JPPIPA 9(11) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Impact of Semi-Fowler's Position in Chronic Heart Failure (CHF) Patients: Scoping Review

Ni Kadek Diah Purnamayanti[1], Santalia Bane Tondok[2*], Wibowo Hanafi Ari Susasnto[2], Rohmani[2]

[1]Bachelor of Nursing Study Program, Faculty of Medicine, Ganesha University of Education, Singaraja, Indonesia.
[2] Nursing Study Program, Department of Nursing Poltekkes Jayapura Ministry of Health, Jayapura, Indonesia.

Received: June 24, 2023
Revised: September 13, 2023
Accepted: November 25, 2023
Published: November 30, 2023

Corresponding Author:
Santalia Banne Tondok
sta.vicky@gmail.com

DOI: 10.29303/jppipa.v9i11.5074

Abstract: Epidemic heart failure patients are a scourge of world health which has an increasing trend as old age increase. Heart failure is a state of heart function not adequately supplying blood for the body's metabolism, known as Congestive Heart Failure. In the productive age population, CHF patients have high morbidity, frequent exacerbations, and mortality. Treatment in the hospital requires intensive care. One of the forms of treatment in question is positioning. This study aimed to determine the impact of the semi-fowler's position on CHF patients. The research design is a systematic review using Google Scholar, Pubmed, and Garuda searches. Inclusion criteria were the research of the last five years; all articles were available. Exclusion criteria are non-experimental research, such as literature and observational studies—critical review using the JBI checklist for quasi-experimental. The results of the study were seven experimental research articles in Indonesia, three studies only giving semi-fowler's position, two studies recommending semi-fowler's position is better than right/left, and two other studies recommending semi-fowler's + Fowler's and semi-fowler's' positions. This study concludes that the semi-fowler's position is the correct position in the treatment of CHF patients.

Keywords: Body position; CHF; Heart failure; Nursing; Semi-fowler.

Introduction

The inefficiency of heart function in supplying the body's metabolic needs is caused by a heart pump pathology condition known as congestive heart failure (CHF) (Dimitru, 2023). In general, the etiologic of CHF is caused by three aspects, namely structural abnormalities, functional abnormalities, and precipitating factors (Malik A, 2023). Hypertension, heart valve disorders, congenital heart disease, arrhythmias, and myocarditis cause structural abnormalities. Functional abnormalities are usually associated with myocardial infarction and coronary heart disease. Other precipitating factors include diabetes, thyrotoxicity, severe anemia, obesity, and nutritional deficiencies such as thiamine. The incidence of CHF globally reaches 64 million people, or about 1-4% of the adult population in developing countries (Groenewegen et al., 2020).

Epidemiology, CHF is a global health burden because it is a life-threatening syndrome known as a cardinal sign, namely dyspnea, fatigue, and edema (Yan et al., 2023). CHF treatment costs a considerable amount due to the high incidence of exacerbations. In the cross-sectional study, the cost of treating CHF patients reached 24,383 dollars per patient per year, and hospitalization costs were 15,879. Socioeconomically, CHF decreases the quality of life and productivity due to physical weakness and immobility (Urbich et al., 2020).

According to the Indonesian Association of Cardiovascular Specialists, the management of CHF patients is based on the classification of functional, structural, and ejection fraction degrees (PERKI, 2020). The classification of the functional capacity of the heart is divided into four classes (I-IV) based on the New York Heart Association (NYHA). Clarification based on abnormalities of heart structure is distinguished in stages A, B, C, and D. Meanwhile, classification based on

How to Cite:
Purnamayanti, N.K.D., Tondok, S.B., Susasnto, W.H.A., & Rohmani, R. (2023). Impact of Semi-Fowler's Position in Chronic Heart Failure (CHF) Patients: Scoping Review. *Jurnal Penelitian Pendidikan IPA*, *9*(11), 1229–1236. https://doi.org/10.29303/jppipa.v9i11.5074

ejection fraction (EF) is known as Heart Failure with Reduced Ejection Fraction (HFREF) and Heart Failure with Preserved Ejection Fraction (HFPEF).

Pharmacological management is often used in three pillars: ACE inhibitors, B blockers, and minerals receptor antagonists (MRA). Other pharmacotherapeutic considerations related to EF are valsartan and ivabradine.

In acute circumstances, nurses are essential in caring for hospital CHF patients (Riley, 2015). After receiving the patient in the emergency department, nurses need to conduct an initial assessment, including hemodynamic status, cardiac output, dyspnea severity, signs of congestive symptoms, and implementation of laboratory tests. Nurses also delegate titration of drugs as vasodilators, vasopressors, inotropic, and diuretics (Lee et al., 2019).

Regarding pharmacotherapy administration, the nurse monitors vital signs and calculates fluid balance in and out. Supportive actions, which are independent actions of nurses, are to provide comfort, one of which is by adjusting the patient's position. Changes in position are essential to impact gravity which affects hemodynamic status directly (Martin-Du Pan et al., 2004). One study recommended that a semi-fowler position of 45 degrees can decrease ventricular preload (Nakamura et al., 2022).

Various case studies in Indonesia recommended the Semi-fowler position for nursing care of CHF patients with decreased cardiac output and ineffective breathing patterns (Melani et al., 2022; Pambudi & Widodo, 2020; Yulianti & Chanif, 2021). This study will conduct a literature study that includes experimental research to validate the impact of the semi-fowler position in the care of CHF patients.

Method

This research is a literature study with a systematic review design. There are five steps in this research: formulating research problem formulation, formulating search protocols, literature search, critical study, and synthesis analysis (Purnamayanti et al., 2021). This study aimed to determine the effectiveness of the semi-fowler position in treating CHF patients. The PICO method was used to formulate the research formula (Diah Purnamayanti et al., 2020).

The study population was adult CHF patients over 18 years of age. The intervention provided is the semi-fowler position. Comparison intervention is a standard treatment procedure. The outcome of this study was cardiovascular status which could include pulse, respiratory rate, oxygen saturation, fatigue, and congested events. The keywords used are semi-fowler AND heart failure. Literature searches are online on Google Scholar, Garuda, and Pubmed.

The inclusion criteria in this study are articles from primary data research taken from CHF patient care clinic settings. The exclusion criteria in this study are non-experimental research, such as literature studies and conservation research. Critical analysis in this study using checklist nine items The Joanna Briggs Institute (Tufanaru C, Munn Z, Aromataris E, Campbell J, 2017). Synthesis analysis is summarized in the search schema and summary table. (Table 1) and conducted a critical review of 7 articles using the JBI RCT (Table 2).

This research identified 2300 Google Scholar articles, 14 Pubmed articles, 8 Garuda articles, then identified 159 articles in the last 5 years. After that, 28 articles were screened for further analysis. After that, 7 articles were found that met the inclusion criteria (Figure 1).

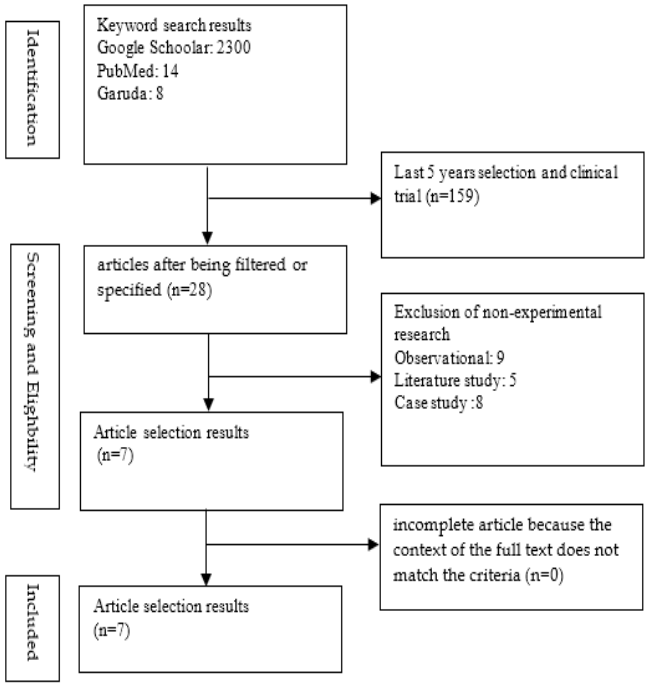


Figure 1. Library Search and Selection Schema

Result and Discussions

The results of this study refer to 7 quasi-experimental clinical studies conducted in Indonesia. Treatment settings include emergency rooms, intensive units (HCU, CVCU, ICCU), and ordinary treatment rooms. The number of samples involved ranged from 10-36 CHF patients. The research design was a pre-posttest without a comparison group of 4 out of 7 articles (57.2%) and designed with 3 out of 7 articles (42.8%). The form of intervention giving only the semi-fowler position was 2 out of 7 articles (28.57%); 3 out of 7 articles (42.89%) comparing with other positions (Semi-fowler

vs. Fowler and Semi-fowler vs. left-right tilt and Semi-fowler 30 degrees vs. 45 degrees vs. 60 degrees); 2 of 7 articles (28.57%) combination position (Semi-fowler + Fowler and Semi-fowler + right lateral) The article trace selection process is shown in Figure 2. A summary of the sinters analysis is illustrated in Table 1.

Changes in the position of the human body have direct implications for the force of gravity that affects various organ systems. Changes in the body's mechanical body require adaptations that affect the functioning of the cardiovascular, respiratory, digestive, osteoarticular, brain, and eye systems (Martin-Du Pan et al., 2004). When considered normal atmospheric pressure is stable in the cardiovascular system, the pressure in the right atrium approaches 0mmHg. The body has hydrostatic pressure due to blood weight and other fluids in the blood vessels. The effect of gravity and body position concerning hydrostatic pressure is formulated in the equation p x g x h where p = blood density (1.05 g/cm3); g = gravitational acceleration (980 cm/sec2); h- distance in cm. Changes in body posture affect hydrostatic pressure in arteries and veins. Hydrostatic pressure is not affected by changes in body position as high as the tricuspid valve.

Table 1: Analysis and Synthesis

Treatment Settings/Author	Sample	Intervention	Cardiovascular Outcomes	Result
Lily Room Sunan Kalijaga Hospital Demak(Fitriyanti &; Eldest , 2020)	22 patients of CHF	Semi-fowler position	Respiratory rate per minute	Semi-fowler effectively lowers respiratory rate
IGD RSUD Ulin(Aprilia et al., 2022)	25 CHF patients: 15 patients with Semi-fowler position; 10 patients with the Fowler position	Position of Semi-fowler, and fowler	Oxygen saturation	Average oxygen saturation at the sewifowler position compared to the fowler position
CVCU Room Granmed Hospital Lubuk Pakam (Hayati et al., 2023).	10 CHF patients	Right Semi-fowler, and lateral positions	Blood pressure, pulse, respiratory rate, and oxygen saturation	The combination of Semi-fowler, and right lateral improves hemodynamic status
Inpatient Room of RSUD Tangerang(Bayu, 2019)	18 CHF patients	Semi-fowler position	Sleep quality measured by PSQI	Semi-fowler significantly improves Sleep Quality
ICCU Room RSUD dr. Soedarso Pontianak(Puspita et al., 2019)	36 CHF patients; 18 people with Semi-fowler position 18 people with left right tilt	Position Semi-fowler, and tilted left right	Sleep quality measured by PSQI	Semi-fowler significantly improves sleep quality compared to left right tilted position
HCU Sumedang Hospital (Wirawan et al., 2022)	16 CHF patients	15 minutes Semi-fowler position followed by 15 minutes fowler position	Oxygen saturation	The combination of Semi-fowler, and fowler positions can increase oxygen saturation
IGD Telogorejo Hospital Semarang (Tanujiarso et al., 2022)	30 CHF patients	30 minutes Semi-fowler position 30 degrees, 45 degrees, and 60 degrees	Oxygen saturation	A 45-degree Semi-fowler most effectively increases oxygen saturation

The heart pump's capacity adjusts to the heart chambers' filling pressure (Starling effect) and prevents hydrostatic changes. In adults standing, a normal hydrostatic pressure of 94 mmHg is measured from a vein in the leg. In another study, it was stated that the neutral trunk position is the best resting condition because it affects the cardiovascular and autonomic nervous systems to decrease the volume of a cup, increase pulse, and activate sympathetic Sarah (Martin-Du Pan et al., 2004; Wang et al., 2022). The neutral trunk position is when the spine The neutral trunk is the best resting position, and deviations from the neutral trunk position can affect the cardiovascular and autonomic nervous systems, resulting in a decrease in the volume of a cup, an increase in heart rate, and the relative activation of sympathetic tone. A neutral trunk is when the spine is in a natural position with normal cervical,

thoracic, and lumbar curvature in both sitting and standing positions (McGee, 2020).

Table 2: Critical Review Results

Study Items	Fitriyanti &; Eldest (2020)	Aprilia et al (2022)	Hayati et al (2023)	Bayu (2019)	Puspita et al (2019)	Wirawan et al (2022)	Ananta Tanujiarso et al (2022)
Is the cause and effect relationship in the study clear?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is the comparison group linear with the intervention group?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Did participants receive other treatments outside of the research intervention?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is there a control group?	Not	Yes	Not	Not	Yes	Not	Not
Are the pre and post test measurement indicators the same?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the comparison group measured the same outcome?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Are research outcomes reliable?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Are the statistics used appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Dyspnea in CHF patients is closely related to bodyposition, including orthopnea, paroxysmal nocturnal dyspnea, trepopnea, and platypnea (Mukerji, 1990). Orthopnea is the sensation of shortness of breath in a lying position, reduced by sitting or standing. Paroxysmal nocturnal dyspnea (PND) is a sensation of shortness of breath that wakes the patient, often after 1 or 2 hours of sleep, and usually diminishes in an upright position. Two uncommon types of shortness of breath are trepopnea and platypnea. Trepopnea is dyspnea that occurs in one position of sleeping on the side and improves when tilted in the opposite direction. Platypnea refers to shortness of breath that occurs in an upright position and decreases with lying down.

Orthopnea occurs in CHF patients because theheart's pumping function when carrying blood from the thoracic extract to the intrathoracic is inhibited. This condition occurs when the patient lies down and will improve if the upper body position is adversarial. Left ventricular failure causes an exemplary ventricular dam resulting in pulmonary edema, which decreases lung function to expand and deflate. This condition can be circumvented by giving the patient a sitting position on the edge of the bed with his legs hanging. While the incidence of PND is due to bronchospasm, which may be caused by congestion of the bronchial mucosa, interstitial edema presses on the bronchioles, resulting in increased ventilation difficulties. The PND condition will worsen if given a supination position in left heart failure patients. The condition of PND will improve after the patient is given a sitting position within five minutes.

The condition of trepopnea occurs in CHF patients when tilted to the left. CHD patients of moderate severity feel tightness when lying on their left side and are more comfortable lying on their right side. When lying on your right side, the right atrium is lower and closer to empty the heart through vena cava backflow so that cardiac output becomes effective. The right tilted position modulates sympathetic to improve pulse rate characterized by a higher increase in serum atrial natriuretic peptide (ANP) compared to the left tilted position. The proper oblique position significantly increases preload in laparoscopic surgery. The proper tilt position increases oxygen supply in the coronary artery bypass graft (CABG) procedure, as seen from increased PaO2. The difference in the proper oblique position is more suitable to increase venous return in mild CHF patients, while in severe CHF patients sitting position is more effective in increasing venous return.

The results of this study recommend the semi-fowler position in emergency and intensive care settings. The semi-fowler position in question is a position with the angle of the center of the body and upper body forming 45 degrees or more. The semi-fowler position can be combined with the Fowler or sitting position for severe CHF exacerbation patients. At the same time, a combination of semi-fowler and right oblique may be recommended for milder exacerbation patients. This provision is in line with the literature review that has been carried out. Namely, providing semi-fowler positions can improve the quality of sleep of CHF patients during hospitalization and improve hemodynamic status (Asmara, W., Sari, S. A., & Fitri,

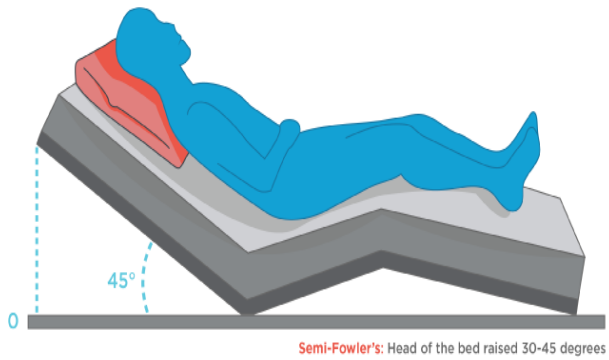
2021; Isrofah, Indriono, A., & Mushafiyah, 2020; Sugih et al., 2019). The positioning is an integral part of treatment to improve ventilation status and increase the effectiveness of pulmonary gas exchange. The 45° Semi Fowler position influences blood gas parameters and oxygenation by oxygen saturation, oxygen partial pressure, and carbon dioxide pressure reduction. Additionally, this position increases tidal volume through the diaphragm and alveolar expansion (AW & Sulistyo, 2019). As a result, the semi-Fowler place will reduce shortness of breath in heart failure patients and improve their sleep quality.

In general, body position significantly relate to human cardio and respiration through several physiological pathway. First explanation involving trunk posture on cardiovascular and automic system (Wang et al., 2022). The observation showed on several trunk positions (Sato & Tudella, 2018). Cardiac index, stroke volume, and cardiac output reduced on forwarding flexion and left rotation. Neutral trunk position optimized thorax capity, enhanced tidal volume, increased ventricle blood filling (preload) (Buchman-Pearle JM, Gruevski KM, Gallagher KM, Barrett JM, 2023). Neutral trunk relaxed the thorasic spine prevent the simpatis nerve system trigger LF/HF ratio as heart rate variability (Laginestra et al., 2023). However right lateral lying position showed the higher LF/HF ratio due the vagus nerve was relaxed andl ess cardia automic pressure (Mireskandari et al., 2022).

Regardless of age, an upright upper trunk during Fowler's posture avoided tachycardic reaction and retained SV opposed to an upright whole trunk, although the autonomic mechanisms causing tachycardic responses fluctuated (National Health Service, 2023). In Fowler's posture, an extended upper trunk could be beneficial in minimize orthostatic stress as well as render regular tasks and communication easier for fragile patients (Kubota et al., 2017)Research conducted by Javaheri et, al (2016) also explains that the semi-Fowler position of 45 degrees affects the development and condition of cardiac output. Patient's lung cavity, reducing shortness of breath and improving sleep quality in heart failure patients (Javaheri et al., 2016). In difference case, prone positioning might boost right ventricular preload and has an influence on venous return determinants on ARDS patients (Lai et al., 2023). Nonetheles, on infant the cardiac output increased due to barorelflex on adults but caused sudden death on infant (Wu et al., 2017).

Second pathway of cardiac output incline due body position through gravity (Hoffmann et al., 2019). The gravity effect caused by distribution of blood suply and vascular distension on pulmonary system.on experimental study showed , prone and supine position increased blood flow on right lung (Wieslander et al., 2019). Right lateral lying position increased blood flow on right lateral lung however dependet supine position increased blood flow on left lung (Mlček et al., 2023). The hydrosattic model explain impact gravity on pulmonary blood flow (Vardhmaan Jain; Stephen J. Bordes; Abhishek Bhardwaj., 2023). The lower position affect vessel distenstion and vascular resistance especially on lateral lying position (David J Marlin & Thea L Vincent, 2007). Futhermore, interleration pulmonary blood flow and cardiac cycle measured by PBVV (Pulmonary blood volume variation) (Al-Mashat et al., 2020).

PBVV measured through CMR imanging in ml every arterial beat (Hur & Sugeng, 2019). PBVV fluctuates more with body position than ipsilateral blood flow, and this appears to be due to gravity-induced variations.In the pulmonary veins' distension as opposed to thearteries in lung tissue (Ricci et al., 2018). The factors which influence PBVV. The relative values have not yet been studied, as PBVV is a measure that was only recently described (Al-Mashat et al., 2020). The significant factors influencing PBVV are the combination Wall compliance of venous and arterial vessels, circulating blood's distribution and volume measured in vessels distension and the volume of blood flow during a heartbeat (Ramos J MD, 2020). As a result of the pulmonary veins' high vessel wall compliance and relative lack of smooth muscle, the pulmonary venous blood volume should be sensitive to pressure changes brought on by gravity's effects on blood volume and blood flow distribution in relation to body position (Edwards Z & Annamaraju P., 2023). All of our data point to PBVV being a measure that is inversely correlated with pulmonary venous distension.



source: https://ibiom.com/en/fowlers-position/
Figure 2. semi-fowler's position

Conclusion

Based on clinical research results, the semi-fowler position can improve the cardiovascular status of CHF patients in hospital settings. Cardiovascular status indicators that need to be observed include oxygen saturation, respiratory rate, pulse, blood pressure, and

sleep quality. In the granting of semi-fowler positioning, the recommended angle is 45 degrees. Semi-fowler positioning can be combined with the correct lateral or Fowler position according to patient comfort and response.

Acknowledgments
We want to express our gratitude to the entire academic community of the Faculty of Medicine, Universitas Pendidikan Ganesha, especially the Bachelor of Nursing Study Program and the Poltekkes Ners Education Study Program, Ministry of Health, Jayapura, for the opportunity to work and collaborate to improve the quality of nursing education in Indonesia

Funding
None.

Conflicts of Interest.
No confilicts of interest.

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