดุและวิธีการ: *การศึกษานี้เป็นการศึกษาความสัมพันธ์เชิงทำนาย กลุ่มตัวอย่างคือผู้ป่วยหัวใจล้มเหลว จำนวน 340 คน ที่มารับการติดตามการรักษาที่คลินิกโรคหัวใจ แผนกผู้ป่วยนอก โรงพยาบาลตติยภูมิ 10 แห่งในทุกภาคของประเทศไทย คัดเลือกกลุ่มตัวอย่างโดยใช้วิธีการสุ่มแบบหลายขั้นตอน การศึกษานี้เก็บรวบรวมข้อมูลในระหว่างเดือนกรกฎาคม พ.ศ. 2552 ถึง เดือนมกราคม พ.ศ. 2553 เครื่องมือการวิจัยประกอบด้วยแบบสอบถามข้อมูลส่วนบุคคล แบบประเมินความวิตกกังวล แบบประเมินภาวะซึมเศร้า แบบประเมินอาการหายใจลำบาก แบบประเมินการหยุดหายใจในขณะนอนหลับ แบบประเมินความตระหนักในเรื่องสุขอนามัยของการนอนหลับและระดับการปฏิบัติ แบบประเมินความเชื่อและทัศนคติที่ไม่ถูกต้องเกี่ยวกับการนอนหลับ และแบบประเมินอาการนอนไม่หลับ วิเคราะห์ข้อมูลโดยใช้สถิติพรรณนา การทดสอบไคสแควร์ และการวิเคราะห์ถดถอยโลจิสติค*

ผลการศึกษา: *พบว่า 32% ของผู้ป่วยหัวใจล้มเหลวมีอาการนอนไม่หลับโดย 23.8% มีอาการอาการนอนไม่หลับระดับปานกลางและ 8.2% มีอาการนอนไม่หลับระดับรุนแรง ผู้ป่วยที่มีอาการนอนไม่หลับส่วนใหญ่ (73.40%) พบว่าผู้ป่วยมีอาการทั้ง 3 แบบ คือเริ่มต้นนอนหลับยาก และตื่นขึ้นมากลางดึกแล้วต้องใช้เวลานานจึงจะสามารถหลับใหม่ได้อีกครั้งจาก The 3P Model of insomnia พบว่าปัจจัยที่มีความสัมพันธ์กับอาการนอนไม่หลับคือ 1) ปัจจัยโน้มนำ: ความวิตกกังวล ความซึมเศร้า 2) ปัจจัยกระตุ้น: สถานภาพสมรส (แยก หย่า หม้าย) อาการหายใจลำบาก การหยุดหายใจในขณะนอนหลับ 3) ปัจจัยที่ทำให้คงอยู่: สุขอนามัยในการนอนหลับ ความเชื่อและทัศนคติที่ผิดเกี่ยวกับการนอนหลับ ส่วนปัจจัยที่สามารถทำนายอาการนอนไม่หลับได้คือ ความวิตกกังวล ความซึมเศร้า สถานภาพสมรส อาการหายใจลำบาก และความเชื่อและทัศนคติที่ผิดเกี่ยวกับการนอน อย่างไรก็ตาม อายุ เพศ การหยุดหายใจในขณะนอนหลับ และสุขอนามัยในการนอนหลับไม่ใช่ตัวทำนายอาการนอนไม่หลับในผู้ป่วยกลุ่มนี้*

สรุป: *อาการนอนไม่หลับเป็นปัญหาสุขภาพที่สำคัญในผู้ป่วยหัวใจล้มเหลว ทั้งนี้ผู้บริการด้านสุขภาพจะต้องให้ความสำคัญกับปัญหาดังกล่าว ปัจจัยที่ทำให้เกิดอาการนอนไม่หลับในผู้ป่วยหัวใจล้มเหลวควรได้รับการประเมินและหาทางแก้ไข*
