wjpmr, 2025, 11(3), 46-52

SJIF Impact Factor: 6.842

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Review Article

ISSN 2455-3301

WJPMR

A REVIEW ON PREVENTION AND MANAGEMENT OF CONGESTIVE HEART FAILURE

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Article Received on 01/01/2025 **Article Revised on 21/01/2025** **Article Accepted on 10/02/2025**

ABSTRACT

Congestive heart failure (CHF) is a prevalent and serious condition that affects millions globally, characterized by the heart's inability to pump blood effectively, leading to a buildup of fluid in the lungs and other parts of the body. This report provides a comprehensive overview of the management and treatment strategies for CHF, with an emphasis on both pharmacological and non-pharmacological approaches. Key pharmacologic interventions, including angiotensin-converting enzyme inhibitors (ACE inhibitors), beta-blockers, and diuretics, are discussed in relation to their mechanisms of action and clinical effectiveness in symptom management and survival improvement. Additionally, device-based therapies such as implantable cardioverter-defibrillators (ICDs) and cardiac resynchronization therapy (CRT) are reviewed for their role in advanced stages of the disease. Non-pharmacological treatments, including lifestyle modifications, dietary recommendations, and patient education, are also highlighted as essential components in improving quality of life and preventing disease progression. The report concludes with an emphasis on a multidisciplinary approach to CHF management, stressing the importance of personalized treatment plans and ongoing patient monitoring to achieve optimal outcomes.

KEYWORDS: Heart failure, lifestyle modifications, multidisciplinary, pharmacological, diuretics.

1. INTRODUCTION

1.1 Congestive Heart Failure: Any structural or functional impairment of ventricular filling or blood ejection is the cause of CHF, a complex clinical condition. Ischemic heart disease is the largest cause of death worldwide and also the primary cause of CHF. Globally, CHF is a prevalent condition with a high rate of morbidity and mortality **(Bozkurt B *et al.*, 2022)**. The most common cause of morbidity and death for people 65 years of age and beyond is Congestive Heart Failure (CHF), the last stage of many heart disorders as shown in **figure 1.1(Rengo F *et al.*, 1995)**. It is important to understand that congestive heart failure is a type of heart failure and not a totally different condition.

- The failure of the left half causes a distinct set of symptoms and signs which is called left heart failure.
- The failure of the right Half causes a distinct set of features collectively called right heart failure.
- The combination of the two is known as congestive heart failure **(King KC *et al.*, 2021)**.

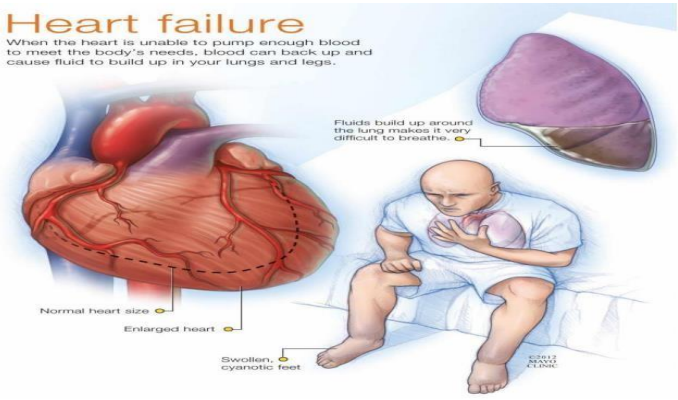

Figure 1.1: Congestive Heart Failure.

1.2 Epidemiology: CHF is an epidemic spread across the entire world; it is estimated that 23 million people in the world are afflicted with CHF, approximately.

- Risk factor for developing CHF includes hypertension, diabetes, coronary artery disease, obesity (BMI>30), and 65 years old or greater **(Komunduri S *et al.*, 2017)**.
- The total cost of care for those with CHF is approximately $30.7 billion, and that value is expected to reach $69.8 billion by 2030. About 1% of people aged 55-64 and 17.4% of people 85 and older suffer from heart failure **(Malik A *et al.*, 2020)**.

1.3 Heart Failure Symptoms: Congestion, or an accumulation of fluid in the body, is the primary cause of congestive heart failure symptoms. Heart failure is frequently accompanied by the following 4, 8 symptoms: shortness of breath, either while sleeping (paroxysmal nocturnal dyspnoea) or during everyday activity or when lying down (orthopnoea) and Edema refers to swelling in the legs stomach. A lack of physical activity may conceal these symptoms. Some less-specific symptoms are weight gain, anorexia, coughing, wheezing, weariness, and nausea. It is useful to be aware of the symptoms associated with different forms of heart failure, even if many of them overlap as shown in **figure 1.2 (Naderi N et al., 2022).**

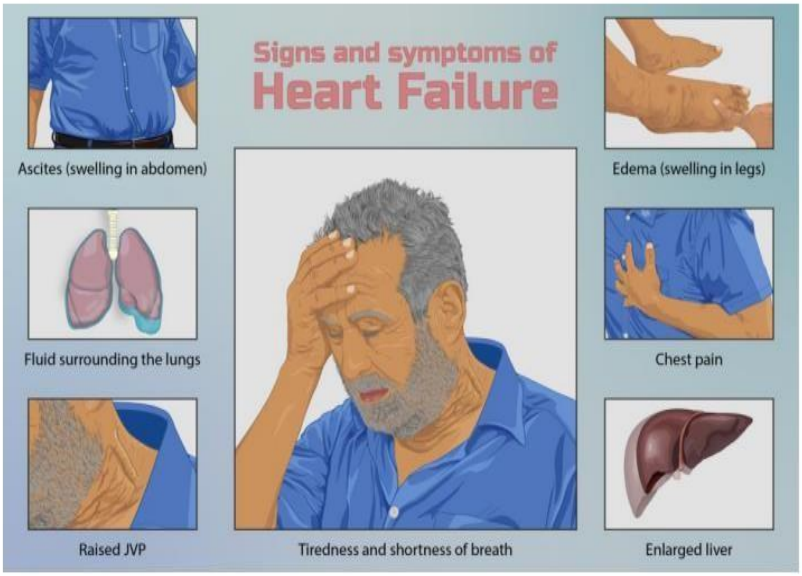

Figure 1.2: Symptoms of Congestive Heart Failure.

1.4 Heart Failure Classification: For patients with Stage C and Stage D heart failure, the New York Heart Association (NYHA) has established 4 classes of heart failure (I through IV) based on how much their symptoms limit physical activity.

- Class I: No symptoms or limitations on physical activity; typical physical activity does not cause dyspnea, fatigue, or palpitation.
- Class II: Slight limitations on physical activity but comfortable at rest. Usual activity causes dyspnea, fatigue, or palpitation.
- Class III: Marked limitations on physical activity. Symptoms occur with mild or minimal exertion or physical activity.
- Class IV: Symptoms with minimal exertion or at rest; unable to comfortably perform any physical activity **(Coats AJ *et al.*, 2021)**.

1.5 Treatment of Congestive Heart Failure: A combination of medicines may be used to treat heart failure. The specific medicines used depend on the cause of heart failure and the symptoms. Medicines to treat heart failure include: Angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), beta blockers and diuretics **(Heart failure *et al.*, 2022)**. Your heart failure kind and, to some extent, its etiology will determine how you are treated.

Every heart failure treatment plan includes both medication and lifestyle modifications. You and your healthcare physician will discuss the best course of action for you **(Jones NR *et al.*, 2017)**.

There's no cure for heart failure. Your heart muscle pumps less blood to your organs as congestive heart failure worsens, causing you to advance to the next stage of the condition. The purpose of treatment is to either prevent you from progressing through the phases of heart failure or to limit its progression because there is no way to go backward through them **(Malik A *et al.*, 2022)**.

1.6 Management and Treatment of Congestive Heart Failure

1.6.1 Pharmacological Therapies for Heart Failure

- **Angiotensin Receptor–Neprilysin Inhibitor (ARNI):** A crucial role is played by the autonomic nervous system, the renin-angiotensin-aldosterone system (RAAS), and the natriuretic peptide (NP) system in modulating the mechanisms responsible for the onset and advancement of heart failure. It is commonly known that RAAS overactivation in HF patients causes pathological cardiac remodelling, elevated arterial blood pressure, vasoconstriction, elevated sympathetic tone, and elevated aldosterone levels **(Senni M *et al.,* 2017)**. The OVERTURE (Omapatrilat Versus Enalapril Randomized Trial of Utility in Reducing Events) trial results did not demonstrate superior benefits when compared to angiotensin-converting enzyme (ACE) inhibitor alone in lowering heart failure hospitalization rate or mortality risk. Omapatrilat was the first medication developed for the inhibition of both ACE and neprilysin pathways. The OCTAVE (Omapatrilat Cardiovascular Treatment Assessment Versus Enalapril) research found that omapatrilat caused an increased incidence of angioedema as a result, the drug's future development was halted **(Kuchulakanti P.K. *et al.,* 2020).**

- **Angiotensin-converting enzyme (ACE) inhibitors:** In order to enhance blood flow, lower blood pressure, and lessen cardiac strain, these medications relax blood vessels. Lisinopril (Zestril, Qbrelis), captopril, and enalapril (Vasotec, Epaned) are a few examples **(Ferri FF *et al.,* 2022)**.

- **Angiotensin II receptor blockers (ARBs):** These medications share several advantages with ACE inhibitors. For those who are unable to take ACE inhibitors, they might be a viable alternative. These consist of candesartan (Atacand), valsartan (Diovan), and losartan (Cozaar) **(Mayo *et al.,* 2022)**.

- **Sodium-glucose cotransporter-2 (SGLT2) inhibitors:** These medications aid in lowering blood sugar levels. In order to treat type 2 diabetes, they are frequently given in conjunction with diet and exercise. However, they are also among the first methods of treating heart failure. This is because a number of studies found that the medication reduced the risk of death and hospitalization in patients with specific forms of heart failure, even those without diabetes. Canagliflozin (Invokana), dapagliflozin (Farxiga), and empagliflozin (Jardiance) are some of these medications **(USFDA *et al.,* 2022)**.

- **Diuretics:** These medications, also known as "water pills," increase the frequency of your urination. This keeps your body from accumulating fluid. Diuretics, such furosemide (Lasix, Furoscix), also reduce lung fluid, making breathing easier **(Sawalha K *et al.,* 2021).** The body loses magnesium and potassium after using some diuretics. To cure this, your doctor could suggest vitamins. You might have routine blood tests to measure your potassium and magnesium levels if you're using a diuretic **(Armstrong PW et al., 2020)**.

- **β -Adrenergic Blocking Agents:** β-blockers decreased chances of CHF worsening and rehospitalization while increasing survival **(Lechat P *et al.,* 2019)**. It's significant to note that this class of medications first deteriorates hemodynamic, symptoms, and LVEF before improving over the course of the following six to twelve months. Chronic dosages should be cut in half and β-blockers should not be started in patients who are hospitalized to the intensive care unit (ICU) with an acute aggravation of CHF. Patients who have recovered from their acute bout of CHF and do not exhibit any symptoms of fluid retention can begin very low dosages. Although β-blockers are generally well tolerated in patients with chronic obstructive pulmonary disease, severe asthmatics should not use them **(Om A *et al.,* 2014)**.

1.6.2 Lifestyle Modifications and Non-Pharmacological Approaches

Salt Restriction: Many guidelines urge dietary salt limitation for people with heart failure. Patients with moderate-to-severe HF are advised by Korean Heart Guidelines to ingest less than 2 grams of salt daily **(Kim MS *et al.,* 2017)**. For patients with stage CHF, the AHA/ACC guidelines recommend avoiding excessive sodium intake in order to prevent congestive symptoms. The ESGC HF guidelines urge avoiding excessive salt intake (>5 g/day) **(Metra M *et al.,* 2021)**. Recent research has shown links between lower salt intake and greater readmission rates as well as higher mortality. The relevance of salt restriction in the management of heart failure remains controversial. Personalized nutritional support appears to be more advantageous than general recommendations, particularly for patients who are at high nutritional risk **(Mavroudis A *et al.,* 2022).** In patients with known HF, the 2010 Heart Failure Society of America guidelines recommend dietary sodium restriction to 2 to 3 g daily **(NM albert *et al.,* 2010)**.

- **Dietary Composition in HF Prevention:** Apart from effects on weight, dietary composition may influence HF risk through other methods. Merely 1.5% of Americans adhere to every dietary suggestion made by the American Heart Association (AHA) **(MJ Blaha *et al.,* 2017)**. Diets containing greater amounts of plant based foods including fruits, vegetables, nuts, seeds, and legumes and fewer animal-derived foods and processed foods appear to be beneficial for HF prevention **(KM Lara *et al.,* 2017)**. In the Physician's Health Study, men who consumed more fruits and vegetables had a lower risk of HF **(Djousse L *et al.,* 2009)**. Since HF patients are elderly and fragile, they must rely on the

food of their caretakers. Since HF patients and their family caregivers typically eat similar diets, another important concern is the quality of the patient health **(Chung ML *et al.*, 2020)**. Restrictions on sodium and fluid intake are typically the foundation of HF nutritional counselling. In addition to congestion, patients with heart failure, particularly those with severe heart failure, are more likely to experience malnourishment or cachexia. Thus, a more comprehensive dietary prescription is required. However, the information that is now available indicates that, in comparison to healthy older individuals of the same age and sex, patients with HF consume fewer calories and exhibit greater shortages in certain micronutrients **(Kang J *et al.*, 2021)**.

- **Weight Loss:** Guidelines recommendation regarding this aspect recommend weight loss to prevent HF, but they recognise that weight loss has an unknown efficacy for treatment in established HF **(McDonagh TA *et al.*, 2021)**. Obesity increases the risk for development of HF. Given that a lower body mass index (BMI) is linked to a higher risk of death, it seems to have a protective effect on patients who have already been diagnosed with heart failure (HF). This condition has been referred to as "obesity paradox." Regardless of comorbidities or HF characteristics, it is seen in HF **(Hwang IC *et al.*, 2022)**.

- **Exercise:** Guidelines recommend exercise as a part of the non-pharmacological treatment of HF but in a rather vague way. According to the KSHF guidelines, the multidisciplinary team that treats HF patients should include an exercise prescriber and encourage the participation in exercise related activities **(Kim MS *et al.*, 2017)**. ESC guidelines urge exercise for all patients who are able to do so in order to improve exercise capacity, quality of life, and reduce hospitalization for heart failure. Additionally, individuals with more severe conditions, frailties, or comorbidities should be evaluated for supervised cardiac rehabilitation programs that involve exercise **(Metra M *et al.*, 2021)**.

Type of Exercise: The best kind of exercise for heart failure patients—interval training (IT) or continuous training (CT)—is another pertinent subject. In a recent meta-analysis, the effects of IT and CT on HF patients' exercise tolerance and cardiorespiratory fitness were examined. There were 17 randomized controlled studies in all, involving 617 patients. When compared to CT, the meta analysis shown that IT can enhance a patient's peak oxygen uptake, left ventricular ejection fraction (LVEF), and 6MWD. The resting heart rate, CO2 ventilation equivalent slope, and respiratory exchange ratio, however, did not show any statistical significance. According to this research, IT is better than CT at improving the cardiorespiratory fitness and exercise tolerance of individuals with HF. However, more carefully thought-out research is needed as shown in **figure 1.3 (Li D *et al.*, 2021)**.

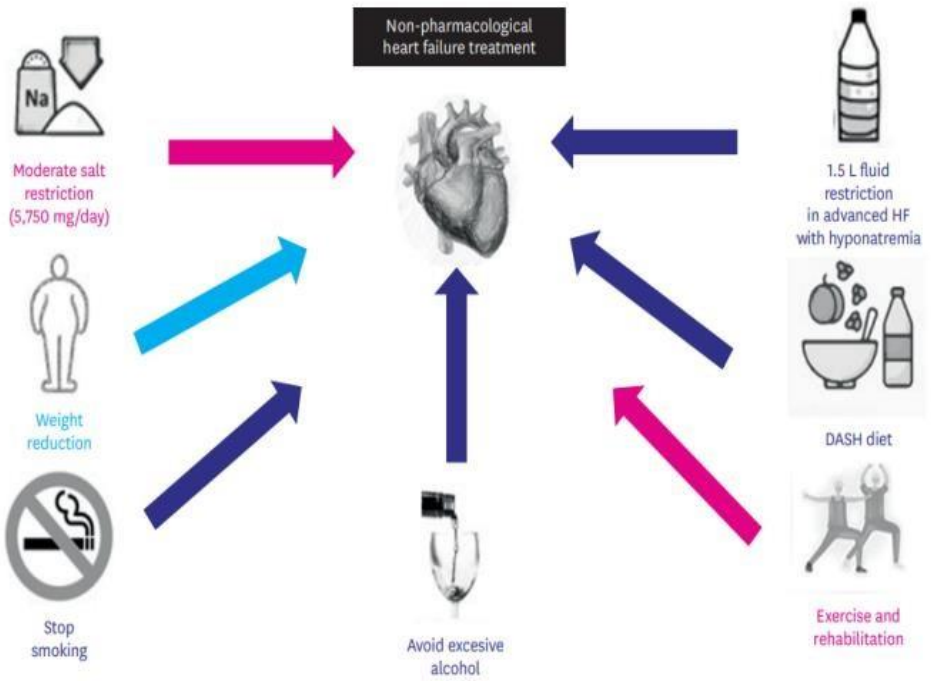

Figure 1.3: Non-pharmacological Heart Failure Treatment.

1.6.3 Traditional Ayurvedic Remedies for Treatment of Heart Failure: Prevention of Hridroga (cardiac disorders): Ayurveda mainly relay upon the principle of 'Prevention is better than cure'. So, the preventive aspect of the diseases has given first prime importance in the management of all the diseases including Hridroga as well **(Kashinath Pandey *et al.*, 2005)**. Ayurveda takes extra care to protect the heart from any kind of damage, whether direct or indirect, as well as from other elements that may ultimately lead to heart disease **(Indryan *et al.*, 2005)**.

Avoiding certain stressors and engaging in cardio-promotive exercises are regular recommendations. Acharya Charaka's profound insight has placed a high value on avoiding the things that lead to emotional and mental disturbances, such as suppressing Dharniya mansika vega (such as anger, anxiety, worry, etc.), Swasthyavritt Palana, and making changes to one's diet and lifestyle (called Ahara and Vihara). Because of their cardioprotective and cardiotonic qualities, several Rasayana medications for the heart (Naimittika Rasayana), such as Arjuna, Pushkarmula, and Tambarra, reduce the risk of developing heart ailments when taken regularly **(Shastri S.N *et al.*, 1979)**.

- **Arjunaristha:** It protects against atherosclerosis, strengthens the heart's muscles, and stops blood arterial plaque from accumulating. It consists of Arjuna tvak (Terminalia arjuna bark), Maghuka Pushpa (Madhuca indica blossoms), Dhataki Pushpa (Woodfordia fructicosa), and Guda or jaggery **(Kaur N *et al.*, 2014)**.
- **Triphalaguggulu:** This plant lowers cholesterol and strengthens the heart. Among them are Amla (Emblica officinalis), Hareetaki (Terminalia chebula), Vibheetaki (Terminalia bellerica), and Guggulu (Commiphora mukul) **(Gopa B *et al.*, 2012)**.
- **Arjunkhirpak:** It can help with blood pressure management, high cholesterol, and angina treatment. It includes sugar, water, cow's milk, and powdered arjuna red bark **(Sharma PC *et al.*, 2002)**.

1.6.4 Device-Based Therapies: For certain HFrEF patients who are at risk of sudden cardiac death, especially those who have a history of ventricular tachycardia or fibrillation, ICDs are advised. ICDs keep an eye on the heart's rhythm and shock the patient when a potentially fatal arrhythmia happens. A biventricular pacemaker is implanted as part of CRT in order to synchronize the heart's ventricles' contractions. It improves symptoms and lowers mortality in HFrEF patients with intraventricular conduction delays **(Heckman GA *et al.*, 2018).**

Mechanical pumps called left ventricular assist devices (LVADs) are placed in the chest to help the heart pump more efficiently. For patients who are not transplant candidates, they are utilized as destination therapy or as a bridge to transplantation **(Patel C et al., 2017)**.

2. MATERIAL AND METHOD

2.1 Material: We collected the material for this project from various site i.e. PubMed, google scholar from different journals i.e. JEITR, springer & various standard books.

2.2 Method: Congestive heart failure is a complex clinical syndrome which is characterised by inefficient myocardial performance. It is a chronic condition in which the heart doesn't pump as well as it should. Traditionally, the management of heart failure has focused on reducing fluid retention, salt restriction, weight loss and enhancing cardiac contractility. CHF requires individualized, multidisciplinary therapy to successfully control symptoms, avoid hospitalizations, and improve long-term outcomes because it presents with a variety of clinical presentations and frequently coexists with several comorbidities. Device management and other non -drug management have also used in the treatment of CHF.

RESULT AND DISCUSSION

The management of congestive heart failure (CHF) has significantly improved outcomes in terms of symptom control, hospitalization rates, and survival, particularly with the advent of pharmacologic therapies and lifestyle interventions. The results demonstrate that a holistic strategy that incorporates sophisticated interventions, lifestyle changes, and pharmaceutical treatments greatly enhances patient outcomes in the treatment of congestive heart failure (CHF). Pharmacologically, aldosterone antagonists, beta-blockers, diuretics, and ACE inhibitors have been shown to be useful in symptom management, hospitalization reduction, and survival rates. These drugs maintain heart health, avoid fluid overload, and control blood pressure. A low-sodium diet, quitting smoking, controlling weight, and engaging in regular exercise are other lifestyle modifications that have been demonstrated to reduce symptoms and enhance general quality of life, especially when implemented early in the course of the illness.

Advanced therapies, including Implantable Cardioverter Defibrillators (ICDs) and Left Ventricular Assist Devices (LVADs), offer promising solutions for patients with severe heart failure, although they come with increased risks and require careful management. Despite these advancements, several barriers to optimal CHF management persist. Patient adherence to medications and lifestyle changes remains a significant challenge, often influenced by factors like depression, cognitive decline, and socioeconomic constraints. Additionally, comorbidities such as diabetes and hypertension complicate treatment regimens, requiring a more individualized and multidisciplinary approach.

CONCLUSION

The critical and complicated condition known as congestive heart failure (CHF) impairs the heart's capacity to pump blood effectively, which can result in a

number of health issues. Effective management of Congestive Heart Failure (CHF) requires a multifaceted approach that includes pharmacological treatment, lifestyle modifications, and, in advanced cases, surgical or device-based interventions. Early diagnosis and timely use of medications such as ACE inhibitors, beta-blockers, diuretics, and aldosterone antagonists have proven crucial in improving heart function, reducing symptoms, and enhancing survival rates. Lifestyle changes, including dietary adjustments, exercise, and smoking cessation, play a critical role in symptom management and preventing disease progression. For patients with severe CHF, advanced therapies such as Implantable Cardioverter Defibrillators (ICDs) and Left Ventricular Assist Devices (LVADs) provide significant benefits, although these come with risks and challenges. However, barriers such as patient non-adherence, socioeconomic disparities, and the presence of comorbid conditions remain significant obstacles to optimal care. Addressing these issues through patient education, individualized treatment plans, and improved access to healthcare will be essential in improving outcomes. Furthermore, ongoing research into personalized medicine, innovative therapies, and early detection holds promise for advancing CHF management. Ultimately, a patient-centered approach, supported by a multidisciplinary healthcare team, will be key to improving the quality of life for CHF patients and reducing the long-term burden of the disease on healthcare systems globally.

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