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Sleep deprivation in patients with heart failure: A literature review

Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

Abstract

Background: Sleep deprivation in patients with heart failure can negatively deteriorate its condition.
Purpose: Identify the sleep deprivation in patients with heart failure (HF) and related factors, and the impact of sleep deprivation.
Method: literature review of quantitative studies. The search strategy employs terms relevant to the research question: HF, sleep deprivation on HF patients. Inclusion criteria papers had to be published in English after 2013 to 2023. 3 databases were searched (Pubmed, Ovid, Ebscohost).
Results: 12 studies were identified (cross-sectional (9 studies) secondary from longitudinal observational (2 studies), randomized controlled trial (1 study). Total patients with HF in all studies are 2359 samples.The most questionnaire to measure sleep deprivation used over the papers are Pittsburgh Sleep Quality Index (PSQI).PSQI mean score range from 5.04 (2.80) to 12.29 (3.91). The prevalence of sleep deprivation ranges from 36.5% to 98.8%. The related factors with sleep deprivation including older age, women, living in urban, lower employment, smoking, high BMI, HF condition, sleep factors, anxious, depressive, and stress. The consequences of sleep deprivation such as lower self-care behavior, self-confidence, attention, increasing pain, shorter cardiac event-free survival, functional outcome, prognosis, quality of life, increase unplanned hospitalization risks, poorer perfomance in cognitive in adults and worse perfomance on cognitive.
Conclusion: Sleep deprivation in HF is higher and related with demographic, HF related factors, lifestyle, sleep factors, and psychosocial. The consequences of sleep deprivation have adverse effects on psychosocial and cognitive.

Keywords: Heart Failure; Sleep; Sleep Deprivation.

INTRODUCTION

Heart failure (HF) is one of the main causes of death in the world, accounting for 9.1% of all deaths worldwide (Tsao, Aday, Almarzooq, Anderson, Arora, Avery, & American Heart Association, 2023). The global HF population is expanding by 64 million, with the prevalence increasing by 46 percent between 2012 and 2030 (Shahim, Kapelios, Savarese, & Lund, 2023). It is known that Asian countries have higher number of HF patients than Western countries, indicating that the number of HF is declining in developed countries (Shahim et al., 2023). Asian and African men underage of 50 are more likely to have HF. Nevertheless, the comparison of men and women with HF varies depending on the kind of HF (Shahim et al., 2023). The prevalence of HF increases with age, reaching 4.5% in those over 50 and 10% in those over 70 (Ruiz-García, Serrano-Cumplido, Escobar-Cervantes, Arranz-Martínez, Turégano-Yedro, & Pallarés-Carratalá, 2023).

Age, ischemic heart disease, diabetes, chronic renal disease, and valvular heart disease are all factors that contribute to HF epidemiology (Shahim et

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al., 2023). Ischemic heart disease is the most frequent kind of HF and is associated with a high burden of comorbidities and mortality. Despite this, a lower ejection fraction in HF contributes to a poor prognosis and more indications and symptoms (Shahim et al., 2023).

In the initial stages of HF, individuals may not exhibit noticeable symptoms. When early warning signs appear, they tend to be subtle and easily overlooked or dismissed. Shortness of breath is one of the first indicators of heart failure. Other signs and symptoms of HF including fatigue, cough, congestion, pain, and sleep problems (Tsao et al., 2023).

Sleep disturbance is a common problem in individuals with HF that can be caused by HF related symptoms such as nocturnal dyspnea, cough, and palpitation (Buysse, Reynolds III, Monk, Berman, & Kupfer, 2019). The relationship between sleep and HF condition is bidirectional. HF can lead to other health issues, including sleep problems, while sleep problems can worse HF symptoms (Philip, 2023). Inadequate sleep can contribute to higher blood pressure and deteriorate HF condition. Patients with HF also report such things as difficulty in initiating sleep, trouble staying asleep, and waking up too early. Sleep disturbance is a common problem in individuals with HF that can be caused by HF related symptoms such as nocturnal dyspnea, cough, and palpitation (Halperin, 2014).

The relationship between sleep and HF condition is bidirectional. HF can lead to other health issues, including sleep problems, while sleep problems can worse HF symptoms (Khan, & Al-Jahdali, 2023).

Sleep deprivation affects cardiovascular system including high blood pressure, high cholesterol, heart rate, increase plaque, and increase stress on heart (Tobaldini, Costantino, Solbiati, Cogliati, Kara, Nobili, & Montano, 2017). In normal condition, sleep deprivation association with the risk of cardiovascular disease (Cui, Xu, Wan, Ling, Jiang, Wu, & Zaid, 2023). Sleep deprivation including sleep obstructive apnea increase sympathetic nervous system activity (Tobaldini et al., 2017), while this activity exaggerated HF conditions. So, sleep deprivation indeed affects HF condition.

A systematic review reveals that several studies before investigated sleep disturbances such as sleep obstructive sleep apnea in patients with HF (Tobaldini et al., 2017). It is important to examine the studies about sleep deprivation such as insomnia, sleeplessness, sleep inadequate in patients with HF. The prevalence of sleep deprivation in HF patients also varies among studies, which need to be investigated more. Complaints of sleep deprivation experienced by heart failure patients certainly have an impact. By knowing the impact, it helps healthcare teams or policy makers to develop a proper management strategy for helping HF patients with sleep disturbances. Aim of this study (1) Examining the prevalence of sleep deprivation in patients with HF (2) Identify tools of sleep deprivation measurements (3) Identify impact of sleep deprivation in patients with HF (4) identify the related factors with sleep deprivation in patients with HF.

RESEARCH METHOD

This study employed literature review design. The search strategy is finding articles from three databases including OVID, PubMed, and EBSCO. The terms applied in this study are found from MeSH headings. The terms included “heart failure”, “sleep deprivation”, and “quality of life”. The combination words and the synonyms were connected with “OR”; the entry terms with the synonym’s terms were connected with “OR”; each term was connected with “AND”. Both qualitative and quantitate studies were included in this study to cope with sleep deprivation. The title and abstract were reviewed to match with inclusion criteria, and if the conclusion cannot meet by the abstract, the full text is needed to weather to include the paper.

Inclusion criteria encompassed papers that were written in English, published in the recent ten years (2013-2023), open access, and categorized as original research. Papers were screened based on title and abstract relevance. Irrelevance papers were eliminated. Duplicates papers were removed. The PICO framework was utilized to evaluate the paper’s eligibility, which involved investigating samples of heart failure patients who have sleep disturbance, tools used to measure sleep, and the impact of sleep disturbance to HF patients.

In assessing the selected literature on the intersection of sleep deprivation and HF, a rigorous methodological approach was employed. The critical appraisal of each identified article was conducted utilizing the Joanna Briggs Institute (JBI) critical appraisal checklist for analytical cross-sectional studies. The articles were summarized in Table 1 and Table 2 using structure author, year, country, study aims, design, sleep deprivation questionnaire, related factors with sleep deprivation, impact of sleep deprivation.

Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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RESEARCH RESULTS

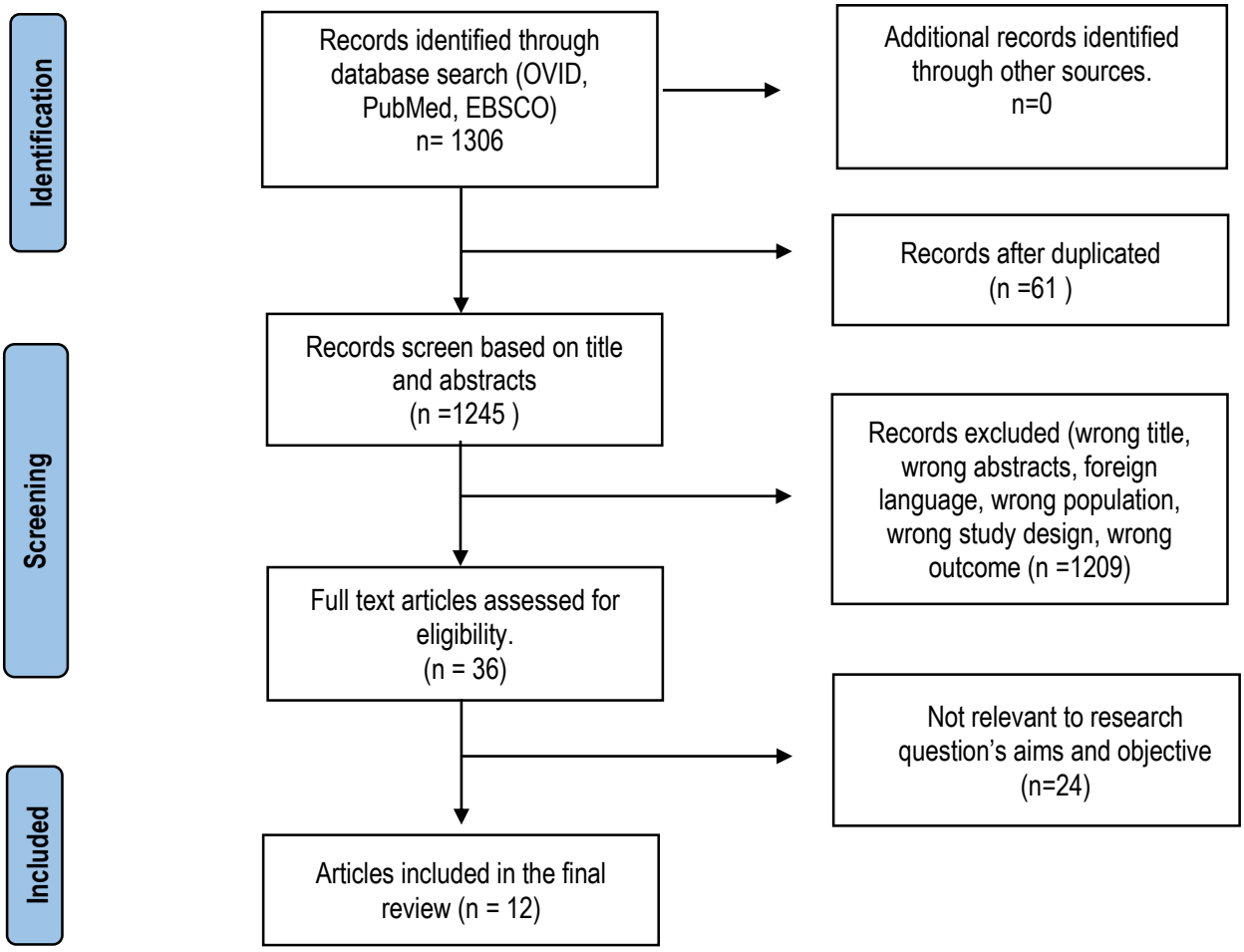

Figure1. Diagram of PRISMA Flow

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Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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Table Results Analysis of The Selected Articles

Author/Year/ Country	Purpose	Method	Result
Edmiston et al., 2023 (USA)	Sleep quality changes in persons with advanced heart failure (HF) who were admitted to the intensive care unit.	Sleep quality was assessed at admission, during hospitalization, and post-discharge.	93% of participants reported poor sleep quality at hospital admission, 90% during hospitalization, and 86% post-discharge.
Spedale et al., 2023 (Italy)	The aim of this study was to evaluate the association between sleep quality and its components and self-care in adults with HF.	This study is a secondary analysis of baseline data from the MOTIVATE-HF study, a randomized controlled trial on patients with HF and their caregivers.	PSQI score median = 12 (10–15). 98.8% of the respondent indicate poor self-reported sleep quality (higher than the 5-point cutoff score)
Conley et al., 2019 (USA)	To describe the relationships between nocturnal sleep characteristics, use of sleep medication, and daytime sleep characteristics and pain among people with HF.	A cross-sectional study of stable participants with HF.	Sleep duration 387.10 (100.5%) Sleep Efficiency 80.07 (17.70%) Sleep Quality 1.39 (0.85%), Daytime Sleepiness 8.31 (4.34%)
Moon et al., 2017 (USA)	Investigate possible mediating roles of disturbed sleep and daytime sleepiness on the relationship between HF and selected cognitive domains among individuals with and without HF.	In a cross-sectional design study.	Mean 0.96 ± 1.09. Disturbed sleeps were higher in individuals with HF compared to without HF
Lee et al., 2016 (USA)	To examine whether self-reported sleep quality is associated with prognosis in patients with heart failure.	Sleep quality was measured with the Pittsburgh Sleep Quality Index.	Global Mean of PSQI 7.8 (4.3) 63.2% of respondents reported poor sleep quality. Mean PSQI in poor sleeper 10.4 (3.3)

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Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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Fritschi et al., 2015 (USA)	The aim of this study was to investigate the extent to which comorbid DM confers independent and additive effects on sleep disturbance, physical functioning, and symptoms among patients with stable HF.	Self-report and polysomnography were used to measure sleep quality, objective sleep characteristics, and sleep-disordered breathing.	PSQI score mean is 9.39 (4.55) in HF patients with DM), 8.45 (4.02) in HF patients without DM) DM slept an average of 30 minutes less than non-DM patients but did not different. between groups in the global PSQI
Edmealem et al., 2020 (Ethiopia)	Poor sleep quality among patients with chronic illness is often unrecognized and untreated, and it results to a negative impact on the prognosis of chronic illness.	The study employed a stratified random sampling technique, and study participants were selected by systematic sampling. The data were collected by a Pittsburgh Sleep Quality Index (PSQI) questionnaire which is a validated and standardized tool.	PSQI mean score 5 (3.48). 36.5% of the respondent had poor sleep quality
Javadi et al., 2015 (Iran)	This study was conducted to determine the quality of sleep and its related factors in hospitalized patients with HF	Samples were selected by convenience sampling.	PSQI mean score 12.29 (3.91), (91.2%) had a poor sleep quality. In the sleep disturbance dimension, most of the subjects (37.1%) had trouble sleeping after awaking during the night
Gaffey et al., 2021 (USA)	Stress also affects health and quality of life among patients with cardiovascular disease and likely plays a prominent role in HF.	We used Pearson correlations and general linear models to assess stress-sleep associations, including the potential moderating effects of sex and symptom severity (NYHA).	Global PSQI Score were associated with Perceived Stress Scale (PSS Sleep Duration (PSQI) not associated with PSS ESS were associated with PSS DBAS were associated with PSS

Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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Moon et al., 2015 (USA)	The aim of this study was to describe the relationships between nocturnal sleep characteristics, use of sleep medication, and daytime sleep characteristics and pain among people with HF.	We conducted a cross-sectional study of stable participants with HF.	ESS = 5.74 ± 3.61 PSQI = 5.04 ± 2.80, more than half (53%) of patients were classified as poor sleepers
Byun et al., 2017 (USA)	This study examined the association of subjective nighttime sleep quality and daytime sleepiness with cognitive impairment in 105 adults (< 60 years old) and 167 elders (≥ 60 years old) with heart failure.	Nighttime sleep quality and daytime sleepiness were measured by the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Scale.	PSQI mean score for adult 7.75 (4.16) PSQI mean score for elder: 6.86 (3.96) ESS mean score for adults: 7.76 (4.91) Ess mean score for elders: 6.47 (4.33)
Hjelm et al., 2013 (Sweden)	The aim of the study was to compare sleep and wake patterns, insomnia, daytime sleepiness, and cognitive function in community-dwelling CHF patients, with and without SDB, and to investigate the association between sleep-related factors and cognitive dysfunction.	In this cross-sectional observational study.	MISS: median (Q1 – Q3): 6 ESS: median (Q1-Q3): 9.5 40% of the respondent had moderate and severe insomnia

Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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DISCUSSION

To the best of our knowledge, this is the first literature study on sleep, particularly sleep deprivation and related factors in patients with HF. According to our findings, patients with HF who are male, over 50 years old, NYHA class II-III, and have an ejection fraction less than 40% (decrease ejection fraction) have difficulty sleeping. As sleep is linked to an increased risk of cardiovascular disease, persons with these traits are likewise at a higher risk. Research has shown that insufficient or fragmented sleep can contribute to problems with blood pressure, increasing the risk of developing high blood pressure, which in turns elevates the risk of heart disease (Byun, Kim, & Riegel, 2017). Sleep is essential for the body's recuperation, and disturbances in sleep can reduce the body's ability to recover and operate correctly. This is especially important for HF patients, since sleep disruption can have a negative influence on their daytime function and overall well-being (Li, Xue, Wang, Zhou, Ma, Heianza, & Qi, 2021). As a result, healthcare practitioners should prioritize the assessment and management of sleep-in patients with HF to reduce the risk of cardiovascular complications associated with inadequate sleep and promote improved heart health.

Sleep needs to be identified well in patients with HF. Various instruments have been developed to measure sleep deprivation in the HF population; however, there is a lack of research that gives the best tools to evaluate sleep in this group. The PSQI was by (Buysse, Reynolds III, Monk, Berman, & Kupfer, 2019). With various dimensions of sleep to evaluate sleep disturbance in the clinical population. PSQI is a valid and reliable tool to evaluate sleep deprivation in people with disease or without disease and it is frequently used (Mollayeva, Thurairajah, Burton, Mollayeva, Shapiro, & Colantonio, 2016). Even in patients with HF. This questionnaire has been used over thousand studies across the word, and it is an easy self-reported by the user (Mollayeva et al., 2016). PSQI has good reliable score with Cronbach alpha 0.70 to 0.83 across the studies (Mollayeva et al., 2016). PSQI has never been tested in a population with HF, hence further research is required. Nonetheless, because PSQI was not created in a specific group, the precise measures for identifying sleep quality in patients with HF are most appropriate and must be developed.

In our study, the prevalence of sleep deprivation was considerable (ranging from 35% to 98%). This prevalence is higher than in the general population (starting at 20% and rising to 33.2%) (Chattu, Manzar, Kumary, Burman, Spence, & Pandi-Perumal, 2018). According to a concept analysis, sleep deprivation in HF is produced by signs and symptoms, sleep problem breathing, insomnia, and psychological burden (Zheng, 2021). In HF, burdening signs, and symptoms such as dyspnea, palpitation, pain, and polyuria decrease sleep quality and result in sleep difficulty/deprivation (Zheng, 2021). Sleep disorder breathing or sleep apnea is common in patients with HF, yet it will discuss in this study different concepts of sleep. Patients with HF frequently report insomnia symptoms, which are related to their NYHA classification. Physical activity is more challenging for those in higher NYHA classes. They are unable to relax and rest due to their dyspnea and weariness. Sleep deprivation in HF is associated with psychological burdens such as stress and depression (Zheng, 2021).

According to our study findings, demographics are the related factors of sleep deprivation in patients with HF. Our findings demonstrated that inconsistent poor sleep weather occurs in both older and younger people (Edmealem, Degu, Haile, Gedfew, Bewket, & Andualem, 2020; Javadi, Darvishpour, Mehrdad, & Lakeh, 2015). And in young age (Byun, Kim, & Riegel, 2017). However, sleep deprivation in older age is caused by rhythm alterations, resulting in a disordered sleep pattern, reduced sleep time, nocturnal sleep, and an increase in daytime naps (Carroll & Prather, 2021). Only women with HF had sleep deprivation in our study (Javadi et al., 2015). Previous research has demonstrated that hormones, stress, sadness, aging, and role transitions all have an impact on women's sleep. Women are more prone than males to take naps, which can disrupt their sleep at night (Nowakowski et al., 2013). Regarding with educational, those in higher education have poor sleep (Edmealem et al., 2020; Javadi et al., 2015). Those in higher education might have to upgrade themselves, workload to raise money, and less enjoyable career and disturb their poor. Lower employee as factors of sleep deprivation (Javadi et al., 2015) is still associated with unknown reasons and need further investigation. Living status (living in

Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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urban area) as the last demographic factors of sleep deprivation (Edmealem et al., 2020) is associated to the high density of residents.

Our data also demonstrate a link between sleep deprivation and lifestyle. Smokers get poorer sleep than nonsmokers (Javadi et al., 2015). This is consistent with earlier systematic reviews that found smoking to be detrimental to. The mechanism of smoke related to sleep deprivation is related to depression in smokers (Amiri & Behnezhad, 2020). Obesity is another lifestyle factor associated with sleep deprivation (Javadi et al., 2015). Sleep and obesity are known to be bidirectional. Sleep deprivation might result in less activity and a higher intake of high-calorie foods. Obesity, on the other hand, can have an impact on sleep quality (Cooper, Neufeld, Dolezal, & Martin, 2018).

Related factors of HF condition are included as contributing factors of sleep deprivation (Conley, Feder, Jeon, & Redeker, 2019; Fritschi, & Redeker, 2015; Javadi et al., 2015; Spedale, Fabrizi, Rebora, Luciani, Alvaro, Vellone, & Ausili 2023). Higher NYHA class, lower ejection fraction, higher comorbidity, higher symptom burden such as fatigue and pain, number of hospitalizations, medication, and sleep disordered breathing (SDB), showing the severity of HF suffered by the patients. If a patient possesses these characteristics, the burden of HF disease must have an impact on sleep quality. Sleep deprivation in HF increase the activity of sympathetic nervous system and deteriorate the HF condition (Lee, Lennie, Heo, Song, & Moser, 2016).

Sleep deprivation is also related to sleep and its self-factors including total sleep time, sleep medication, daytime sleepiness, wake after sleep onset, and noise. Sleep deprivation is a complex issue that can be related to various sleep factors, those factors can contribute to ineffective sleep, leading to sleep disturbance and poor sleep quality (Altun, Cınar, & Dede, 2012). Disruption of sleep has been linked to increases in cardiometabolic risk factors like obesity, hypertension, and diabetes mellitus which could lead to cardiovascular disease (Zheng, 2021). The use of sleep medication can help improve sleep quality and duration, misuse of sleep medication can lead to dependence and exacerbate sleep deprivation, making it crucial to prioritize the assessment and management of sleep medication as part of the care for patients with sleep disturbances (Edmiston, Hardin, & Dolansky, 2023). Excessive daytime sleepiness can occur secondary to sleep deprivation, medication effect, illicit substance use, obstructive sleep apnea, and other medical and psychiatric condition (Philip, 2023). Wake after sleep onset refers to the amount of time an individual spends awake after initially falling asleep and can be influenced by various factors, including environmental factors, medical condition, and psychological factors (Hanson & Huecker, 2023). Environmental noise also provokes measurable biological changes in the form of stress response and clearly affect sleep quality (Halperin, 2014). Further research in this area is needed to better understand the specific mechanism through which sleep-related factors influence sleep quality.

Sleep deprivation is associated with psychosocial issues. Many publications in our review mentioned that patients with anxious, depressive symptoms, dysfunctional beliefs about sleep, and a negative perception of their illness's prognosis have sleep problems (Byun et al., 2017; Gaffey, Jeon, Conley, Jacoby, Ash, Yaggi, & Redeker, 2021). A previous study discovered that perceived stress and depression have an impact on sleep. Perceived stress reduces sleep quality, whereas depression causes three nights of poor sleep (Zaidel, Musich, Karl, Kraemer, & Yeh, 2021). Sleep deprivation and heart health is bidirectional. t is commonly recognized that those who sleep poorly are at a higher risk of developing cardiovascular disease (Tobaldini et al., 2017). Similarly, cardiovascular illness is caused by a lack of sleep. As a result, in this study, sleep loss can result in aggravating signs and symptoms. The repercussions of this disease can result in a worse functional level, a poor prognosis for HF, rehospitalization, and potentially a reduced survival rate. Sleep deprivation is linked to an increase in cortisol, or the stress hormone. The sympathetic nervous system is engaged when our bodies sense a stressor. The activation of the sympathetic nervous system in HF is associated with worsening signs and symptoms (Hjelm, Strömberg, Årestedt, & Broström, 2013).

The consequences of sleep deprivation in patients with HF is also affects psychosocial (Edmealem et al., 2020; Javadi et al., 2015; Spedale et al., 2023). Lower self-care, self-confidence, and quality of life are all factors in the patient's psychosocial self-esteem.

Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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Sleep deprivation has a negative impact on psychosocial factors such as mood and behavior, and the relationship is bidirectional. Sleep deprivation has a negative impact on psychosocial factors such as mood and behavior (Chattu et al., 2018; Zaidel et al., 2021).Moreover, sleep deprivation also affects in self-care and self-confidence (Lemola, Räikkönen, Gomez, & Allemand, 2013), and may play a role in depression. Patients with poor self-esteem have a negative impact on their condition. Patients with heart failure will lose hope in their condition, resulting in a poor prognosis.

The last consequences of sleep on cognitive (Moon, Phelan, Lauver, & Bratzke, 2015). Sleep is crucial for maintaining cognitive skills, and sleep deprivation can lead to decreased performance in various cognitive tasks, such as problem-solving, decision-making, and memory retrieval (Chattu et al., 2018). Lack of sleep can negatively impact one's ability to focus and think clearly. Complete sleep deprivation affects not only working memory and attention but also long-term memory and decision-making skills. Lack of sleep to some extent affects attention, particularly alertness. There are not enough studies on how it affects higher-order cognitive functions. There are not enough studies on how it affects higher-order cognitive functions (Khan & Al-Jahdali, 2023).

CONCLUSION

The prevalence of sleep deprivation was considerable (ranging from 35% to 98%) in patients with HF. Lack of sleep in this condition was linked to several variables, including psychological, lifestyle, sleep, and demographic ones. Lack of sleep has detrimental effects on HF patients' conditions, psychological well-being, and cognitive function.

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Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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Septa Meriana Lumbantoruan*, Juhdeliena, Agustina Saputri

Fakultas Keperawatan, Universitas Pelita Harapan
Corresponding author: *E-mail: septa.lumbantoruan@uph.edu

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