International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(REVIEW ARTICLE)

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Advances in the treatment of heart diseases: A review of emerging therapies

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International Journal of Science and Research Archive, 2025, 14(01), 532-535

Publication history: Received on 03 December 2024; revised on 08 January 2025; accepted on 10 January 2025

Article DOI: https://doi.org/10.30574/ijsra.2025.14.1.0084

Abstract

Cardiovascular diseases (CVDs) remain the leading cause of mortality in Brazil. In 2022, approximately 400,000 deaths were attributed to these diseases, regaining the top position after the COVID-19 pandemic in 2021. The increasing prevalence of cardiovascular diseases (CVDs) has driven several sectors to invest in research and technological innovations aimed at human health. Pharmaceutical industries and biotechnology companies have played a crucial role in developing advanced therapies and innovative solutions to mitigate the impact of these diseases on the global population. This study aims to highlight the main innovations implemented as well as new strategies in the management of CVDs, aiming to demonstrate their effect in reducing prevalence, consequences, and impact on global population quality of life. This study was conducted through a narrative review of the literature, using the following sources: scientific databases: PubMed, LILACS, and Google Scholar; documents from official bodies: Brazilian Ministry of Health, World Health Organization (WHO), and other government reports or international medical organizations; clinical guidelines: updated recommendations from medical and scientific societies related to the management of CVDs. Modern and emerging strategies in the treatment of cardiovascular diseases (CVDs) have led to notable advances, particularly in three key areas: diagnostic technologies, pharmacological therapies, and minimally invasive interventions. Each of these areas contributes significantly to improving clinical management, providing more effective, safer, and personalized treatments for patients. As research continues to advance, new therapies and emerging approaches, such as gene and cell therapy, offer a promising future for the treatment of heart diseases, improving survival and quality of life for patients worldwide.

Keywords: Cardiovascular diseases; Treatment advances; Pharmacological treatment; Cardiovascular disease management; Cardiac technological treatment

1. Introduction

Cardiovascular diseases (CVDs) are recognized as one of the leading causes of morbidity and mortality globally, representing a significant impact on public health. These conditions encompass a broad spectrum of disorders affecting the cardiovascular system, including coronary artery disease, hypertension, heart failure, and cerebrovascular events. The rising prevalence of these diseases underscores the urgent need for evidence-based strategies for their prevention, accurate diagnosis, and effective therapeutic intervention (LUSTOSA et al., 2023).

Cardiovascular diseases (CVDs) remain the leading cause of mortality in Brazil. In 2022, approximately 400,000 deaths were attributed to these conditions, regaining the top spot after the COVID-19 pandemic in 2021 (DATASUS, 2022).

Globally, CVDs continue to be the leading cause of death, with a significant 39.4% increase in the number of deaths between 1990 and 2022, rising from 12.4 million to 19.8 million (World Health Organization, 2022).

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Older individuals have experienced longer periods with chronic diseases, especially CVDs, resulting in a greater length of life with disabilities and functional limitations (LIMA, REZENDE & AMARAL, 2021).

The growing prevalence of cardiovascular diseases (CVDs) has driven various sectors to invest in research and technological innovations aimed at human health. Pharmaceutical industries and biotechnology companies have played a crucial role in developing advanced therapies and innovative solutions to mitigate the impacts of these diseases on the global population (LIMA, REZENDE & AMARAL, 2021).

Therefore, the aim of this study is to highlight the key innovations implemented as well as the new strategies in the management of CVDs, aiming to demonstrate their effect on reducing prevalence, consequences, and impact on the quality of life of the global population.

2. Methodology

This study was conducted through a narrative literature review, aiming to identify and describe the main innovations and strategies in the management of cardiovascular diseases (CVDs) in the past five years. The review included relevant studies published in scientific databases and official documents from recognized organizations.

The sources used in the review were: scientific databases—PubMed, LILACS, and Google Scholar; official documents from governmental bodies—Brazil's Ministry of Health, World Health Organization (WHO), and other reports from governmental or international medical entities; clinical guidelines—updated recommendations from medical and scientific societies related to the management of CVDs.

Studies published between January 2019 and December 2023 were included, particularly those addressing technological and pharmacological advances, preventive and therapeutic strategies for CVDs, publications available in Portuguese, English, or Spanish, and studies or documents presenting a direct impact on reducing the prevalence, complications, and limitations related to CVDs.

The descriptors used for the search were: management of cardiovascular diseases, therapeutic innovations, technological advances in health, cardiovascular prevention strategies, impact on quality of life, cardiovascular disease treatment strategies.

Controlled terms and keywords, including the descriptors mentioned above, were used in their Portuguese, English, and Spanish versions. The screening was conducted in three stages: reading the titles, analyzing the abstracts, and conducting a full-text assessment. The information extracted was categorized into themes such as diagnostic advances, therapeutic strategies, and public health approaches, based on their relevance to clinical practice and population impact.

The data were analyzed qualitatively, considering the implications of innovations in the management of CVDs on reducing prevalence, improving quality of life, and decreasing functional limitations associated with the diseases. The analysis was complemented by current guideline recommendations to contextualize the findings in the global landscape.

3. Literature review

In recent years, there have been significant advances in understanding cardiovascular diseases (CVDs) and the strategies adopted to combat them. Medical research and technological progress have played a key role in improving prevention and treatment practices. Furthermore, the emphasis on promoting cardiovascular health through lifestyle modifications and pharmacological interventions has been central in the fight against these conditions. Among the main CVDs, coronary artery disease, hypertension, heart failure, stroke, and cardiac arrhythmias are particularly noteworthy (LUSTOSA et al., 2023).

Advances in pharmacological therapies and interventional procedures have led to significant changes in the treatment of cardiovascular diseases. Innovative therapies, such as PCSK9 inhibitors and next-generation anticoagulants, have provided effective alternatives for managing conditions like hypercholesterolemia and atrial fibrillation, offering superior control over risk factors and reducing thromboembolic complications. Moreover, coronary intervention procedures, such as angioplasty and stent placement, have become safer and more effective due to technological progress and refined techniques, allowing for more precise treatment with better outcomes for coronary diseases (LUSTOSA et al., 2023).

The approach to cardiovascular diseases represents a significant challenge in contemporary medicine due to the diversity in clinical presentations and the variable response to treatments among patients. Traditional treatment models, often based on general protocols, are not always effective in individualizing care. In this context, personalized medicine has emerged as an innovative approach, aiming to tailor therapeutic interventions to the specific characteristics of each patient, considering genetic, environmental, and lifestyle factors (COSTA et al., 2023).

Modern and emerging strategies in the treatment of cardiovascular diseases (CVDs) have led to remarkable advances, particularly in three key areas: diagnostic technologies, pharmacological therapies, and minimally invasive interventions. Each of these areas significantly contributes to improving clinical management, providing more effective, safer, and personalized treatments for patients (BARROS et al., 2023 & SANTOS et al., 2023).

In recent years, the treatment of cardiovascular diseases (CVDs) has experienced significant advances driven by innovations in various fields such as pharmacological therapies, diagnostic technologies, and minimally invasive interventions. These advances have resulted in notable improvements in survival and quality of life for patients. Below are some of the main advances in the treatment of heart diseases:

3.1. Advances in Pharmacological Therapies

- SGLT2 Inhibitors: Initially developed for the treatment of type 2 diabetes, SGLT2 inhibitors, such as dapagliflozin and empagliflozin, have shown significant efficacy in managing heart failure (HF), even in patients without diabetes. These medications have been shown to reduce hospitalizations and cardiovascular mortality, regardless of left ventricular ejection fraction, a key metric in assessing HF.
- ARNIs (Angiotensin Receptor-Neprilysin Inhibitors): The combination of sacubitril and valsartan, known as ARNI, has proven to be more effective than angiotensin-converting enzyme inhibitors (ACEIs) in treating heart failure with reduced ejection fraction. Studies such as the PARADIGM-HF have demonstrated the superiority of ARNIs in reducing overall mortality and hospitalizations due to heart failure by promoting vasodilatory effects and improving heart function.
- Direct Oral Anticoagulants (DOACs): For patients with atrial fibrillation, direct oral anticoagulants (such as rivaroxaban, apixaban, and dabigatran) have shown safer and more effective alternatives to traditional anticoagulants (warfarin). These drugs do not require constant INR (International Normalized Ratio) monitoring and have a lower risk of food and drug interactions.

3.2. Advanced Diagnostic Technologies

- Advanced Cardiac Imaging: The use of imaging techniques, such as cardiac magnetic resonance (CMR) and computed tomography (CT) has significantly improved the assessment of heart function and early detection of heart diseases such as heart failure and coronary artery disease. These technologies have provided more accurate and personalized diagnoses, enabling more effective treatments.
- Implantable Cardiac Pressure Monitors: Devices such as implantable cardiac pressure monitors have proven useful in monitoring patients with heart failure, allowing for early detection of clinical changes and immediate interventions. This continuous monitoring can prevent hospitalizations and severe complications.

3.3. Minimally Invasive Interventions

- Angioplasty and Stent Placement: In patients with coronary artery disease, angioplasty (a procedure to unblock coronary arteries) and stent placement (devices to keep arteries open) have become more effective and safer procedures. The introduction of drug-eluting stents has helped prevent restenosis (artery narrowing) and improved clinical outcomes.
- Cardiac Resynchronization Therapy (CRT): CRT, which involves implanting a biventricular pacemaker, has shown significant benefits in patients with heart failure and severe systolic dysfunction, improving the coordination of heart contractions and overall heart function. CRT has been associated with reduced hospitalizations and mortality in patients with advanced heart failure.
- Ventricular Assist Devices (VADs): For patients with advanced heart failure refractory to conventional treatment, VADs are an important therapeutic option, helping to maintain blood circulation while the heart recovers or awaits a transplant. These devices have contributed to improved survival and quality of life in critically ill patients.

3.4. Emerging Approaches

- Gene and Cell Therapy: One of the most promising emerging areas in heart disease treatment is gene and cell therapy. Clinical trials with stem cells are exploring the regeneration of damaged cardiac tissue, particularly in patients with heart failure resulting from myocardial infarction. Although initial results are promising, there are still significant challenges to overcome, such as optimizing cell delivery techniques and integrating cells into cardiac tissue.
- Immunotherapy: In the field of autoimmune heart diseases, such as myocarditis, immunotherapy is being investigated as a strategy to reduce inflammation and improve heart function, expanding therapeutic options for these rare but severe conditions.

3.5. Advances in the Treatment of Atrial Fibrillation:

- Atrial fibrillation, a common arrhythmia, has received significant attention in the development of new treatments, such as catheter ablation, which aims to correct abnormal electrical circuits in the heart. The combination of pharmacological treatments with invasive approaches, such as ablation, has shown good results in controlling arrhythmias and reducing the risk of stroke.
- These innovations have contributed to more effective and personalized treatment of CVDs, aiming not only for clinical improvement but also for optimizing patients' quality of life (BARROS et al., 2023 & SANTOS et al., 2023).

4. Conclusion

Advances in the treatment of heart diseases represent an important milestone in managing these conditions, providing patients with better therapeutic options, fewer side effects, and greater efficacy. The combination of innovative pharmacological therapies, minimally invasive interventions, and advanced diagnostic technologies has enabled more targeted and personalized treatments. As research continues to progress, new therapies and emerging approaches, such as gene and cell therapy, offer a promising future in the treatment of heart diseases, improving survival and quality of life for patients worldwide.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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