

Original Article

Sleep Quality in Patients with Heart Failure: Comparison Between Patients and Non-Patients in Yazd, Iran (2014)

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ABSTRACT

Background: Heart failure is a common and dangerous life-threatening disease, with an impact on various aspects of life such as sleep quality. This study was conducted to determine sleep quality in patients with heart failure (HF) and its correlates.

Methods: This case-control study was conducted on 160 individuals referring to Afshar Heart Hospital in Yazd through convenience sampling. After diagnostic tests (i.e., angiography and echocardiography) and examinations by physicians, 80 patients with HF and 80 healthy individuals (control group) were selected. Data were collected using a questionnaire. The statistical analyses included descriptive statistics, the Mann–Whitney test, and the Kruskal–Wallis test using SPSS (version 16).

Results: The patients had an average Pittsburgh Sleep Quality Index (PSQI) score of 5.5 (SD=0.3) with a median of 5. Around 43% of the patients compared with around 34% of the comparison group were identified as poor sleepers; these differences, however, were not statistically significant. The educational level (P=0.033), type of job (P=0.028), history of myocardial infarction (P=0.03), severity of pain (P=0.04), and fatigue (P=0.02) were related to sleep quality. The average daily sleep duration reported by the patients was nearly 6 hours. The mean sleep latency was 20 min among the patients. Getting up to urinate was the most common reason for waking up during the night.

Conclusions: Increasing the awareness of patients with HF about improving sleep and encouraging them to participate in regular courses can improve the quality of their sleep and prevent sleep disorders. (*Iranian Heart Journal 2015; 16(3): 28-37*)

Keywords: ■Patients ■Heart failure ■Sleep quality ■Pittsburgh Sleep Quality Index ■PSQI

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Hear failure (HF) is one of the most common disorders and lethal syndromes. This disease is associated with a reduction in the quality of life and an increase in hospitalization and mortality rates worldwide.^{1,2} Research shows that cardiovascular diseases are the first leading cause of death among the Iranian population.³

Patients with HF are vulnerable to many problems caused by cardiovascular dysfunction such as dyspnea, fatigue, difficulty falling asleep, dry mouth, maintaining sleep, and waking up too early.⁴ Indeed, patients with HF often have a poor sleep quality. In a study by Chen et al.,⁵ 74.4% of the patients were identified as poor sleepers and they suffered from sleep problems in daily life. Redeker and Stein⁶ compared sleep quality between patients with and without HF and showed that waking up at night was statistically high in the HF patients, who had a poor sleep quality.

Sleep is one of the basic human needs and is an effective element in physical and mental health.⁷ Sleep provides physical restoration through anabolic functions such as protein and tissue synthesis.⁸ Poor sleep quality in patients with HF exerts a negative effect on the quality of life, emotional well-being, and physical-psychological functions.^{1,8} The most common symptoms of sleep disorders include difficulty falling asleep, waking up and having trouble getting back to sleep, daytime sleepiness, and awaking early in the morning.⁸

Various factors are associated with the quality and the amount of sleep such as demographic variables (e.g., age, gender, marital status, and educational level), clinical factors (e.g., severity of disease),⁵ and psycho-social factors (e.g., depression, anxiety).¹ Also, taking beta-blockers and comorbidities such as hypertension, respiratory disorders, and stroke have been linked with sleep disorders.⁸ In one study, a sleep duration of less than 6-7 hours was associated with a higher prevalence rate of hypertension, diabetes, and cardiovascular diseases.⁹ Several methods

have been tested for improving sleep. Zeighami et al.¹⁰ showed that the use of the essence of *Citrus aurantium* was useful in reducing sleep disturbance in their patients with HF.¹⁰ Also, Arab et al.¹¹ found that eye masks and earplugs, as useful and affordable devices, improved the sleep quality in their patients.

Accordingly, it is necessary for health care providers to assess the severity of sleep disorders and its correlates so as to be able to design effective intervention measures in patients with HF. The present study was, thus, conducted to determine the quality of sleep in patients with HF and its correlates.

METHODS

Study Setting and Sample

This case-control study was conducted in the Iranian city of Yazd from January to February 2014. The participant sample size of this study was 160 individuals. The quality of sleep was compared between a group of patients with HF and a group of patients without HF. The participants in both groups were recruited from those referring to Afshar Heart Hospital. The subjects were screened in the 2 groups after diagnostic tests, including angiographic and echocardiographic examinations by cardiologists. Subsequently, 80 patients with HF and 80 non-patients (comparison group) were selected by convenience sampling. The comparison group did not have heart problems.

The inclusion criteria for the patients were comprised of age ≥ 20 years, diagnosis of HF via diagnostic tests, and consent to participate in this study. The exclusion criteria consisted of cancer, neurological disorders, and respiratory disorders such as sleep apnea. In addition, the subjects who failed to answer all the questions in the questionnaire on sleep quality were excluded from the study. Finally, 160 participants were included in the present study.

Instrumentation

Data were collected using a questionnaire that contained items on demographic

characteristics (i.e., age, marital status, educational level, and job), disease characteristics (i.e., duration of disease, history of myocardial infarction, history of cardiac surgery, severity of pain and fatigue, and blood pressure), lifestyle (i.e., smoking and drinking tea and coffee), and Pittsburgh Sleep Quality Index (PSQI).

The PSQI, which is widely used in medical studies, was employed to assess sleep quality during the preceding month. It contains 19 items that are grouped into 7 components: subjective sleep quality (1 item); sleep latency, that is the amount of time that it takes to fall asleep (12 items); sleep duration (1 item); habitual sleep efficiency, that is the percentage of the actual hours of sleep divided by the hours spent in bed (3 items); sleep disturbances (9 items); use of sleeping medications (1 item); and daytime dysfunction (2 items). Each component score ranges from 0 to 3. The overall sleep quality score, which is obtained from the sum of these components, has a range of 0 to 21. A PSQI score >5 (5 as a cutoff point) indicates poor sleep quality. The validity and reliability of the PSQI have been confirmed in several studies.^{12, 13}

The questions were read to each participant, who subsequently answered the questions. Additional data were obtained from the patients' medical records. The clinical data were confirmed by the nurses tending the patients.

Statistical Analysis

The statistical analyses were performed using Statistical Package for the Social Sciences (SPSS), version 16. The analyses were comprised of 1) descriptive statistics, including mean, standard deviation (SD), median, and interquartile range for the quantitative variables and frequency and percentage for the qualitative variables, and 2) the Mann–Whitney and Kruskal–Wallis tests (nonparametric tests) for testing the relationships between the variables. Multivariable logistic regression was utilized to estimate the odds ratios (ORs) and 95% confidence intervals (CIs) for the associations between the independent variables and HF. A 5% level of statistical significance was considered for all the analyses.

RESULTS

In this study, 80 adults with HF and 80 adults without HF completed the questionnaire. The majority of the patients with HF (58.8%) were male, married (100%), illiterate (57.5%), and unemployed (35.4%). Additionally, most of the patients with HF (78.5%) did not smoke (Table 1). The mean age of the patients was 60.5 (SD=13.8) years. A history of myocardial infarction was reported in 33% of the patients. The duration of HF in 62% of the patients was between 1 and 3 years. There were significant differences in the educational level between the 2 groups (P=0.023).

Table 1. Demographic characteristics of the study participants

Variables		Patients N (%)	Non-Patients N (%)
Gender	Women	33(41.2)	39(48.1)
	Men	47(58.8)	42(51.9)
Marital status	Single	0(0)	2(2.5)
	Married	80(100)	79(97.5)
Educational level	Illiterate	46(57.5)	28(34.6)
	Diploma and lower	42(51.9)	42(51.9)
	Academic	11(13.6)	11(13.6)
Occupation	Housewife	28(35.4)	24(29.6)
	Employee	8(10.1)	12(14.8)
	Self-employed	20(25.3)	21(25.9)
	Worker	10(12.7)	16(19.8)
	Retired	13(16.5)	8(9.9)
Smoking	Yes	17(21.5)	15(18.5)
	No	62(78.5)	66(81.5)

The patients had an average PSQI score of 5.5 (SD=0.3) with a median of 5. Considering a cutoff point of 5, around 43% of the patients compared with approximately 34% of the comparison group were identified as poor sleepers (PSQI >5); these differences, however, did not constitute statistical significance.

Of the demographic variables, educational level (P=0.033) and type of job (P=0.028) were correlated with sleep quality. The participants with a higher educational level reported a better overall sleep quality. Sleep

quality was significantly worse among the workers, followed by the housewives, whereas the employees had the best sleep quality score (Table 2). Of the clinical variables, history of myocardial infarction (P=0.03), severity of pain (P=0.04), and severity of fatigue (P=0.02) were allied to sleep quality. Sleep quality was significantly poor in the patients with a history of myocardial infarction. Also, the patients with severe grading of pain and fatigue had a poor quality of sleep (Table 3).

Table 2. Comparison of sleep quality based on the demographic and lifestyle characteristics of the patients with heart failure

Variables		Mean \pm SD	Median(IR)	P Value
Gender	Women	5.2 \pm 2.4	5(3)	0.9*
	Men	5.3 \pm 2.6	5(3)	
Marital status	Single	4.5 \pm 2.1	4.5(3)	0.6*
	Married	5.3 \pm 2.5	5(3)	
Educational level	Illiterate	5.7 \pm 2.7	5(3.25)	0.033**
	Diploma and lower	5.1 \pm 2.3	5(3)	
	Academic	4.1 \pm 1.7	4(2)	
Occupation	Housewife	5.6 \pm 2.4	5(3)	0.028**
	Employee	4.2 \pm 1.8	4(3.75)	
	Self-employed	5.4 \pm 2.7	5(3.5)	
	Worker	5.8 \pm 2.9	5(3.25)	
	Retired	4.6 \pm 2.06	4.5(1.75)	
Smoking status	Yes	5.6 \pm 2.4	5(3)	0.46*
	No	5.2 \pm 2.5	5(3)	
Coffee drinking	Yes	6.6 \pm 3	6.5(5.75)	0.1*
	No	5.21 \pm 2.42	5(3)	

IR, Interquartile range

* Mann-Whitney test

** Kruskal-Wallis test

Table 3. Comparison of sleep quality based on the clinical characteristics in the patients with heart failure

Variables		Mean \pm SD	Median(IR)	P Value
Duration of disease	< 1 y	5 \pm 2.1	4(3)	0.1*
	1-3 y	5.54 \pm 2.6	5(3)	
History of myocardial infarction	Yes	6.1 \pm 3	6(4)	0.03*
	No	5 \pm 2.2	5(3)	
Intensity of pain	Mild	4.7 \pm 2.2	5(2.5)	0.04**
	Moderate	5.4 \pm 2.3	5(3)	
	Severe	6.2 \pm 3	7(6)	
Intensity of fatigue	Mild	4.6 \pm 2.2	5(3)	0.02**
	Moderate	5.5 \pm 2.5	5(3)	
	Severe	6 \pm 4	6(4)	

IR, Interquartile range

* Mann-Whitney test

** Kruskal-Wallis test

The average of sleep duration reported by the patients was nearly 6 hours. Specifically, 43% of the patients slept more than 7 hours and 15% slept less than 5 hours during the night. There was no significant difference between the healthy people and the patients with HF.

Sleep duration was shorter in the patients who consumed coffee (P=0.006).

The mean of sleep latency was 20 minutes among the patients. Specifically, 64 (80%) patients with HF took less than 15 minutes to fall asleep after going to bed. Lower educational levels (P=0.01), history of

myocardial infarction ($P=0.004$), and increased pain ($P=0.003$) were associated with a longer sleep latency. Also, the workers and then the housewives had the longest sleep latency, while the retirees had the shortest sleep latency ($P=0.02$).

Approximately, 94% of the patients had sleep efficiency $>85\%$. Drinking coffee ($P=0.02$) and a history of cardiac surgery ($P=0.01$) were associated with worse sleep efficiency. Also, 43% of the patients rated their quality of sleep as very good and 17.5% rated their sleep quality as fairly bad and very bad. The patients who had severe pain reported the worst subjective sleep quality ($P=0.016$).

The factors relating to sleep disturbance in the patients with HF are shown in Table 4. The most common reasons for waking up frequently during the night were waking up for urination, feeling too hot, having pain, and snoring or coughing. According to the results, sleep disturbance was more frequent with increased fatigue ($P=0.02$). Twenty percent of the patients with HF and 9.9% of the comparison group experienced a lack of enthusiasm for performing their daily tasks due to sleepiness. The patients with HF had more habitual daytime dysfunction than did the non-patients, and this difference was statistically significant between the 2 groups ($P=0.018$).

Table 4. Sleep disturbance in the patients with heart failure

Sleep Disturbance	Never, N (%)	< Once/wk, N (%)	1–2 Times/wk, N (%)	>3 Times/wk, N (%)
Difficulty getting back to sleep after awakening at night	26(32.5)	2(2.5)	24(30)	28(35)
Waking up to urinate	18(23.1)	4(5.1)	39(50)	17(21.8)
Waking up due to difficulty breathing	38(47.5)	1(1.2)	26(32.5)	15(18.8)
Waking up due to cough or snoring	32(40)	1(1.2)	16(20)	31(38.8)
Waking up due to feeling cold	37(46.2)	1(1.2)	18(22.5)	24(30)
Waking up due to feeling hot	25(31.2)	2(2.5)	15(18.8)	38(47.5)
Waking up due to pain	28(35.9)	1(1.2)	17(21.8)	32(41)
Waking up due to a nightmare	37(46.2)	2(2.5)	19(23.8)	22(27.5)

The scores for the PSQI components are depicted in Table 5. The patients with HF had more sleep disturbance, worse sleep efficiency, and longer sleep latency than did the comparison group, but there were no

group-related differences. Logistic regression models were used to determine the factors associated with the prevalence of HF, and the results are reported in Table 6.

Table 5. Comparison of the sleep variables: the patients with heart failure versus the comparison group

Dimensions		Mean \pm SD	Median (IR)	P Value
Subjective sleep quality	Patient	0.85 \pm 0.9	1(1)	0.8
	Non-patient	0.83 \pm 0.9	1(1)	
Sleep efficiency	patient	0.09 \pm 0.4	0(0)	0.2
	Non-patient	0.03 \pm 0.24	0(0)	
Daytime dysfunction	patient	0.42 \pm 0.8	0(1)	0.04
	Non-patient	0.22 \pm 0.59	0(0)	
Sleep disturbances	patient	1.76 \pm 0.85	2(1)	0.9
	Non-patient	1.75 \pm 0.9	2(1)	
Sleep duration	patient	1.03 \pm 1.1	1(2)	0.5
	Non-patient	0.91 \pm 1.1	0(2)	
Sleep latency	patient	1.37 \pm 0.91	2(1)	0.7
	Non-patient	1.36 \pm 0.84	2(1)	
Use of sleeping medications	patient	0	0	-
	Non-patient	0	0	
Overall sleep quality	patient	5.5 \pm 0.3	5(3)	0.37
	Non-patient	5.15 \pm 0.25	5(3)	

IR, Interquartile range

* Mann-Whitney test

Table 6. Logistic regression of predictor variables of heart failure

	OR	P Value	CI
Occupation			
Housewife	1		
Employee	0.63	0.62	(0.1-4.01)
Self-employed	0.6	0.48	(0.14-2.46)
Worker	0.32	0.16	(0.06-1.5)
Retired	1.01	0.98	(0.2-5.12)
Gender			
Women	1		
Men	3.91	0.02	(1.16-13.15)
Educational level			
Illiterate	1		
Diploma and lower	0.5	0.11	(0.21-1.17)
Academic	0.7	0.68	(0.12-3.87)
Coffee consumption			
No	1		
Yes	6.5	0.01	(1.5-28.12)

OR, Odds ratio; CI, Confidence interval
P<0.05 was considered significant.

DISCUSSION

Our results showed that the patients with HF had poorer sleep quality than did those without HF, but this difference was not statistically significant. Parker and Dunbar¹⁴ reported that sleep problems in their HF patients were more frequent than those in their healthy comparison group and showed that difficulty breathing, increased age, drug use, anxiety, and depression were the factors influencing sleep quality.

The reported prevalence of poor sleep quality in patients with HF is varied in the different studies conducted thus far. Wang et al.⁴ showed that 81% of their study population had poor sleep quality. Aslani et al.³ reported that the prevalence of sleep disorders in their patients with HF was 51%. In a study by Skobel et al.,¹⁵ 37% of the patients with HF had poor sleep quality. In this survey, the mean of the PSQI score was 5.5±0.37, which was lower than the mean reported by Alosco et al.¹ (8.4), Chen et al.⁵ (9.06), and Wang et al.⁴ (10.8). This difference may be due to the high age of the patients with HF in the other studies.

Different individuals need different amounts of sleep. It seems that the best amount of sleep is between 7 and 8 hours during the night. Our results showed that most of the patients slept more than 7 hours per night, but there was no significant difference between the 2 groups. Erikson et al.⁸ reported the mean

duration of sleep was nearly 8 hours in their study patients. According to a study by Redeker and Stein,⁶ the average sleep duration was between 6.35 and 7.9 hours in the patients.

Several methods have been proposed for the enhancement of sleep duration. Zeighami et al.¹⁰ indicated that the use of the *Citrus aurantium* essence increased deep sleep, lengthened sleep duration, and improved the quality of sleep in their study patients. Also, some researchers have reported that using earplugs and eye masks can improve sleep quality in patients.¹¹ Sleep initiation and maintenance disorders are frequently observed in patients. In the current study, most of the patients took less than 15 minutes to fall asleep. Likewise, Chen et al.⁵ reported that 40.8% of their patients needed less than 15 minutes to fall asleep. Also, Redeker and Stein⁶ showed that 45% of their patients had difficulty falling asleep. The finding of this research showed that the patients did not have difficulty initiating sleep and most of them slept more than 7 hours in the night.

The need to get up to urinate at night was the most common sleep disorder in the present study, which supports the results of the studies by Wang et al.⁴ and Brostrom et al.¹⁶ This problem may occur because of the accumulation of interstitial fluid in the distal parts of the body caused by right congestive HF.⁴

Sleep efficiency was measured by the percentage of the actual hours of sleep divided by the hours spent in bed in the present study. According to our results, sleep efficiency in more than 90% of the patients was higher than 85%. This could be an explanation as to why our patients did not consume sleep medications. Similarly in a study by Abbasi et al.,¹⁷ none of the patients used sleep medications. The findings of a study by Chen et al.⁵ showed that although half of the participants stated that their sleep quality was poor, only 16.8% of them used sleep medications. Refraining from taking sleep medications may be due to concerns

about becoming dependent on the drug or drug interactions.

In the current study, although 80% of the patients rated their sleep quality as good, only 57.1% of the patients were identified as good sleepers, which supports the results of Ghoreishi et al.¹⁸ In our study, there was no significant association between gender and sleep quality, which is consistent with the results of some other studies.^{6, 11, 19} The findings of a study performed by Frighetto et al.²⁰ showed that sleep quality in the men was worse than that in the women.

The results of the present study indicated a significant correlation between educational level and sleep quality: sleep quality was better in those with higher levels of education. This finding chimes in with the results of the studies by Zeighami et al.,²¹ Chen et al.,⁵ and Drake et al.²² in Iran and other countries. Low educational levels may compromise self-care and lifestyle in patients. In our study, although the sleep quality in the married patients was better than that in the others, there was no significant relationship, which supports the results of the investigations by Neyse et al.¹⁹ and Scotto et al.²³ in America. Behrouzifar et al.²⁴ reported that sleep quality among their married patients was significantly better than that in their single samples.

The findings of this research showed a significant association between different types of jobs and sleep quality. According to the findings, the workers had the worst and the employees had the best sleep quality. Adams²⁵ and Friedman²⁶ concluded that socioeconomic variables such as job, income, and education were associated with sleep quality.

Our findings showed no significant correlation between age and sleep quality, which is concordant with the results of the studies by Neyse et al.¹⁹ and Scotto et al.²³ in the U.S. A study by Saremi et al.²⁷ showed that increasing age created major changes in the sleep process, so that waking up during

the night was more frequent with increasing age.

In the present study, those HF patients who smoked had poorer sleep quality than their non-smoking counterparts. However, there was no statistical relationship between smoking and sleep quality, which is consistent with a study by Mansouri et al.²⁸ In contrast, this relationship was statistically significant in a study by Zeighami et al.²¹ Nicotine is the primary addictive agent in cigarettes and causes insomnia and increases sleep disturbance. Therefore, smoking cessation can reduce sleep disturbance in patients with HF.

According to our statistical analyses, coffee consumption was significantly associated with a reduction in sleep duration and sleep efficiency. The caffeine present in coffee reduces sleep efficiency and sleep duration by increasing the level of awareness, especially when it is used close to bedtime. In our study, those HF patients who had a history of myocardial infarction not only had a poorer sleep quality but also fell asleep significantly earlier than those without a history of myocardial infarction, which is consistent with the results of a study by Hsanpour-Dehkordi et al.²⁹ In our study, although the patients with HF fell sleep earlier, they had a poorer sleep quality than the others.

The findings of this research showed a significant association between the severity of pain and sleep quality in the patients with HF. The quality of sleep was worse in tandem with an increase in pain severity. Also, sleep quality was poorer in the patients with severe fatigue than in the patients with low and moderate fatigue. The Spearman correlation coefficient showed a significant positive relationship between the severity of fatigue and sleep quality.

One study estimated that between 50% and 80% of the patients with non-fetal chronic pain had sleep disorders.³⁰ This connection can be a two-way relationship inasmuch as sleep disturbance in patients with chronic pain may increase the severity of pain and

attention to pain. In a study conducted in the U.S., sleep problems were associated with increased pain.³¹ The results of a study showed that a short sleep duration reduced the duration of sleep stages, especially the stage of rapid eye movement; this reduction increased the sensitivity to pain and ultimately led to a poorer sleep quality.¹⁷ We suggest that the family members of patients ease their severity of pain through different methods such as Quran recitation, distraction, relaxation, proper physical activity, and medical treatment.

First and foremost among the limitations of the present study are its cross-sectional design and the use of a self-report questionnaire for the assessment of sleep quality. Future studies should compare subjective reports of sleep disturbances in patients with the findings of diagnostic tests so as to definitively demonstrate a relationship between diseases and sleep disorders. Needless to say, larger sample volumes will augment the reliability of future investigations.

CONCLUSIONS

Periods of regular sleep are essential for health, wellness, and physical refreshment. Our results showed that sleep quality was poor in nearly half of our HF patients, with getting up to urinate being the most common reason for waking up during the night. Consultation with an urologist can be useful for these patients. Increasing the awareness of patients with HF about improving sleep and encouraging them to participate in regular educational courses in this regard can improve the quality of their sleep and prevent sleep disorders.

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Conflict of Interest

The authors declare that they have no conflict of interests.

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