

**Modern approaches to primary prevention in chronic heart failure from the point of view of evidence-based medicine.**

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**Abstract**

**Background:** Disability communities face significant challenges, both medically and socially. Chronic health conditions often lead to prolonged periods of disability, affecting individuals' social status and overall well-being. Rehabilitation programs are essential in mitigating these effects, promoting faster recovery, and improving the quality of life for people with disabilities. This study investigates the impact of a comprehensive rehabilitation program that encompasses medical treatment, therapy, counseling, and vocational training.

**Methods and Materials:** A mixed-methods approach was used to evaluate the effectiveness of the rehabilitation program. Quantitative data were collected from 500 participants through medical assessments and progress reports. Additionally, qualitative data were gathered via interviews and surveys with participants and their families to understand their experiences and perceptions. The program included physical therapy, psychological support, vocational training, and social integration activities. Statistical analysis and thematic analysis were employed to analyze the data.

**Results:** The results demonstrate that the rehabilitation program significantly improved participants' recovery and overall well-being. Approximately 73.55% of participants showed a speedy recovery, 14.67% experienced a natural recovery rate, and the remaining participants had slow or no recovery. The qualitative data revealed high satisfaction levels among participants, although some expressed concerns about the duration of visible improvements. The program's holistic approach addressed various physical, mental, and social aspects, contributing to its success.

**Conclusion:** The rehabilitation program successfully achieved its goals of aiding participants in their recovery journey, fostering personal growth, and enhancing their quality of life. The findings highlight the importance of a comprehensive and integrated approach to rehabilitation that includes medical treatment, therapy, counseling, and vocational training. Future recommendations include expanding vocational training options, strengthening

community partnerships, and increasing mental health resources to further support individuals with disabilities.

**Keywords:** Rehabilitation Program, Disability Recovery, Mixed-Methods Approach, Physical and Psychological Therapy, Social Integration

## **Introduction**

### **Relevance of the topic:**

The significance of studying primary prevention of chronic heart failure originates from the potential benefit of reducing this condition's considerable cost on individuals and global healthcare systems.

Chronic heart failure is a progressive and incapacitating condition characterized by the heart's inability to adequately circulate blood, causing symptoms such as tiredness, dyspnoea, and fluid accumulation. It significantly lowers patients' quality of life and is associated with high rates of disease, death, and use of healthcare services.

Researching this disease provides the opportunity to reduce the occurrence of heart failure, therefore decreasing the human anguish and societal impact associated with the condition. It is critical for minimizing the incidence, severity, and fatality rate associated with this debilitating condition [1].

### **Aim of the study:**

To examine the risk factors contributing to CHF and the best prevention methods on a primary level for CHF. To understand the connection between risk factors and primary prevention in CHF

### **Objective of the study:**

Comprehending the seriousness of primary prevention in CHF progression and acknowledging the extent of impact risk factors have in CHF. Emphasizing the significance of early-stage prophylaxis in congestive heart failure (CHF).

### **Materials and methods:**

The materials were used to search for keywords in scientific databases such as PubMed, AHA, ScienceDirect, Semantic Scholar, and ESC. The methods used are a comprehensive review of scientific literature and critical details analysis.

### **Practical significance:**

Heart failure is a severe public health issue, resulting in high morbidity, death, and healthcare costs. The incidence and prevalence of heart failure can be reduced by implementing effective primary preventive strategies, such as lifestyle changes and targeted medicines, reducing the strain on healthcare systems and improving overall population health. Research will help to improve our knowledge of CHF and prevent the advancement of heart failure. Addressing modifiable risk factors early on can help patients maintain their general health, preserve cardiac function, and avoid heart failure's severe symptoms and effects. Healthcare costs can be decreased. Education and awareness campaigns concentrating on primary prevention empower people to take proactive steps to protect their hearts. It also helps with decreasing readmission rates and premature mortality. Investing in primary prevention of heart failure improves long-term sustainability by shifting the emphasis from symptom care to disease prevention.

## Chapter 1: chronic heart failure

### 1.1 Definition and Epidemiology Of Chronic Heart Failure

Chronic heart failure (CHF) is a gradually worsening condition that leads to a diminished quality of life for the patient and imposes a financial strain on the healthcare system. Although there have been improvements in managing conditions that contribute to congestive heart failure (CHF), the occurrence and prevalence of CHF are still on the rise [2]. There are more than 64 million people in the world who suffer from heart failure worldwide, and 50% have severe HF[3]. Studies have shown that with the increase in the number of HF patients, the financial burden being placed by healthcare on the government increases, as well. The total medical cost for heart failure treatments in the USA reached \$20.9 billion (2016) and is expected to reach \$53.1 billion by 2030[4].

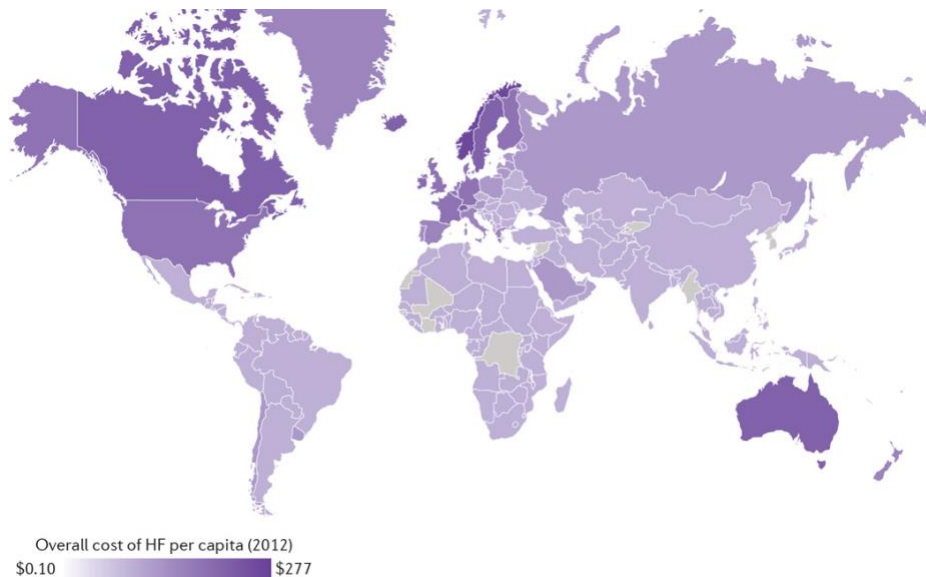


Figure 1: Overall cost of HF worldwide

In Figure 1, it is shown that certain regions in the world have a higher cost of treatment of HF than others. It is noted that the countries spending more are considered more developed and have better medical technology.

As seen in (Table 1) below, heart failure treatment impacts the overall expenditure of the Malaysian government and is responsible for 1.05% of the total expenditure.

Research has shown that Malaysia has one of the highest prevalence rates in Southeast Asia, with 721 cases per 100,000 people (2017). It was shown that there were high rehospitalization rates (13-18.1% within 30 days). The rates have also increased over the years. It was concluded that HF does pose a substantial financial burden to the Malaysian public healthcare system, and interventions are needed to reduce CHF and target risk factors. This is considered an effective prevention method to help the economy[5].

Table 1: The direct cost burden of heart failure as a percentage of total healthcare expenditure in 2021.

Estimated total health expenditure in 2021 (RM million) <sup>a</sup>	72,700
Base-case estimation of HF cost burden (range), (RM million)	766.3 (50.5 – 1,929.0)
Cost burden as a percentage of total healthcare expenditure	1.05 (0.07 – 2.66)

<sup>a</sup> The total health expenditure was obtained from CodeBlue. (2021). Malaysia's health spending estimated to hit 5% GDP in 2021. Social Health Analytics Sdn Bhd. Retrieved 02 July 2022 from <https://codeblue.galencentre.org/2021/09/21/malysias-health-spending-estimated-to-hit-5-gdp-in-2021/>

## **CHAPTER 2: RISK FACTORS OF CHRONIC HEART FAILURE**

### **2.1 Cardiovascular Health**

Diseases and bad cardiovascular health help boost the progression of chronic heart failure for the worse. CHF is often a complication due to the cardiac damage experienced from other CVD diseases like MI, ACS, valvular disorders, and even congenital heart diseases like tetralogy of Fallot and transposition of the great arteries.

Certain viral and bacterial infections can cause HF. Viruses such as the Coxsackie virus, severe acute respiratory syndrome coronavirus 2, and Epstein-Barr virus lead to chronic activation of inflammation processes and depress heart function. HIV infections lead to immune-mediated damage in a state of immunosuppression. Infections also increase proinflammatory cytokines and damage the heart cells [6].

### **2.2 Unhealthy Lifestyles, Narcotic Usage and Smoking**

Engaging in an unhealthy lifestyle is a recognized risk factor for the onset of cardiovascular illnesses. Alcohol misuse, sedentary lifestyle, smoking, and obesity, particularly in later stages of life, can significantly impair overall cardiovascular health and contribute to the development of specific disorders that ultimately result in CHF. Elevated sodium consumption is linked to a heightened susceptibility to heart failure and a deficiency in dietary fiber [7].

CHF is often associated with substance misuse, specifically methamphetamine, opiate, and alcohol consumption. They are a major cause of illness that is directly linked to visits to the emergency room and hospitalizations for heart failure [8].

Cigarette smoking is recognized to elevate the risk of congestive heart failure (CHF), regardless of the presence of CAD. The reason for this is that cigarette smoking triggers oxidative stress and inflammatory effects on the cardiovascular system [9].

## **Chapter 3: preventing heart failure**

### **3.1 Lifestyle Modifications**

The primary objective in preventing heart failure is maintaining a robust cardiovascular system. This can be achieved through adhering to a nutritious diet, abstaining from detrimental habits such as smoking and substance abuse, engaging in regular physical activity, and implementing effective stress management techniques. Adopting a better lifestyle, which includes maintaining a well-balanced diet, engaging in regular exercise or physical activities, limiting alcohol consumption, maintaining a BMI below 30 kg/m<sup>2</sup>, and abstaining from smoking, is independently linked to a reduced risk of heart failure. Research has demonstrated that adhering to at least four actions can reduce the risk of congestive heart failure (CHF) by 45% [10].

Adequate nutritional composition of food has been demonstrated to reduce the likelihood of developing congestive heart failure (CHF). Diets rich in plant-based foods such as fruits, vegetables, nuts, seeds, and legumes and low in animal-derived and processed foods have been proven to reduce the development of atherosclerotic plaques and prevent heart failure. Consuming fruits and vegetables has been demonstrated to enhance cardiovascular results. Research has demonstrated that the DASH diet is effective in managing blood pressure and decreasing the occurrence of heart failure in both males and females. Improved dietary patterns are directly associated with reduced mortality rates in patients. Several studies have demonstrated that following a Mediterranean diet can reduce the incidence of heart failure and decrease the levels of N-terminal pro-brain natriuretic peptides [11].

Reducing salt intake is crucial in preventing health issues through dietary means. Elevated consumption of sodium is recognized to be linked with high blood pressure. Consequently, a decrease in salt intake lowers the likelihood of developing hypertension and other cardiovascular disorders, thereby reducing the risk of heart failure [12]. Regular physical activity is another lifestyle alteration that can reduce the risk of many health issues. Engaging in physical activity aids in regulating Body Mass Index (BMI), promotes the overall well-being of bodily systems, and helps prevent the onset of diseases. A higher BMI raises the likelihood of developing HF at an earlier age compared to individuals with a normal BMI [13].

### **3.2 Screening As A Method Of Early Detection.**

From a population-level standpoint, one of the most efficient prevention measures is to identify and focus on high-risk groups prior to the onset of the disease. This occurs before the occurrence of permanent myocardial transformations that lead to the progression of symptomatic heart failure.

HF risk prediction techniques, such as PCP-HF, have demonstrated strong performance in accurately identifying and differentiating the risk of heart failure. This contributes to the advancement of the prevention of heart failure by shifting the focus from individual risk factor control to the assessment of absolute risk. Another significant predictor of HF risk relies on laboratory and instrumental diagnoses. Cardiac biomarkers such as cardiac troponin and B-type natriuretic peptide (BNP) are frequently linked to diseases that can result in congestive heart failure (CHF) [14].

Furthermore, certain electrocardiogram (ECG) observations are linked to the occurrence of heart failure (HF) in the absence of CAD. The indications include QRS prolongation over 120 milliseconds and left ventricular hypertrophy. Although the symptoms are not specific, they

indicate the presence of disorders associated with heart failure. Through additional examinations, a diagnosis can be provided [15].

Additionally, there are specific genetic tests that can be utilized to examine and evaluate disorders linked to congestive heart failure (CHF). At present, specific genetic variations and predispositions have a role in the elevated occurrence and prevalence of risk factors that lead to cardiovascular diseases, ultimately resulting in heart failure. Over 100 genes have been identified as being associated with cardiomyopathies, which can ultimately lead to heart failure if not addressed[16].

### 3.3 Vaccinations As Prophylaxis

As was noted earlier, some specific viruses and bacteria are capable of causing diseases that might lead to heart failure. Vaccinations against some of these diseases are possible and ought to be delivered. When it comes to infections not prevented by vaccinations, it is important to adhere to the appropriate hygiene standards and make every effort to avoid coming into contact with them[17].

### 3.4 Patient Education

Educating the patient about the disorders that they are now suffering from or that they may be at risk for developing is of the utmost importance. Compared to regular care, implementing proactive intervention in general practice has the potential to significantly enhance the quality of life of patients with CHF. The patient will notice an improvement in both their emotional and physical health, and they will feel as though they have more control over their illness as a result of this.

(Table 2) below is an example of how the ESC encourages and has implemented it as part of guidelines to help patients be educated and manage themselves with CHF[18].

Table 2: Summary Of ESC Recommendations For CHF Patients.

#### **Chronic heart failure patients should:**

- Monitor and identify changes in symptoms (e.g. daily weighing)
  - Manage symptom changes (e.g. > 2 kg over 3 days) by adapting behaviour (e.g. see their primary care physician)
  - Adhere to medication, diet and exercise regimens
  - Restrict sodium, fat, cholesterol, alcohol. Limit fluid intake to (1.5–2 l/day)
  - Abstain from cigarette smoking
  - Report mental health disturbance (e.g. depression, anxiety) to their healthcare professional
- 

### 3.5 Sleep Apnoea And CHF

Breathing disorders that occur during sleep are rather common in individuals who are suffering from heart failure and are linked to an increased risk of morbidity and mortality. The occurrence of central sleep apnoea is more prevalent in patients with heart failure who have a reduced ejection fraction. In contrast, the occurrence of obstructive sleep apnoea is more common in patients who have heart failure with retained ejection fraction. CPAP ventilation is the most frequently utilized therapy option for obstructive sleep apnea. This medication has been proven



to generate various cardiovascular benefits, including a drop in blood pressure, a reduction in the risk of stroke or transient ischemic attack, and a reduction in arrhythmias, according to a number of studies [19].

## Conclusion

HF hospitalization and mortality are rising; hence, primary prevention before clinical signs and symptoms is critically needed. The goal is to reduce the amount of Stage C or Stage D HF patients with poor prognoses.

Early risk intervention with preventative techniques may yield the most benefit before permanent damage. To match preventive intervention intensity to individual risk, it will be necessary to identify high-risk populations for HF. Various risk prediction techniques, such as the PCP-HF model, have been verified in worldwide populations and supported by the US 2022 multi-society HF Guidelines. <sup>24</sup> When paired with standard risk factor levels, genetic, biologic, clinical, and socioeconomic markers of elevated risk may improve personalized risk prediction. After identifying at-risk individuals, implementation gaps that prevent optimal risk factor levels must be addressed. Further research is needed to evaluate if medicinal therapy, such as MRA or SGLT2i, can prevent incident HF in high-risk people.

Externally verified multivariate HF risk assessment can be used in clinical practice for personalized risk assessment and focused prevention. After identifying a high-risk patient, practitioners may explore natriuretic peptides or echocardiography testing step-by-step. Genetic testing may be utilized more widely for precision medicine-focused HF risk assessment. New care systems for HF risk assessment and screening are needed for more effective, efficient HF prevention measures as genetic information grows fast.

HF prevention is best achieved by promoting a heart-healthy lifestyle from birth to old age. Reducing individual and population-level HF morbidity and mortality requires a comprehensive patient-centered life course approach that accounts for optimal CVD health (healthy diet, 150 min of moderate to vigorous physical activity, tobacco avoidance, normal BMI). [20]

## **List of Abbreviations**

CHF- Chronic Heart Failure

AHA- American Heart Journal

ESC- European Society Of Cardiology

AHF- Acute Heart Failure

HF- Heart Failure

MI- Myocardial Infarction

CVD- Cardiovascular Diseases

RF- Risk Factors

ACS- Acute Coronary Syndrome

HIV- Human Immunodeficiency Virus

DASH- Dietary Approaches to Stop Hypertension

CAD- Coronary Artery Diseases

PCP-HF- Pooled Cohort Equations Heart Failure

BNP- Brain Natriuretic Peptide

LVH- Left Ventricular Hypertrophy

OSA- Obstructive Sleep Apnoea

CPAP- Continuous Positive Airway Pressure

MRA- Magnetic Resonance Angiography

SGLT2i- Sodium-Glucose Transport Protein 2 Inhibitors

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