



# Sleep Quality in Heart Failure Patients: A Systematic Review of Risk Factors and Assessment Tools

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## Abstract

**Background:** Poorly sleeping is a common problem for heart failure patients and can significantly decrease their quality of life. Among heart failure patients, the widespread issue of poor sleep quality can lead to a diminished quality of life. The present study aimed to review systematically the evidence focused on the determinants of sleep quality factors in heart failure patients.

**Methods:** We conducted a comprehensive search for observational studies in both English- and Persian-language databases from Feb 1991 to Jan 2023. The search strategy included keywords such as "sleep quality" and "heart failure" and risk factors. All screening and extraction steps were carried out by two researchers.

**Results:** The initial search yielded 10,357 articles. After screening, 37 studies (30 cross-sectional studies, 1 longitudinal study, 2 correlational studies, 1 prospective observational study, 2 case-control studies and 1 descriptive-analytical study) were included. We categorized the identified factors as demographic, habits and lifestyle, medication use, and psychological. The Pittsburgh Sleep Quality Index (PSQI) is the most commonly used sleep quality assessment tool.

**Conclusion:** Mental health-related and lifestyle factors such as depression, fatigue, female sex, and high BMI play important roles in disrupting sleep quality. In addition, it is necessary to develop new assessment tools for sleep quality specified for HF patients.

**Keywords:** Sleep quality; Risk factors; Heart failure; Systematic review

## Introduction

Heart failure (HF) is a global health issue causing complications like fatigue, edema, and shortness of breath (1), leading to poor sleep quality in approximately 75% of HF patients (2). Sleep dis-

turbances are strongly related to comorbidities like hypertension, diabetes, and dyslipidemia, risk factors for CVDs (3). Cardiovascular patients often face impaired sleep quality, especially after



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heart attacks, coronary artery bypass surgery, or heart failure (4). Factors affecting sleep quality in HF patients include pain (5), shortness of breath, and anxiety, which can cause drowsiness, a bad temper, and difficulty performing daily activities. Factors such as age, enuresis, sex, depression, underlying diseases, education level, employment status, and hospital stay affect sleep quality in heart disease patients (6). Riege's study found that smoking, alcohol consumption, and body mass index were not associated with sleep disorders (7). However, Muthukrishnan et al. found anxiety as a significant predictor of poor sleep quality among HF patients after coronary artery bypass surgery (8).

Existing research has explored sleep disorders among cardiac patients, but the specific factors influencing sleep quality in this population remain unclear. Moreover, prior studies have predominantly focused on the effects of respiratory sleep disturbances, such as apnea and shortness of breath, in individuals with heart failure. Consequently, the current study sought to synthesize the factors that can impact the sleep of heart failure patients. The findings from this systematic review can inform the development of nursing interventions aimed at enhancing sleep quality for heart failure patients.

## Methods

This study systematically reviewed observational studies on factors affecting sleep quality in HF patients. The review was designed using the PRISMA protocol for systematic review. The studies were included if they met the criteria of observational research, participants aged over 18 years, and those suffering from sleep disorders. Nonoriginal articles, interventional and animal studies were excluded. The study aimed to evalu-

ate the factors affecting sleep quality in HF patients.

### *Literature search*

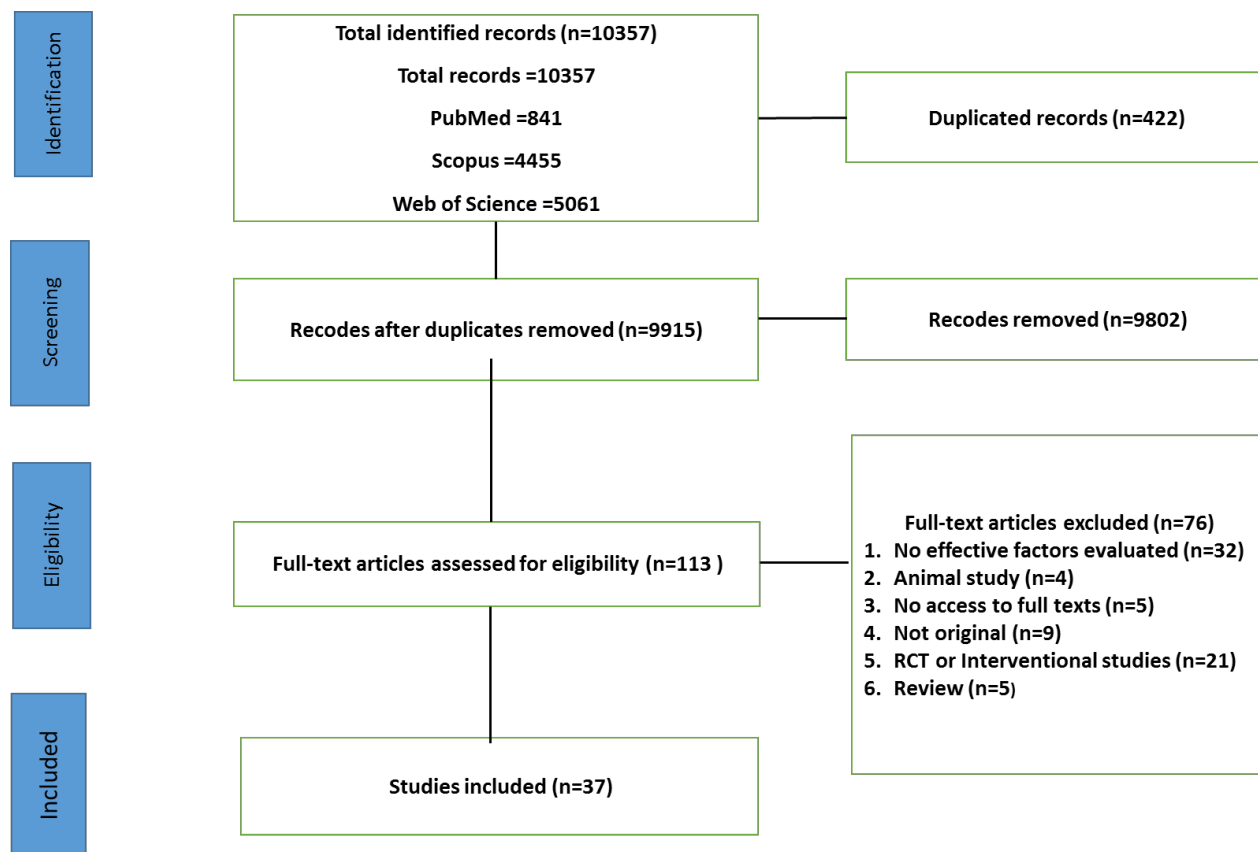
This systematic review was conducted using a systematic search strategy across various electronic databases, including PubMed, Google Scholar, Web of Science, Scopus, and Science Direct, as well as relevant Persian language databases (SID, Iran Medex, Magiran, Medlib, and IranDoc), covering the period from 1991 to 2023. The review process was overseen by a health research librarian, who guided the researchers in screening publications and hand-searching for associated articles. The search strategy encompassed keywords related to sleep duration, sleep disorders, sleep hygiene, sleep problems, sleep disturbances, sleep quality, sleep-wake disorders, circadian rhythm, sleep initiation and maintenance disorders, poor sleep quality, and terms associated with heart failure, such as heart decompensation, cardiac failure, myocardial failure, congestive heart failure, chronic heart failure, and related risk factors (Fig. 1).

### *Data extraction*

The study evaluated the quality of articles using JBI evaluation checklists for cross-sectional, correlational, and longitudinal studies. Articles with over 50% "yes" answers were included in the study. The study also discussed factors affecting sleep quality in heart failure patients, with a focus on articles with more than 50% "yes" answers (9).

### *Ethics approval and consent to participate*

This study is a part of the doctoral thesis in the field of nursing, which was ethically evaluated and approved by the research ethics committee of Mashhad University of Medical Sciences (Code: IR.MUMS.REC.1401.233).



**Fig. 1:** Flow diagram of the database search and article selection

## Results

The study analyzed 10,357 articles, excluding duplicates and initial screening. After excluding interventions, nonoriginal, or animal articles, sleep factors, and inaccessible full texts, 37 observational studies were included. These studies focused on factors influencing sleep quality in heart failure patients, providing a comprehensive basis for data extraction and analysis. The studies included 30 cross-sectional, 1 longitudinal, 2 correlational, 1 prospective observational, 2 case-

control, and 1 descriptive-analytical studies (Table 1).

### *Demographic factors*

Table 2 reveals demographic determinants of sleep quality in heart failure patients. Female sex was identified as a predictor in 10 studies, while eight suggested poor sleep qualities in older participants. Financial status was emphasized as a robust predictor in one study. However, two studies contradicted these findings. Table 3 summarizes the studies, objectives, tools, and results.

**Table 1:** Critical appraisal of article quality

| First Authors, Year, ref         | Study design                     | sample | Mean age | Score | Decision |
|----------------------------------|----------------------------------|--------|----------|-------|----------|
| Redeker (2010), (10)             | Cross sectional                  | 173    | 60.3     | 7/8   | Included |
| Jeon (2020), (11)                | Cross-sectional                  | 135    | 60.6     | 7/8   | Included |
| Awotidebe (2017), (12)           | Case control                     | 50     | 60.6     | 8/10  | Included |
| Chen (2013), (13)                | Cross-sectional                  | 133    | 62       | 7/8   | Included |
| Jorge-Samitier (2020), (2)       | Cross-sectional                  | 203    | 81.1     | 7/8   | Included |
| Lee (2016) (14)                  | Longitudinal,observational study | 204    | 62       | 8/11  | Included |
| Redeker (2005), (15)             | Cross-sectional                  | 61     | 61       | 6/8   | Included |
| Riegel (2012), (7)               | Cross-sectional                  | 266    | 70       | 7/8   | Included |
| Moradi (2014), (16)              | Cross-sectional                  | 158    | 73       | 7/8   | Included |
| Matsuda(2015), (17)              | Cross-sectional                  | 1071   | 64       | 7/8   | Included |
| Santos (2011), (18)              | Cross-sectional                  | 400    | 57       | 7/8   | Included |
| Johansson (2012), (19)           | Cross-sectional                  | 613    | 78       | 7/8   | Included |
| Nasir (2015), (20)               | Cross-sectional                  | 40     | 60       | 6/8   | Included |
| Momayyezi (2015), (21)           | Case-control                     | 160    | 56       | 9/10  | Included |
| Kanno (2016), (22)               | Prospective observational        | 1083   | 68       | 7/8   | Included |
| Janya (2017), (23)               | Predictive correlational         | 340    | 60       | 6/8   | Included |
| Nasiry (2018), (24)              | Cross-sectional                  | 150    | 52       | 8/8   | Included |
| Syeda Misbah Batool (2020), (25) | Cross sectional                  | 260    | 49       | 5/8   | Included |
| Avci (2021), (26)                | Cross-sectional                  | 95     | 65       | 7/8   | Included |
| Hajj (202), (27)                 | Cross-sectional                  | 113    | 52       | 8/8   | Included |
| Goudarzian (2016), (28)          | Descriptive-correlational        | 290    | 53       | 7/8   | Included |
| Matsuda(2021), (29)              | Cross-sectional                  | 1294   | 64       | 8/8   | Included |
| Lainsamputty (2018), (30)        | Correlational                    | 153    | 61       | 8/8   | Included |
| Edmealem (2020), (31)            | Cross-sectional                  | 396    | 65       | 8/8   | Included |
| Conley (2019), (32)              | Cross-sectional                  | 173    | 60       | 8/8   | Included |
| Redeker (2012), (33)             | Cross-sectional                  | 109    | 60.3     | 6/8   | Included |
| Wang (2007), (6)                 | Cross-sectional                  | 101    | 74       | 8/8   | Included |
| Erickson (2003), (34)            | Cross-sectional                  | 396    | 54       | 8/8   | Included |
| Brostrom(2004), (35)             | Cross-sectional                  | 223    | 74       | 7/8   | Included |
| Javadi (2014), (36)              | Cross-sectional                  | 240    | 60       | 7/8   | Included |
| Gharaibeh(2023), (37)            | Cross-sectional                  | 200    | 58       | 7/8   | Included |
| Esnaasharieh(2022), (38)         | Cross-sectional                  | 100    | 60       | 7/8   | Included |
| Kania(2022), (39)                | Cross-sectional                  | 505    | 57.1     | 8/8   | Included |
| Xiong(2023), (40)                | Cross-sectional                  | 254    | 64       | 8/8   | Included |
| Zeighami Mohammadi 2013, (41)    | Cross-sectional                  | 100    | 5        | 7/8   | Included |
| Aria (2017), (42)                | Cross-sectional                  | 100    | 69       | 8/8   | Included |
| Aslani (2007), (43)              | Descriptive-analytical           | 205    | 58       | 6/8   | Included |

**Table 2:** Demographic factors affecting sleep in heart failure patients

| Demographic factors                     | Effective/Ref                           | Non-Effective |
|-----------------------------------------|-----------------------------------------|---------------|
| Gender (male/female)                    | (6, 11, 12, 16, 18, 24, 34-36, 38)      | (13, 25)      |
| Age                                     | (2, 16, 22, 24, 28, 31, 34, 36, 41, 43) | (21, 25, 28)  |
| educational level                       | (16, 20, 21, 28, 31, 36, 41)            | (13)          |
| Employment status (employed/unemployed) | (16, 21)                                | ----          |
| Marital status (single/married)         | (23, 24).                               | ----          |
| Residency (rural/urban)                 | (31)                                    | ----          |
| Income (low/middle/high)                | (28, 38, 41)                            | (13)          |
| Job                                     | (16, 18, 21, 24)                        | ----          |

### ***Habits and lifestyle***

Studies indicate that lifestyle factors such as napping (32), early morning wake-ups, bathing (37), using sleeping pills (2), smoking, and alcohol consumption affect sleep quality in heart failure patients (36, 44). However, these factors may not significantly impact sleep quality (7, 20, 25, 28). Obesity has been linked to poor sleep quality in some studies (2, 13, 25). Physical activity, unlike obesity, could be a recommended solution for sleep disorders in heart failure patients. Therefore, addressing these lifestyle factors is crucial for improving sleep quality in HF patients (38).

### ***Psychological factors***

Depression is a significant factor affecting sleep quality in HF patients (6, 7, 10, 11, 17, 20, 22, 23, 26, 29, 42, 45), with disrupted sleep being more common in depressive patients. Anxiety is also a useful indicator of impaired sleep quality (5, 17, 19, 23, 29, 31, 42). Other psychological factors contributing to poor sleep quality include dysfunctional beliefs (17, 23, 29), attitudes towards disease prognosis (31, 40), negative mental image (28), poor self-perceived health (6, 7), perceptions of disease prognosis (7, 31), and nightmares (18). These psychological determinants contribute to poor sleep quality in heart failure patients.

### ***Physical health factors***

Physical factors affecting sleep quality in heart failure patients include hospital admission (6, 16, 40), left ventricular ejection fraction (16, 34), heart function (6, 11, 12, 18, 34, 45), pain (5, 13, 18, 19, 21, 32, 46), enuresis (2, 6, 18, 30, 33), fatigue (10, 14, 15, 18, 20, 27, 30, 32, 45), respiratory problems (2, 18, 23, 47), length of hospital stay (6, 16), and drug use (6, 40). Other factors in-

clude comorbidities (6, 48), nocturnal heartbeat (47), and history of myocardial infarction (20, 21). A significant link was found between chronic obstructive pulmonary disease (COPD) and sleep quality in patients with heart failure (41). Enuresis was the most common cause of sleep disorders in hospitalized HF patients, and having a history of heart surgery was a predictor of sleep quality in HF patients (6, 18, 21, 31). Comorbidities, nocturnal heartbeat, and history of myocardial infarction also affect sleep quality (38).

### ***Drugs***

Sleep quality in heart failure patients is often affected by the use of angiotensin-converting enzyme inhibitors (2, 6, 23, 27, 31, 35), although Chen et al. (48) have shown no significant association between these medications and sleep quality. However, Zeighami Mohammadi found a statistically significant relationship between the use of these inhibitors and sleep quality in heart failure patients (41).

### ***Sleep assessment tools***

Previous studies have utilized various tools to evaluate sleep quality in HF patients, with the PSQI being the primary tool used in 21 studies. Other sleep quality assessment instruments include the Difficulty Initiating and Maintaining Sleep (DIMS) Scale, the Sleep Habits Questionnaire (SHQ), polysomnography, the Epworth Sleepiness Scale, Actigraphy, the Uppsala Sleep Inventory, sleep-disordered breathing (SDB), the Sleep Hygiene Awareness and Practice Scale (SHAPS), the Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS-16), and the Insomnia Severity Index (ISI).

**Table 3:** Summary Descriptive information of screening studies included

| First author, Year (Ref)  | Objective(s)                                                                                                                                               | Sleep quality assessment tool(s)                                                                | Result                                                                                                                                                                                   |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Redeker, 2010, (10)       | Evaluation of insomnia symptoms and their relationship with clinical and demographic characteristics and Daytime Function in Stable Heart Failure patients | 1. Insomnia symptoms (DIMS),<br>2. Sleep Habits Questionnaire (SHQ)<br>3. Polysomnography (PSG) | Depression and fatigue in stable HF patients were significantly associated with excessive daytime sleepiness.                                                                            |
| Jeon, 2020, (11)          | Rest-activity rhythms, daytime symptoms, and functional performance among people with heart failure                                                        | 1. Actigraphy<br>2. polysomnography (PSG)                                                       | Circadian rhythm changes impact fatigue, depression, drowsiness, heart function. PSQI scores vary between male and female heart failure patients.                                        |
| Awotidebe, 2016, (12)     | Evaluation of functional capacity and sleep quality in patients with chronic HF                                                                            | Pittsburgh Sleep Quality Index (PSQI)                                                           | Female HF patients were more likely to poor sleep quality and functional capacity.                                                                                                       |
| Chen, 2013, (13)          | Excessive Daytime Sleepiness in Taiwanese HF patients                                                                                                      | 1. Epworth Sleepiness Scale<br>2. PSQI                                                          | There was an association between sleep disorders and daytime napping.                                                                                                                    |
| Conley, 2019, (32)        | Determination of daytime and nighttime sleep characteristics and pain among adults with stable HF.                                                         | 1. PSQI<br>2. Sleep Habits Questionnaire<br>3. Actigraphy<br>4. Polysomnography                 | There was a significant relationship between pain and total sleep time, poor sleep quality, insomnia symptoms, use of sleeping pills, frequent napping, daytime drowsiness, and fatigue. |
| Jorge-Samitier, 2020, (2) | Sleep Quality in HF Patients in the Spanish Population.                                                                                                    | PSQI                                                                                            | "Enuresis linked to Respiratory Disorders"<br>• Snoring and coughing.<br>• Sleeping pills.<br>• Poor sleep quality.                                                                      |
| Lee, 2016, (14)           | Prognostic importance of self-reported sleep quality in HF patients.                                                                                       | PSQI                                                                                            | "63% of participants experience poor sleep quality"<br>Long sleepers, nonwhite, depressed more likely.                                                                                   |
| Redeker, 2005, (45)       | Sleep and quality of life in stable HF patients.                                                                                                           | 1. Actigraphy<br>2. PSQI                                                                        | "Sleep Quality and Duration in Stable Systolic Heart Failure Patients"<br>• Improved heart function.<br>• Improved mental health.                                                        |
| Redeker, 2012, (33)       | Assessment of nocturia, sleep and daytime function in stable HF patients.                                                                                  | 1. Polysomnography<br>2. Epworth Sleepiness<br>3. PSQI                                          | "Stable Heart Failure Patients: Enuresis Severity, Sleep Decrease, Heart Function Decrease, Fatigue,                                                                                     |

**Table 3:** Continued...

|                       |                                                                                                                          |                                                           | Drowsiness"                                                                                                                                                                                                                                                     |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wang, 2007, (6)       | Charactrization of the factors determining sleep quality if HF patients.                                                 | PSQI                                                      | Sleep Discontinuation Causes<br>Enuresis as primary reason.<br>Sleep quality factors: gender, health, depression, comorbidities, functional class, hospital stay, comorbidities, drugs used.                                                                    |
| Broström, 2004, (35)  | Investigation of sleep difficulties, daytime sleepiness, and health related quality of life in patients with chronic HF. | 1. Epworth Sleepiness Scale<br>2. Uppsala Sleep Inventory | "Sleep Duration Differences"<br>•Females sleep shorter.<br>• Males wake up harder.                                                                                                                                                                              |
| Riegel, 2012, (7)     | Modifiable factors associated with sleep dysfunction in adults with heart failure.                                       | PSQI                                                      | "Sleep Quality Unaffected by Smoking, Alcohol Consumption, Body Mass Index"                                                                                                                                                                                     |
| Moradi, 2014, (16)    | Sleep quality and associated factors among with Iranian chronic HF patients                                              | PSQI                                                      | PSQI Scores and Health Factors<br>•Significant relationship between scores and age, gender, education, job status, hospital stay, referral type, nonheart disease, diuretic use, and left ventricular ejection fraction.<br>• Daytime diuretic use recommended. |
| Matsuda, 2021, (29)   | Psychological determinants of disrupted sleep quality in patients admitted for cardiovascular diseases                   | PSQI<br>Sleep-disordered breathing (SDB)                  | Depression and anxiety were strongly associated with poor sleep quality but were not associated with sleep disordered breathing (SDB).                                                                                                                          |
| Santos, 2011, (18)    | Factors associated with sleep pattern in heart failure patients                                                          | PSQI                                                      | Sleep Disorder Causes<br>•Enuresis<br>•Respiratory distress<br>•Pain<br>•Female gender<br>•Unemployment<br>•Fatigue<br>•Shortness of breath<br>• Severe heart failure functional issues.                                                                        |
| Johansson, 2012, (19) | The contribution of heart failure to increased sleep disturbances and depressive symptoms in older adults                | Uppsala Sleep Inventory                                   | "Sleep Disorders and Cardiopulmonary Symptoms"<br>•Shortness of breath and nocturnal heartbeat.<br>• Significant association with pain.                                                                                                                         |

Table 3: Continued...

|                       |                                                                                                                    |                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                          |
|-----------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nasir, 2015, (20)     | Sleep quality and depression in hospitalized congestive HF patients                                                | PSQI                                                                                                                                                     | Sleep Quality in Heart Failure Patients <ul style="list-style-type: none"> <li>• Severe HF problems, female gender, education, job type, history of infarction, pain, fatigue linked to poor sleep quality.</li> <li>• No significant relationship between hypertension, smoking, diabetes, lower PSQI score.</li> </ul> |
| Momayyezi, 2015, (21) | Comparison sleep quality in HF patients and healthy participants.                                                  | PSQI                                                                                                                                                     | "Demographics, Education, Job Type, Myocardial Infarction History, Pain, Fatigue, Sleep Quality"<br>Enuresis most common nighttime awakening in HF patients.                                                                                                                                                             |
| Kanno, 2016, (22)     | Prognostic significance of Insomnia in HF patients                                                                 |                                                                                                                                                          | "HF Patients' Insomnia Linked to Age, Gender, Diuretics/Inotropics Use, Psychiatric Disorders, Depression, Cognitive Disorders"                                                                                                                                                                                          |
| Janya, 2017, (23)     | Determinants of Insomnia in HF patients                                                                            | Sleep Hygiene Awareness and Practice Scale (SHAPS).<br>Dysfunctional Beliefs and Attitudes about Sleep scale (DBAS-16).<br>Insomnia Severity Index (ISI) | Predictors of Insomnia in Heart Failure Patients <ul style="list-style-type: none"> <li>• Divorce/Wifhood</li> <li>• Moderate anxiety/depression</li> <li>• Severe shortness of breath</li> <li>• Dysfunctional sleep beliefs/attitudes.</li> </ul>                                                                      |
| Nasiry, 2018, (24)    | Assessment of sleep quality and general health in patients with heart failure.                                     | PSQI                                                                                                                                                     | Male Patients' Sleep Quality and Efficiency <ul style="list-style-type: none"> <li>• Lower mental sleep quality and efficiency compared to females.</li> <li>• Higher sleep delay and disorders in males.</li> <li>• Marital status significantly associated with higher sleep quality.</li> </ul>                       |
| Batool, 2020, (25)    | Assessment of sleep quality and effective factors among congestive cardiac failure patients.                       | PSQI                                                                                                                                                     | Sleep Quality and Disease <ul style="list-style-type: none"> <li>• Prolonged disease and high BMI linked.</li> <li>• Aging, smoking, gender unrelated.</li> </ul>                                                                                                                                                        |
| Avcı, 2021, (26)      | The effect of daytime activities and depression symptoms level on sleep quality in the elderly with heart failure. | PSQI                                                                                                                                                     | Depression Symptoms and PSQI Score <ul style="list-style-type: none"> <li>• Significant positive relationship.</li> </ul>                                                                                                                                                                                                |

**Table 3:** Continued...

|                          |                                                                                                                                                                                            |                                                                   |                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          |                                                                                                                                                                                            |                                                                   | <ul style="list-style-type: none"> <li>•Daytime activity fatigue negatively impacts sleep quality.</li> </ul>                                                                                                                                                                                                                                   |
| Hajj, 2020, (27)         | Investigating sleep quality, fatigue, and quality of Life in individuals with HF                                                                                                           | PSQI                                                              | Poor sleep quality was significantly associated with severe fatigue.                                                                                                                                                                                                                                                                            |
| Goudarzian 2016, (28)    | Determination of the effect of body image on sleep quality in Iranian patients with congestive HF.                                                                                         | PSQI                                                              | <p>Sleep Quality and Body Image Relationship</p> <ul style="list-style-type: none"> <li>•Significant relationship between sleep quality and patient's body image.</li> <li>•No significant correlation between sleep quality scores, age, BMI, education, exercise, smoking, alcohol consumption, heart disease, depression history.</li> </ul> |
| Matsuda, 2015, (17)      | Determining the prevalence of poor sleep quality and its association with depression and anxiety scores in patients admitted for cardiovascular disease: A cross-sectional designed study. | PSQI                                                              | <p>Depression, Anxiety, Poor Sleep Quality</p> <ul style="list-style-type: none"> <li>•Significant relationship between depression, anxiety, poor sleep quality.</li> <li>•Gender linked to poor sleep quality and depression.</li> <li>• Higher association with depression among females.</li> </ul>                                          |
| Lainsamputty, 2018, (30) | Investigating correlation between fatigue and sleep quality among patients with HF                                                                                                         | PSQI                                                              | There was a significant relationship between fatigue and poor sleep quality.                                                                                                                                                                                                                                                                    |
| Edmealem, 2020, (31)     | Sleep quality and associated factors among patients with diabetes, hypertension, and HF in Ethiopia                                                                                        | PSQI                                                              | <p>Sleep Quality and Disease Perception</p> <ul style="list-style-type: none"> <li>•Age, education level, residence, disease prognosis perception, anxiety.</li> <li>•Enuresis as most common sleep disorder cause.</li> </ul>                                                                                                                  |
| Erickson, 2003, (34)     | Symptoms of sleep disturbance in HF patients                                                                                                                                               | A researcher-made questionnaire for assessment of sleep disorders | <p>Married Patients' Sleep Issues</p> <ul style="list-style-type: none"> <li>•Difficulty waking up and light sleeping.</li> <li>•Male patients report more daytime napping difficulties.</li> <li>•Hypnotics and ejection fraction use not linked to sleep disorders.</li> </ul>                                                                |
| Javadi 2014, (36)        | Investigating the quality of sleep and its related factors in hospitalized patients with HF                                                                                                | PSQI                                                              | <p>Sleep Quality in Heart Failure Patients</p> <ul style="list-style-type: none"> <li>• Age, gender, education level.</li> <li>• Smoking, obesity.</li> </ul>                                                                                                                                                                                   |

Table 3: Continued...

|                               |                                                                                                                                                   |                                                                   |                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gharai-beh 2023, (37)         | Evaluation of sleep disorders in different classes of HF                                                                                          | PSQI                                                              | Sleep Quality Factors <ul style="list-style-type: none"> <li>• Urination waking up.</li> <li>• Midnight or early morning wake-ups.</li> <li>• Coughing and snoring wake-ups.</li> <li>• Difficulty falling asleep within 30 min.</li> </ul>                                                                                     |
| Esnaashari 2022, (38)         | Investigating the relationship between physical activity and sleep quality in heart failure patients.                                             | PSQI                                                              | Sleep Quality and Physical Activity <ul style="list-style-type: none"> <li>• Significant inverse relationship between sleep quality and physical activity.</li> <li>• Improved sleep quality with increased activity.</li> <li>• Predictors include physical activity, gender, heart surgery history, disease stage.</li> </ul> |
| Kania 2022, (39)              | Identifying the parameters associated with poor sleep quality in HF patients with Obstructive Sleep Apnea                                         | (PSQI), the Epworth Sleepiness Scale (ESS)                        | Female sex and coexistence of heart failure are predictors of poor sleep quality.                                                                                                                                                                                                                                               |
| Xiong 2023, (40)              | Assessment of sleep quality and its relationship with fear of disease progression in patients with chronic heart failure                          | PSQI                                                              | Impaired Sleep Quality Predictors: <ul style="list-style-type: none"> <li>• Hospitalization history</li> <li>• High number of HF medications</li> <li>• Monthly income</li> <li>• Fear of disease progression</li> </ul>                                                                                                        |
| zeighami Mohammadi 2013, (41) | Evaluation of Sleep Problems and Its Associated Factors in Male Patients with Systolic Heart Failure                                              | (PSQI), the Epworth Sleepiness Scale (ESS), Sleep Disorder Scale, | "Sleep Quality in Heart Failure Patients" <ul style="list-style-type: none"> <li>• Chronic obstructive pulmonary disease, angiotensin converting enzyme drugs.</li> <li>• Age, income, BMI, education, smoking.</li> </ul>                                                                                                      |
| Aslani 2007, (43)             | Studying the spectrum of sleep disorders in patients with heart failure hospitalized in the heart department of Hajar Shahrekord Hospital in 2013 | A researcher-made questionnaire for assessment of sleep disorders | Women's Sleep Disorders <ul style="list-style-type: none"> <li>• Frequency of sleep disorders higher in women (<math>p &lt; 0.001</math>).</li> <li>• Age doesn't significantly affect sleep disorder scores.</li> <li>• Increase in teeth grinding and snoring with age (<math>0.05 &gt; p</math>).</li> </ul>                 |
| Aria 2017, (42)               | investigate the relationship between sleep quality, anxiety, and depression in patients with heart failure                                        | PSQI                                                              | Factors like anxiety and depression significantly correlating with poor sleep.                                                                                                                                                                                                                                                  |

## Discussion

This systematic review aimed to identify the factors affecting sleep quality in HF patients. Briefly, most studies have used PSQI scores to assess sleep quality in HF patients. In addition, the main sleep disorders in HF patients are respiratory problems and apnea. We also classified sleep quality factors into personal, physical, psychological, and lifestyle factors.

Sleep quality in heart failure patients is influenced by various factors such as age, sex, marital status, residency, economic status, job, and education (49). Females tend to have a higher prevalence of sleep disorders due to psychological issues and menopause, which can worsen sleep quality, especially in elderly patients (21). Short-sleeper women are more likely to sleep longer than men, but more male patients report daytime drowsiness and nighttime awakenings (16, 20). Age is a significant factor in sleep quality, as heart failure occurs in old age (2, 16, 22, 24, 43, 50). Emotional stress (43) and physical problems also contribute to sleep disorders in older individuals (49, 51). Overall, factors such as age, sex, marital status, residency, economic status, job, and education play crucial roles in determining sleep quality in HF patients.

Two studies found a correlation between economic and education status and sleep quality (52, 53), but Chen et al. (13) and Liu et al.'s (54) findings did not. Other studies suggest financial worries (55), physical and health issues, marital status, and chronic diseases contribute to poor sleep quality, particularly in older individuals (24, 56).

### *Habit and lifestyle*

Smoking in HF patients is linked to impaired sleep quality (36), with nicotine causing insomnia and increased sleep disorders (36). However, this relationship was not statistically significant in two studies (20, 28). Coffee consumption negatively impacts sleep duration and efficiency (21), while alcohol consumption is associated with short sleep and snoring (31). Other sleep-disrupting

factors include insomnia, daytime sleepiness, obstructive sleep apnea, and obesity (57). Exercise is also associated with better sleep quality (28, 38), while obesity is a significant sleep-disrupting factor in HF patients, as it often leads to respiratory problems (28). Higher BMI is frequently associated with poor sleep quality in HF patients, as reported in previous studies (2, 6, 25, 28, 36, 52). These factors highlight the importance of addressing sleep quality in HF patients.

### *Psychological factors*

Research shows a strong association between mental health status and sleep quality (58), with psychological factors like depression, anxiety, and disturbing dreams disrupting sleep and contributing to sleep disorders (6, 7, 10, 11, 17, 20, 22, 23, 26, 29, 45). Depression is particularly prevalent in HF patients, with studies showing it as a predictive factor for poor sleep quality in individuals with acute myocardial infarction (59). Self-perceived health status also significantly influences sleep quality (6), with patients' attitudes about their disease prognosis (31) and sleep patterns reflecting their mental health and cognitions (23). Additionally, body image is significantly influenced by sleep quality (28), with chronic HF patients with poor sleep quality often exhibiting poor body image (40).

### *Physical health factors*

Enuresis, overactivation of the bladder, and nocturnal polyuria are common physical problems that negatively impact sleep quality in HF patients (2, 6, 18, 21, 30, 33). These conditions can lead to death and distress, with one-third of these patients waking up three times at night to urinate (21, 37, 60). Elderly HF patients often have a low threshold for pain, which disrupts sleep. Pain is common in HF patients, with chest and knee pain being the main complaints (5, 18-21, 32, 46, 47). Fatigue is another significant factor affecting sleep quality, as it reduces daily activity in patients with poor heart function, reducing excessive sleepiness and daytime drowsiness (10, 11, 21, 27, 30, 32, 33). Daytime napping can improve sleep

quality, with the duration and number of naps being crucial factors (13).

### *Sleep assessment tools*

In this systematic review, subjective tools like the ISI and Pittsburgh Sleep Quality Index (PSQI), as well as actigraphy and polysomnography, were used to assess sleep quality in HF patients. The PSQI was the most common tool, used in 21 of the 29 studies. While the PSQI is a brief and convenient assessment, it has been criticized for evaluating sleep quality over the past month. This may have led to more positive estimates of sleep quality at home compared to the hospital (46). Additionally, some studies found no significant association between perceived and PSQI-estimated sleep quality (2, 14, 16), possibly due to the extended time HF patients spend in bed (2). The authors recommend developing a standard sleep assessment questionnaire tailored for heart failure patients.

### *Limitations*

The study's limitations include the use of different sleep quality assessment tools across studies; have contributed to the varied results. Access to all databases was not possible, and the wide range of included studies prevented focusing on confounding variables. Future studies could consider these limitations.

### **Conclusion**

The study found poor sleep quality in HF patients due to various factors, including physiological, physical, individual, habit, and lifestyle factors. Depression, fatigue, female sex, and high BMI were identified as significant subcategories. The study recommends developing a specific HF patient questionnaire and implementing programs to improve sleep quality, focusing on factors like diuretics and emotional adjustment skills. Future research should explore cultural and social influences on sleep quality and design interventions for improved sleep hygiene and pain reduction. Larger sample sizes and control for

confounding factors would improve the methodological quality of studies and facilitate meta-analyses to identify factors influencing sleep quality in HF patients.

### **Journalism Ethics considerations**

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

### **Data availability statement**

The data that support the findings of this study are available from Mashhad University of Medical Sciences. Restrictions apply to the availability of these data, which were used under license for this study.

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### **Conflict of interest**

The authors declare that there is no conflict of interests.

### **References**

1. Khera R, Dharmarajan K, Krumholz HM (2018). Rising Mortality in Patients with Heart Failure in the United States: Facts Versus Fiction. *JACC Heart Fail*, 6 (7): 610-612.
2. Jorge-Samitier P, Durante A, Gea-Caballero V, et al (2020). Sleep Quality in Patients with Heart Failure in the Spanish Population: A Cross-Sectional Study. *Int J Environ Res Public Health*, 17 (21): 7772.
3. Clark AJ, Salo P, Lange T, et al (2016). Onset of Impaired Sleep and Cardiovascular Disease

- Risk Factors: A Longitudinal Study. *Sleep*, 39 (9): 1709-18.
4. Arnaud C, Bochaton T, Pépin JL, Belaidi E (2020). Obstructive sleep apnoea and cardiovascular consequences: Pathophysiological mechanisms. *Arch Cardiovasc Dis*, 113 (5): 350-358.
5. Adib-Hajbaghery M, Izadi-Avanji F, Akbari H (2012). Quality of sleep and its related risk factors in hospitalized older patients in Kashan's Hospitals, Iran 2009. *Iran J Nurs Midwifery Res*, 17 (6): 414-420.
6. Wang TJ, Lee SC, Tsay SL, et al (2010). Factors influencing heart failure patients' sleep quality. *J Adv Nurs*, 66 (8): 1730-40.
7. Riegel B, Glaser D, Richards K, et al (2012). Modifiable factors associated with sleep dysfunction in adults with heart failure. *Eur J Cardiovasc Nurs*, 11 (4): 402-409.
8. Muthukrishnan A, Muralidharan TR, Subash J, et al (2020). Association of poor sleep quality with risk factors after coronary artery bypass graft surgery-A prospective cohort study. *J Vasc Nurs*, 38 (2): 83-92.
9. Porritt K, Gomersall J, Lockwood C (2014). JBI's Systematic Reviews: Study selection and critical appraisal. *Am J Nurs*, 114 (6): 47-52.
10. Redeker NS, Jeon S, Muench U, et al (2010). Insomnia symptoms and daytime function in stable heart failure. *Sleep*, 33 (9): 1210-6.
11. Jeon S, Conley S, Redeker NS (2020). Rest-activity rhythms, daytime symptoms, and functional performance among people with heart failure. *Chronobiol Int*, 37 (8): 1223-1234.
12. Awotidebe TO, Adeyeye VO, Adedoyin RA, et al (2016). Assessment of functional capacity and sleep quality of patients with chronic heart failure. *Hong Kong Physiother J*, 36: 17-24.
13. Chen HM, Clark AP, Tsai LM, et al (2013). Excessive daytime sleepiness in Taiwanese people with heart failure. *J Nurs Res*, 21 (1): 39-48.
14. Lee KS, Lennie TA, Heo S, et al (2016). Prognostic Importance of Sleep Quality in Patients with Heart Failure. *Am J Crit Care*, 25 (6): 516-525.
15. Redeker NS, Jeon S, Andrews L, et al (2015). Feasibility and Efficacy of a Self-Management Intervention for Insomnia in Stable Heart Failure. *J Clin Sleep Med*, 11 (10): 1109-19.
16. Moradi M, Mehrdad N, Nikpour S, et al (2014). Sleep quality and associated factors among patients with chronic heart failure in Iran. *Med J Islam Repub Iran*, 28 (4): 149.
17. Matsuda R, Kohno T, Fukuoka R, et al (2015). Abstract 14835: The Prevalence of Sleep Disturbance and Its Strong Impact on Depression Symptom in Patients Hospitalized with Cardiovascular Diseases. *Circulation*, 132(1): A14835-A.
18. Santos MAd, Cruz DdALMd, Barbosa RL (2011). [Factors associated to sleep pattern in heart failure patients]. *Rev Esc Enferm USP*, 45 (5): 1105-12.
19. Johansson P, Riegel B, Svensson E, et al (2012). The contribution of heart failure to sleep disturbances and depressive symptoms in older adults. *J Geriatr Psychiatry Neurol*, 25 (3): 179-87.
20. Nasir U, Shahid H, Shabbir MO (2015). Sleep quality and depression in hospitalized congestive heart failure patients. *J Pak Med Assoc*, 65 (3): 264-9.
21. Momayyezi M, Fallahzadeh H, Barzegar R (2015). Sleep quality in patients with heart failure: comparison between patients and non-patients in Yazd, Iran (2014). *Iranian Heart J*, 16 (3): 28-37.
22. Kanno Y, Yoshihisa A, Watanabe S, et al (2016). Prognostic significance of insomnia in heart failure. *Circ J*, 80 (7): 1571-7.
23. Chimluang J, Aungsueroch Y, Jitpanya C (2017). Descriptors of Insomnia among Patients with Heart Failure. *J Med Assoc Thai*, 100 (4): 403-9.
24. Nasiry D, Tavakoli A, Saber-Moghadam M (2018). The Relationship Between Sleep Quality and General Health in Patients with Heart Failure. *JHNM*, 4 (28): 239-245.
25. Batool S, Shafqat A, Khan M, et al (2020). Quality of Sleep Among the Patients of Congestive Cardiac Failure and Factors Associated with Poor Sleep Quality. *in Medical forum monthly*, 31 (3): 34-41.
26. Avci A, GÜN M (2021). The Effect of Activities of Daily Living and Depression Symptom Level on Sleep Quality in the Elderly with Heart Failure. *Pak Heart J*, 54 (1): 64-72.
27. Hajj J, Mathelier H, Drachman B, Laudanski K (2020). Sleep Quality, Fatigue, and Quality of Life in Individuals with Heart Failure. *J Nurse Pract*, 16 (6): 461-5.
28. Goudarzian AH, Beik S, Zamani F, et al (2016). Correlation between Body Image and Sleep

- Quality in Patients with Congestive Heart Failure in the Sari City, North of Iran. *Galen Med J*, 5(3): 147-152.
29. Matsuda R, Kohno T, Kohsaka S, et al (2021). Psychological disturbances and their association with sleep disturbances in patients admitted for cardiovascular diseases. *Plos One*, 16 (1): e0244484.
30. Lainsampatty F, Chen HM (2018). The correlation between fatigue and sleep quality among patients with heart failure. *NurseLine J*, 3: 100-14.
31. Edmealem A, Degu SG, Haile D, et al (2020). Sleep Quality and Associated Factors among Diabetes, Hypertension, and Heart Failure Patients at Debre Markos Referral Hospital, Northwest Ethiopia. *Sleep Disord*, 2020: 6125845.
32. Conley S, Feder SL, Jeon S, et al (2019). Daytime and Nighttime Sleep Characteristics and Pain among Adults with Stable Heart Failure. *J Cardiovasc Nurs*, 34 (5): 390-398.
33. Redeker NS, Adams L, Berkowitz R, et al (2012). Nocturia, sleep and daytime function in stable heart failure. *J Card Fail*, 18 (7): 569-75.
34. Erickson VS, Westlake CA, Dracup KA, et al (2003). Sleep Disturbance Symptoms in Patients with Heart Failure. *AACN Adv Crit Care*, 14 (4): 477-87.
35. Broström A, Strömberg A, Dahlström U, et al (2004). Sleep difficulties, daytime sleepiness, and health-related quality of life in patients with chronic heart failure. *J Cardiovasc Nurs*, 19 (4): 234-42.
36. Javadi N, Darvishpour A, Mehrdad N, et al (2015). Survey of Sleep Status and its Related Factors among Hospitalized Patients with Heart Failure. *J Tehran Heart Cent*, 10 (1): 9-17.
37. Gharaibeh B, Al-Absi I, Abuhammad S, et al (2022). Sleep quality among different classes of heart failure patients in Jordan: A STROBE compliant cross-sectional study. *Medicine (Baltimore)*, 101 (48): e32069.
38. Esnaasharieh F, Dehghan M, Mangolian Shahrababaki P (2022). The relationship between sleep quality and physical activity among patients with heart failure: a cross-sectional study. *BMC Sports Sci Med Rehabil*, 14 (1): 20.
39. Kania A, Polok K, Celejewska-Wójcik N, et al (2022). Clinical and Polysomnographic Features Associated with Poor Sleep Quality in Patients with Obstructive Sleep Apnea. *Medicina (Kaunas)*, 58 (7): 907.
40. Xiong J, Qin J, Gong K (2023). Association between fear of progression and sleep quality in patients with chronic heart failure: A cross-sectional study. *J Adv Nurs*, 79 (8): 3082-3091.
41. Zeighami M Sh (2013). Evaluation of sleep problems and its associated factors in male patients with systolic heart failure. *Qom University of Medical Sciences Journal*, 4(24):64-73.
42. Aria H, Naghizadeh MM (2019). Sleep Quality, Anxiety, and Depression in Patients with Heart Failure. *J Adv Med Sci Appl Technol*, 21(8) 213-220.
43. Aslani Y, Akbari A, Heydari A (2007). Investigation of the spectrum of sleep disorders in patients with heart failure hospitalized in the heart department of Hajar Shahrekord Hospital in 2003. *Journal of Shahrekord University of Medical Sciences* 9(1):44-49.
44. Zhuang S, Huang S, Huang Z, et al (2023). Prospective study of sleep duration, snoring and risk of heart failure. *Heart*, 109(10):779-84.
45. Redeker NS, Hilkert R (2005). Sleep and quality of life in stable heart failure. *J Card Fail*, 11 (9): 700-4.
46. Wesselius HM, van den Ende ES, Alsmä J, et al (2018). Quality and Quantity of Sleep and Factors Associated with Sleep Disturbance in Hospitalized Patients. *JAMA Intern Med*, 178 (9): 1201-1208.
47. Johansson P, Arestedt K, Alehagen U, et al (2010). Sleep disordered breathing, insomnia, and health related quality of life a comparison between age and gender matched elderly with heart failure or without cardiovascular disease. *Eur J Cardiovasc Nurs*, 9 (2): 108-17.
48. Chen HM, Clark AP, Tsai LM, et al (2009). Self-reported sleep disturbance of patients with heart failure in Taiwan. *Nurs Res*, 58 (1): 63-71.
49. Mohammadian M, Khosravi A, Nohi S, et al (2018). Factor associated with self-reported sleep quality in adults-a population-based study. *Journal of Knowledge & Health in Basic Medical Sciences*, 12(4): 1-6.
50. Riegel B, Hanlon AL, Zhang X, et al (2013). What is the best measure of daytime sleepiness in adults with heart failure? *J Am Assoc Nurse Pract*, 25 (5): 272-9.

51. Arasteh M, Fayegh Y, Sharifi Z (2014). Investigation of sleep quality and its influencing factors in patients admitted to the gynecology and general surgery of Besat Hospital in Sanandaj. *Medical Journal of Mashhad University of Medical Sciences*, 57: 762-9.
52. Zeighami R, Jalilolghadr S (2014). Investigating the effect of "Citrus Aurantium" aroma on sleep quality of patients hospitalized in the coronary care unit (CCU). *cmja*, 4 (1): 720-733.
53. Friedman EM, Love GD, Rosenkranz MA, et al (2007). Socioeconomic status predicts objective and subjective sleep quality in aging women. *Psychosom Med*, 69 (7): 682-91.
54. Liu JC, Hung HL, Shyu YK, et al (2011). The impact of sleep quality and daytime sleepiness on global quality of life in community-dwelling patients with heart failure. *J Cardiovasc Nurs*, 26 (2): 99-105.
55. Morris JL, Belcher SM, Jeon B, et al (2023). Financial Hardship and its Associations with Perceived Sleep Quality in Participants with Type 2 Diabetes and Obstructive Sleep Apnea. *Chronic Illn*, 19 (1): 197-207.
56. Fu P, Zhou C, Meng Q (2020). Associations of Sleep Quality and Frailty among the Older Adults with Chronic Disease in China: The Mediation Effect of Psychological Distress. *Int J Environ Res Public Health*, 17 (14): 17(14):5240.
57. Zheng D, Yuan X, Ma C, et al (2021). Alcohol consumption and sleep quality: a community-based study. *Public Health Nutr*, 24 (15): 4851-4858.
58. Karimi R, Arshadi N (2019). The relationship of sleep quality with mental health and job burnout. *bjcp*, 13: 121-9.
59. Sharif-Nia H, Yaghoobzadeh A, Goudarzian AH, et al (2018). The Relationship between Sleep Quality with Depression in Patient with Acute Myocardial Infarction. *Qom Univ Med Sci J*, 12: 29-38.
60. Son YJ, Kwon BE (2018). Overactive Bladder is a Distress Symptom in Heart Failure. *Int Neurol J*, 22 (2): 77-82.