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SHORT REVIEW

Unveiling the Sudden Surge in Cardiac Arrest among Indian youth: Causes, Clinical Care and Natural Remedies

Madhurima Sahay[1], Avijit Mazumder[1*], Bhavani Pentela[1], Rashmi Mishra[2] and Gurvinder Singh[3]

[1]Department of Pharmacology, Noida Institute of Engineering and Technology (Pharmacy Institute), Plot No.19, Knowledge Park-II, Greater Noida - 201306, Uttar Pradesh, India; avijitmazum@yahoo.com

[2]Department of Biotechnology, Noida Institute of Engineering and Technology, Plot No.19, Knowledge Park-II, Greater Noida, 201306, Uttar Pradesh, India

[3]School of Pharmaceutical Technology, Lovely Professional University, Phagwara - 144411, Punjab, India

Abstract

Background: South Asia is disproportionately afflicted by Cardiovascular Diseases (CVDs), which are the world's leading cause of death. Urbanization, sedentary lifestyles, poor food, and high levels of psychosocial stress are all contributing to the increased incidence of Sudden Cardiac Arrest (SCA) in India, a country with a sizable youth population. **Aim:** The purpose of this study is to describe the etiological aspects of SCA, highlight its rising frequency among Indian youth, and talk about management and prevention techniques to lower the number of preventable cardiovascular deaths. **Methods:** Using databases such as PubMed, Scopus, ScienceDirect, Web of Science, and Google Scholar, an extensive literature review was carried out. Keywords including "young adults," "premature mortality," "sudden cardiac arrest," "sedentary lifestyle," "herbal sources," and "cardiovascular health" were employed. Additionally, pertinent national-level data from WHO, NCRB, and ICMR were included. **Results:** In addition to modifiable risk factors like obesity, hypertension, smoking, and alcohol use, SCA in young people is often linked to structural and hereditary conditions like hypertrophic cardiomyopathy, coronary artery anomalies, primary arrhythmias, myocarditis, and Marfan syndrome. According to recent data from India, childhood obesity and family history are major causes of the rising number of unexpected deaths among young people. However, only a few universities have access to AEDs, and bystander CPR rates are still extremely low (1–3 %). Using electrocardiography (ECG) and echocardiography in athletes and high-risk groups can greatly enhance results. Altering one's lifestyle and using herbal medicines as a supplement may also help to maintain cardiovascular health. **Conclusion:** Early detection, preventive screening, quick emergency response, and policy-driven interventions are critically needed, as evidenced by the increased incidence of SCA among Indian young. To protect young cardiovascular health and lower premature mortality, a multimodal strategy including lifestyle changes, structured screening programs, community education, and healthcare reforms is essential.

Major Findings: SCA among Indian youth is rising due to lifestyle factors, obesity, stress, and hereditary cardiac disorders. Emergency response remains weak, with CPR rates at 1–3 % and scarce AED access. Preventive screening and lifestyle interventions are essential to reduce premature mortality and improve cardiovascular outcomes.

Keywords: Herbal Sources, Premature Mortality, Sedentary Lifestyle, Sudden Cardiac Arrest, Unhealthy Dietary Choices, Young Adults

1. Introduction

In India, cardiovascular disorders contribute to 24.8% of total fatalities, with respiratory diseases accounting for 10.2%, and malignant and other cancers making up 9.4%[1]. This aligns with data from the Centres for Disease Control and Prevention (CDCP), where cardiovascular disease, chronic obstructive pulmonary

*Author for correspondence

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disease, and stroke are identified as the leading causes of death[2]. Cardiovascular diseases, encompassing conditions like ischemia and stroke, claim the lives of 17.7 million individuals annually, serving as the leading cause of fatalities. The trajectory of cardiovascular diseases is anticipated to intensify due to demographic changes, shifts in epidemiology, and heightened urbanisation. Factors associated with an increased risk include smoking, sedentary lifestyle, obesity, hypertension, and elevated cholesterol levels[3]. The surge in Cardiac Arrest (CA) cases among the youth in India presents a critical and pressing health concern that demands thorough examination. From the influence of changing lifestyles and environmental stressors to the prevalence of specific cardiovascular conditions in younger age groups, understanding the root causes is crucial for effective intervention and prevention strategies[4]. As we delve into the intricacies of this burgeoning epidemic, the goal is to advocate for proactive measures, including lifestyle modifications, heightened health awareness, and informed policy initiatives, to safeguard the cardiovascular well-being of India's youth[5]. CA is defined as the cessation of electrical or mechanical cardiac activity, validated by the lack of circulation indications. It takes place when the heart comes to an abrupt and unforeseen halt in its pumping function. In such instances, blood ceases to circulate to crucial organs, including the brain[6]. SCD is defined as an unusual, premature death caused by cardiac failure within a brief period of time, frequently ≤1 hour following the beginning of symptoms, in an individual without any pre-existing condition that would indicate a fatal prognosis[7].

1.1 Warning Signs

Most individuals who undergo a CA typically exhibit one or more symptoms within the hour preceding the event. These indications include:

- Shortness of breath, more prevalent in women than in men.
- Profound fatigue or extreme exhaustion.
- Back pain and symptoms resembling those of the flu.
- General symptoms such as abdominal discomfort, nausea, and vomiting.
- Chest tightness and angina, predominantly observed in males.
- Frequent episodes of dizziness or fainting, especially during physical activity, while sitting, or lying on your back.
- Sensations of racing, fluttering, or irregular heartbeat.

2. Materials and Methods

The search strategy employed for this study encompassed several databases, including PubMed, Scopus, ScienceDirect, Web of Science, and Google Scholar. Key search terms such as sudden cardiac arrest, young adults, premature mortality, sedentary lifestyle, unhealthy dietary choices, and herbal sources for management were utilised to identify pertinent literature. The primary focus of this research is understanding the surge of cardiac arrest in the younger population and finding herbal alternatives for its management. Exclusion criteria were used to eliminate studies that were not directly pertinent to the topics. Furthermore, reference lists of pertinent articles were manually reviewed to complement the database search, and expert opinions were solicited to ensure thorough coverage of the subject matter.

3. Pathophysiology of Cardiac Arrest

The pathophysiology of CA is characterized by a complex interaction of electrical, mechanical, and metabolic processes that lead to a sudden cessation of efficient circulation and consequent organ failure[8], which results in: Cardiac electrical instability, characterized by irregular heartbeats or arrhythmias, arises from irregularities in the heart's impulse conduction system and can manifest as rapid or sluggish heart rates, missed beats, or erratic rhythms. This condition is often caused by structural cardiac disease, electrolyte imbalances, drug adverse effects, and genetic factors. Symptoms range from palpitations and dizziness to fainting and Cardiac Arrest (CA). Management includes diagnosing and treating underlying conditions, lifestyle modifications, medications, and, in severe cases, treatments like implanted devices or ablation. Ventricular Fibrillation (VF) and Ventricular Tachycardia (VT) are critical arrhythmias necessitating immediate medical intervention, such as defibrillation, medications, and

possibly Implantable Cardioverter-Defibrillator (ICD) placement. VF features rapid, chaotic electrical activity in the ventricles, causing ineffective heart quivering, while VT involves regular but rapid heartbeats that can deteriorate into VF, leading to Sudden Cardiac Arrest (SCA). Reduced oxygen delivery, stemming from factors like low oxygen levels, lung function impairment, anemia, or poor blood flow, exacerbates CA by causing tissue hypoxia and organ malfunction. Effective treatment includes cardiopulmonary resuscitation (CPR), supplementary oxygen, and addressing underlying issues. Loss of cardiac output, due to cardiac dysfunction, severe arrhythmias, shock, or mechanical blood flow impediments, reduces oxygen and nutrient delivery to essential organs, leading to systemic hypoperfusion and impaired function. Timely interventions such as defibrillation, CPR, and Advanced Cardiac Life Support (ACLS) are crucial for restoring cardiac output and improving survival. Cellular and organ dysfunction quickly follows reduced cardiac output, with vulnerable organs like the brain, heart, kidneys, liver, and lungs experiencing damage due to insufficient perfusion and oxygenation. CA, a sudden stop in effective heart activity, deprives vital organs of oxygenated blood, leading to unconsciousness and halted respiration, as illustrated in Figure 1. Prompt detection and coordinated medical response are essential for managing CA and improving patient outcomes[9].

4. Aetiology of Sudden Cardiac Arrest in Young Adults

SCA among children and young adults can stem from various factors (see Figure 2).

4.1 Hypertrophic Cardiomyopathy (HCM)

This hereditary condition is the primary cardiovascular cause of SCA in young individuals and often remains unnoticed. It involves thickening of muscle cells in the heart's ventricles, leading to irregular cardiac rhythms, especially during physical exertion. Additionally, other

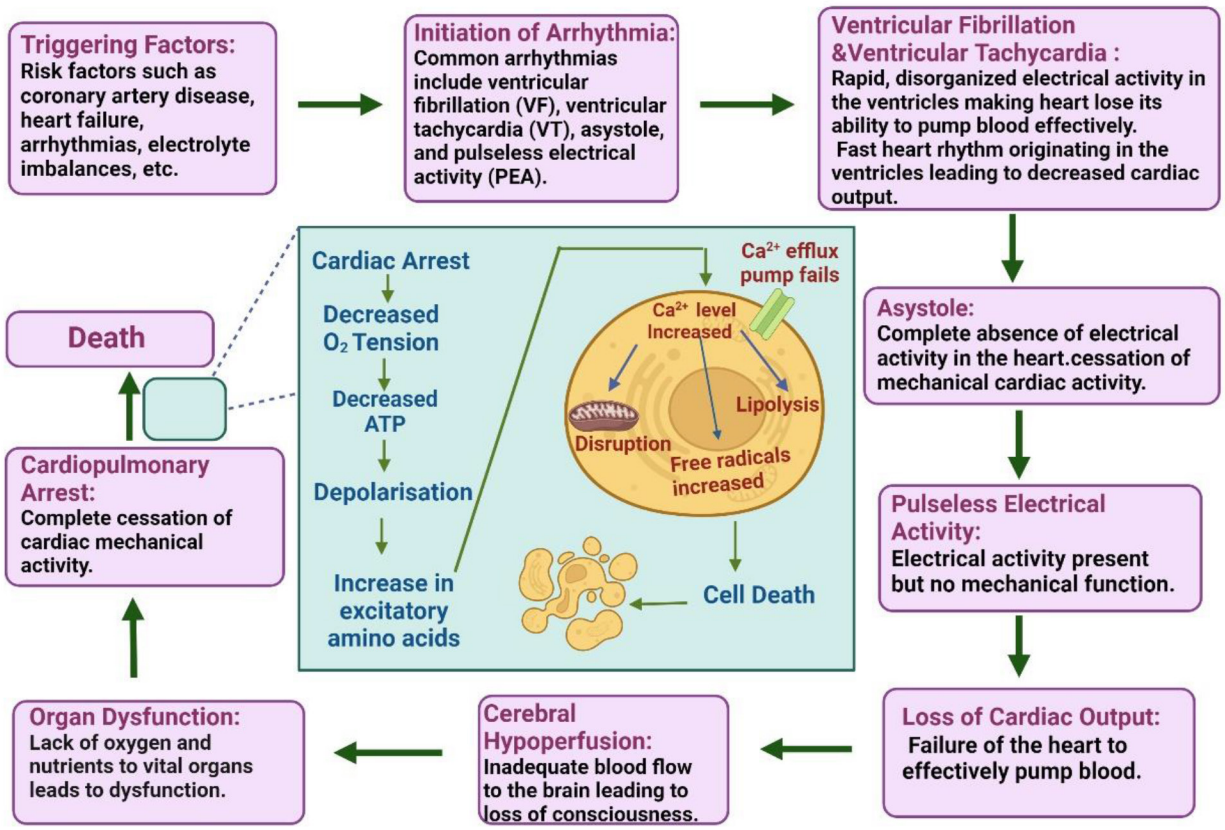


Figure 1. Depicting the flow of pathophysiology of cardiac arrest along with the mechanism of cell death leading to sudden death.

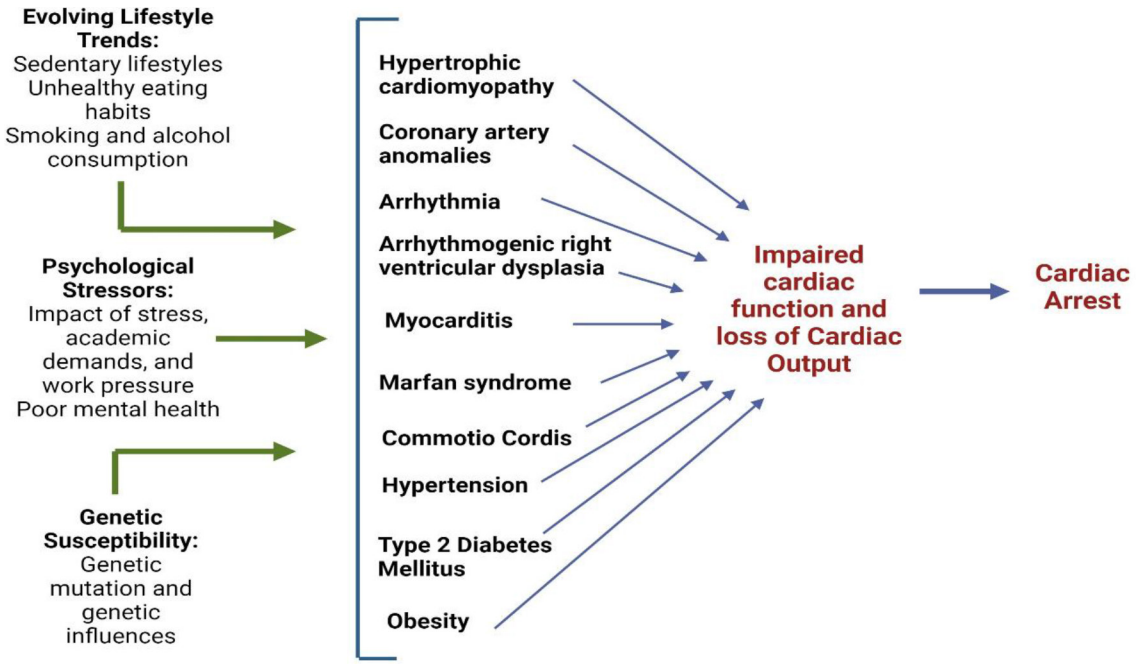


Figure 2. Various physiological causes and underlying diseases lead to cardiac arrest in young people.

types of pediatric cardiomyopathy may contribute to this risk[10]. Histologically, HCM is characterised by myocardial dysfunction, fibrosis, and abnormalities in small blood vessels. From a macroscopic perspective, hypertrophy typically manifests asymmetrically, with around 25% of patients displaying resting Left Ventricular Outflow Tract Obstruction (LVOTO)[11]. The primary cause of SCD in HCM is often ventricular arrhythmias, which can be effectively managed with an Implanted Cardioverter Defibrillator (ICD) therapy. The cornerstone of care lies in the identification of high-risk patients. Over the past four decades, research efforts have identified various phenotypic traits that can aid in identifying individuals who could benefit from ICD placement[12].

4.2 Coronary Artery Anomalies

Abnormalities in the connection of the coronary arteries to the heart can decrease blood flow to the heart muscle during physical activity, resulting in CA. These anomalies are often present from birth in young individuals, though symptoms 4.3 may not manifest until later in life[13]. Patients aged 30 or younger who have isolated coronary artery anomalies face an elevated risk of sudden death during physical activity. Consequently, there is a pressing need for increased diligence in detecting these abnormalities early and proceeding with surgical repair when necessary[14].

4.3 Primary Arrhythmias

SCA may manifest in individuals with structurally normal hearts owing to unnoticed hereditary conditions affecting the heart's electrical conduction. Examples include Long QT syndrome and Wolff-Parkinson-White syndrome[15,16].

4.4 Arrhythmogenic Right Ventricular Dysplasia

In this inherited disorder, portions of the heart's muscle tissue are replaced by scar tissue[17]. Arrhythmogenic right ventricular cardiomyopathy/dysplasia represents an infrequent yet impactful contributor to sudden arrhythmic death in otherwise healthy young individuals, alongside being a lesser factor in congestive heart failure cases. It can induce temporary incapacitation with severe consequences. The extensive clinical spectrum of this condition appears to stem from one or both of two factors: (a) the replacement of much of the right ventricular myocardium with fat and (b) a hereditary predisposition to environmental toxins, such as those encountered in cases of myocarditis[18].

4.5 Myocarditis

Inflammation of the heart's walls, typically triggered by an infection, characterises myocarditis. Among children, most cases of myocarditis occur when a virus,

like enterovirus, infiltrates the heart. Additionally, bacterial, fungal, or parasitic infections, as well as drug allergies, can also induce myocarditis[19]. Cardiac magnetic resonance imaging is a widely recognised diagnostic approach for identifying myocarditis, and the detection of late gadolinium enhancement during this imaging procedure serves as the most reliable independent predictor for SCD, overall mortality, and cardiac-specific mortality[20].

4.6 Marfan Syndrome

This disorder of connective tissue can lead to tears in the aortic blood vessels of the heart. Individuals born with Marfan syndrome, often tall with elongated arms, may remain unaware of their condition[21]. During pregnancy, physical activity, and instances of trauma, the underlying tissue deficiencies in individuals with Marfan syndrome can be exacerbated. The suspicion of Marfan syndrome should arise particularly in tall individuals facing vascular challenges, prompting the collection of appropriate tissue and blood samples for DNA extraction or storage, if necessary, to confirm the diagnosis through genetic analysis[22].

4.7 Commotio Cordis

This condition arises from a blow to the chest directly over the heart during specific phases of the cardiac cycle. It primarily affects young individuals aged 4-18, though it can also manifest in adults. Sudden death may occur immediately or after a few moments of dizziness following a blow to the chest wall. Victims often present with ventricular fibrillation, and successful resuscitation can be more challenging than anticipated due to the victims' youth, overall good health, and absence of structural heart disease[23].

4.8 Hypertension

Hypertension can cause SCA by directly harming the heart muscle, causing atherosclerosis, decreasing the circulation to the heart, and raising the risk of various cardiovascular problems that might lead to CA[24]. It can cause the development of various cardiovascular disorders such as coronary artery disease, heart attacks, and arrhythmias (abnormal heart rhythms), all of which can result in SCA. Furthermore, high blood pressure can weaken blood vessel walls, increasing the risk of aneurysms (bulging and potentially rupturing blood vessels), including those in the brain (intracranial aneurysms), which can cause a stroke or rapid hemorrhage[25].

4.9 Obesity

Excess body weight exerts strain on the heart, resulting in anatomical alterations such as left ventricular hypertrophy (heart muscle thickening) and heart chamber dilatation. These alterations can reduce the heart's capacity to adequately pump blood, increasing the risk of heart failure. It greatly increases the risk of CA by causing structural and functional changes in the heart, worsening cardiovascular risk factors, and raising the chance of atherosclerosis and other cardiovascular problems[26].

5. Causes that Place Youth at Increased Risk of Cardiac Arrest

5.1 Evolving Lifestyle Trends

5.1.1 Sedentary Lifestyles

Sedentary habits prevalent among younger generations are one of the leading causes. The human body is designed for movement, and prolonged periods of inactivity can lead to muscular weakness, decreased flexibility, and impaired circulation[27].

5.1.2 Unhealthy Eating Habits

Fast-food habits have intense effects on cardiovascular health, leading to many other diseases too. Diets high in processed foods, saturated fats, sugars, and sodium contribute to the development of obesity, hypertension, dyslipidemia, and insulin resistance, all of which are major risk factors for heart disease[28].

5.1.3 Increasing Rates of Smoking and Alcohol Consumption

Rising tobacco and alcohol use increases blood pressure and levels of triglycerides in the blood and increases risks of stroke and congestive heart failure[29].

5.2 Psychological Stressors and Heart Health

5.2.1 Impact of Stress, Academic Demands, and Work Pressure

This causes illness, anxiety, despair, a lack of sleep, and poor academic performance. Stress, scholastic

commitments, and work pressure all have a substantial influence on heart health, since they can contribute to the development and worsening of cardiovascular problems. Chronic stress causes physiological reactions such as elevated heart rate, blood pressure, and inflammation, which can eventually lead to hypertension, atherosclerosis, and arrhythmias[30].

5.2.2 Mental Health

It is a precursor to elevated cortisol levels, which cause greater cardiac reactivity and decreased blood flow to the heart. The physiological processes behind this include autonomic nervous system dysfunction, increased inflammation, impaired immunological function, and harmful behaviours such as smoking, poor food choices, and physical inactivity. Furthermore, those with poor mental health may be less inclined to stick to medical treatments and engage in good lifestyle choices, worsening their cardiovascular risk[31].

6. Epidemiological Trends in Cardiac Arrest

Based on data from the National Crime Records Bureau (NCRB) and the Indian Council of Medical Research (ICMR), roughly 28,000 deaths in India were attributed to sudden cardiac arrest in 2022, with the majority of these deaths occurring in those between the ages of 18 and 45. Additionally, according to estimates from the World Health Organisation (WHO), India accounts for more than 20% of the world's premature mortality from cardiovascular diseases, with urban youth showing a particularly strong upward trend[32-34].

Considering that coronary heart disease is responsible for approximately 80% of all sudden deaths, the epidemiological trends in SCD closely mirror those of coronary heart disease. As individuals age, there is a corresponding rise in the occurrence of sudden cardiac mortality, alongside an increase in incidences of ischemic heart disease among both men and women. However, among those affected by coronary heart

Table 1. Summary of studies of sudden cardiac arrest in the youth population around the world

Author(s)	Year of Publication	Age Group	Key findings	References
Lieve KVV, Wilde AAM, et.al	2015	21-year-old	A 21-year-old girl arrives at the emergency room with a history of repeated fainting episodes while exercising. ECG shows instances of ventricular tachycardia. Further investigation reveals a structurally sound heart, and genetic testing supports the diagnosis of Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT).	38
Ackerman MJ, Priori SG, *et al*	2011	17-year-old	A 17-year-old guy has chest discomfort and palpitations. The ECG reveals extended QT intervals, and additional testing confirms the diagnosis of long QT syndrome. Genetic testing has shown a harmful mutation in the KCNQ1 gene.	39
Maron BJ, Doerer JJ, *et al*	2009	16-year-old	A 16-year-old male basketball player collapses during a game due to unexpected chest discomfort and lack of breath. Despite receiving prompt CPR and defibrillation, the patient remains in ventricular fibrillation. Further examination finds a familial history of abrupt cardiac death, and genetic testing confirms the diagnosis of Hypertrophic Cardiomyopathy (HCM).	40
Corrado D, Basso C, *et al*	2006	18-year-old	An 18-year-old male soccer player falls during practice and is diagnosed with ventricular fibrillation. Despite rapid CPR and defibrillation, the patient does not regain consciousness. A post-mortem investigation indicates evidence of Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC).	41
Lange RA, Hillis LD, *et al*	2001	17-year-old	A 17-year-old girl has a history of eating issues. Had a sudden fall while exercising excessively. Diagnosis: SCA due to electrolyte imbalances and heart problems related to anorexia nervosa.	42

disease, the proportion of sudden coronary deaths diminishes as age advances[35]. Remarkably, this trend extends to younger individuals, too, as seen in Table 1. As per the findings of the Oregon SCD Study,

58% of individuals aged 5 to 34 who experienced sudden unexpected death had at least one cardiovascular-related risk factor. Moreover, there was a 39% prevalence of obesity among these young individuals[36]. The family history of SCD may pose a potential risk factor for experiencing such an event. Additionally, among young individuals, a concerning trend is the misuse of opioids, which could elevate the likelihood of developing cardiovascular issues in the future[37]. More of these cases are listed in Table 1.

7. Management and Prevention

A CA can be fatal unless prompt intervention is administered. Most CAs occur outside of medical facilities, meaning that emergency care is often rendered by family, friends, or members of the community. Everyone must identify signs of a CA and respond promptly with appropriate actions if they encounter one[43]. Management and prevention of CA involve various strategies aimed at addressing underlying risk factors, early detection, prompt intervention, and lifestyle modifications. Management and prevention of CA can involve several strategies[44]:

7.1 Prompt Intervention

Bystander-initiated Cardiopulmonary Resuscitation (CPR) rates in India are extremely low, ranging from 1-3 per cent, compared to over 40% in many wealthy countries. Automated External Defibrillators (AEDs) are likewise not widely accessible to the general population; most installations are found in metro stations, airports, and a few other organisations. Survival rates after sudden cardiac arrest could be significantly increased by bolstering community-based CPR training programs and making sure that AEDs are required to be placed in public spaces with heavy foot traffic, such as gyms and schools[45].

In cases of CA, immediate intervention is critical for survival. CPR should be initiated immediately by bystanders or trained individuals to maintain blood circulation and oxygenation until medical help arrives[46]. Early defibrillation using Automated External Defibrillators (AEDs) is crucial for reviving a normal heart rhythm in cases of ventricular fibrillation or ventricular tachycardia[47]. Additionally, Advanced Cardiac Life Support (ACLS) protocols should be promptly initiated by trained medical professionals. These protocols include advanced airway management, the administration of medications such as epinephrine, and additional defibrillation if necessary[48].

7.2 Lifestyle Modifications

A key factor in lowering the incidence of sudden cardiac arrest in high-risk populations is preventive cardiovascular monitoring. When young athletes, people with a family history of heart disease, or those who report unexplained fainting, routine electrocardiography (ECG) and echocardiogram can aid in the early diagnosis of structural and electrical abnormalities. For instance, pre-participation screening programs in Italy have shown a significant decrease in unexpected athlete mortality, and cardiology groups in India are actively supporting similar programs[49, 35].

To promote heart health, it is essential to adopt a diet that emphasises the consumption of vegetables, fruits, whole grains, and lean proteins while reducing the intake of saturated fats, cholesterol, and sodium. Incorporating regular physical activity or exercise tailored to individual capabilities and medical conditions is also crucial. Additionally, avoiding excessive alcohol consumption and illicit drug use is important. Ensuring adequate sleep and employing stress management techniques further support overall cardiovascular health[50].

7.3 Natural Remedies for Managing Cardiac Failure

Natural remedies for managing heart failure can supplement conventional therapy and perhaps enhance quality of life without causing significant adverse effects. Herbal supplements are thought to improve heart function and alleviate symptoms of heart failure if taken under medical care. Table 2 lists some plants, along with their in vivo/in vitro investigations and mechanisms of action.

Table 2. Herbal sources for the management of cardiovascular diseases

Herbal Source	*In vitro* / *In vivo* / Clinical	Dose used	Mechanism of Action	References
Terminalia arjuna	Clinical (heart failure, angina)	500 mg – 1 g bark extract, 2–3× daily	Antioxidant, positive inotropic effect, improvement in endothelial function, cardioprotective via reduction of oxidative stress	[51]
Crataegus spp (Hawthorn)	Clinical (CHF RCTs, meta-analysis)	900 mg/day standardised extract	Improves myocardial contractility, enhances coronary blood flow, antioxidant activity, and vasodilation	[52]
Allium sativum (Garlic), aged extract/powder	Clinical (hypertension, hyperlipidemia)	600–1200 mg/day (aged garlic extract)	Inhibition of HMG-CoA reductase, enhancement of nitric oxide and vasodilation, antiplatelet and antihypertensive effects	[53]
Commiphora mukul (Guggulipid)	Clinical (hypercholesterolemia RCT, JAMA 2003)	1–2 g/day standardised guggulipid	Proposed bile acid receptor (FXR) modulation and cholesterol metabolism, but RCT showed no benefit and raised LDL in some	[54]
Curcuma longa (Curcumin)	Clinical (lipids, BP, inflammatory markers, RCTs)	500 mg – 2 g/day curcumin/curcuminoids	Anti-inflammatory via NF-κB inhibition, antioxidant, modulation of lipid metabolism, and endothelial protection	[55]
Salvia miltiorrhiza (Danshen)	Clinical (angina, coronary disease)	Danshen dripping pills: 270–540 mg/day	Improves microcirculation, antioxidant, vasodilation via nitric oxide, and anti-thrombotic activity	[56]
Hibiscus sabdariffa L.	Male *Sprague Dawley* rats	60 mg/200 gm	Promotion of urination and blocking angiotensin converting enzyme 1	[57]
Portulaca oleracea	Male *Wistar* rats	110 mg/kg	It affects α-adrenoceptors on the postsynaptic side and hampers the influx of Ca2+ through the cell membrane	[58]
Imperata cylindrica	*In-vivo* model of anaesthetised cats and *In-vitro* model of rabbit *jejunum*	Increasing concentrations from 10 to 320 mg/kg	Acts as a beta-blocker	[59]
Radish seed and Yellow *Chrysanthemum* extract	SHR-Wistar-Kyoto rats	High dose (300 mg/kg), moderate dose (200 mg/kg), low dose (100 mg/kg)	Related to the renin-angiotensin system	[60]
Moringa oleifera Lam.	Female ICR strain mice	0.3 g/kg/day	Antioxidant effect	[61]
Hibiscus sabdariffa and *Zingiber officinale*	L-NAME induced hypertensive rats	*Hibiscus* sabdariffa (250 mg/Kg) and *Zingiber* officinale (75 mg/Kg)	Blockage of voltage-gated Ca2+ channels	[62]
Coffea arabica	Spontaneously hypertensive rats	140 mg/kg	Nitric oxide-mediated vasodilation	[63]
Acorus calamus L.	NaCl induced HTN	10, 50 mg/kg	Ca2+ antagonism, in addition to nitric oxide, mediates vasodilation	[64]
Bredemeyera floribunda Willd.	NaCl induced HTN	20-80 mg/kg	Diuretic activity	[65]
Sclerocarya birrea A.	NaCl induced HTN	10^{-7} to 10^{-5} mg/ml	Nitric oxide level increases, and the intracellular Ca2+ level decreases	[66]
Vitis vinifera	Pre-hypertensive rats	4 mg/kg/day for 6 months	Nitric oxide-dependent vasodilation	[67]

Table 2. Continued...

Herbal Source	*In vitro* / *In vivo* / Clinical	Dose used	Mechanism of Action	References
Boletus aestivalis (Paulet)	Spontaneously hypertensive rats	77 mg/kg	Convert angiotensin I to angiotensin II and activate it	[68]
Crocus sativus	Normotensive rats and Desoxycorticosterone acetate-induced hypertensive rats	2.5, 5 and 10 mg/kg	The ability of the vas deferens to contract in response to the hormone epinephrine is diminished or weakened	[69]
Parinari curatellifolia Planch.	*Zootoxin* induced HTN	1 mg/ml	Release of vasoactive amines and the inhibition or interference with the action of acetylcholine in the nervous system	[70]
Chromolaena odorata (L.)	High salt diet in rats	100, 200 mg/kg	Enhancing vascular function leads to antihypertensive effects	[71]
European olive	N-nitro-arginine methyl ester induced HTN	50 mg/kg	Oleuropein collaborates synergistically with other compounds, exhibiting antioxidant, ACE inhibitory, and potentially Ca2+ channel blocking effects.	[72]
Lycoris radiata Herb.	Surgical occlusion of the femoral artery or vein, resulting in increased blood pressure in rats and dogs	10-40 mg/kg	α-adrenergic blocking activity Vasodepressin-like action of licorenine	[73]
Ferula foetida (Bunge) Regel	Corticosteroid-induced HTN	200/400 /800 mg/kg	Elevated total peripheral resistance and hemodynamic alterations were observed, along with heightened sympathetic and renin-angiotensin system functions.	[74]
Pleurotus tuberregium	Salt-rich diet in monkeys	100-200 mg/kg	Lowers intraocular pressure in monkeys	[75]
Tinospora crispa	NaCl induced HTN	1-100 mg/kg	β2-antagonists	[76]
Juglans regia L.	NaCl induced HTN	5,15,45 mg/kg	Artery muscle relaxation by acting on the Renin-angiotensin system	[77]
Ashwagandha	Epinephrine induced HTN	120, 240 mg/kg	NO-mediated response	[78]
Teucrium polium L.	Physiological saline induced HTN	20, 40, 80 mg/kg	Causes relaxation and dilation in smooth muscle cells	[79]
Tridax procumbens	High sodium chloride food in rats	150-200 mg/kg	Alteration of SBP and pulse pressure	[80]
Salvia miltiorrhiza Bunge.	NaCl induced HTN	0.7-175 mg/kg	Tanshinones induced relaxation in isolated coronary arteries	[81]
Camellia sinensis	Phenylephrine induced HTN	0.3-1.2 mg/ml	Blockage of α1-adrenergic receptors	[82]

9. Conclusion

The increasing occurrence of SCAs among young adults in India demands urgent attention and a thorough understanding. Comprehending the complexities of CAs involves acknowledging the interaction of lifestyle factors, genetic predispositions, and environmental stressors. From sedentary lifestyles and poor dietary habits to genetic susceptibilities and psychological stressors, various factors contribute to heightened risk among the youth population. Furthermore, epidemiological trends indicate concerning patterns, with coronary heart disease emerging as a primary cause of sudden deaths, especially among older individuals. However, among younger demographics, cardiomyopathies, coronary artery anomalies, and primary arrhythmias gain prominence. Efficient management and prevention strategies require a multifaceted approach, incorporating risk factor management, early detection, prompt intervention,

lifestyle modifications, medication, and education. Empowering individuals with knowledge and skills to recognise symptoms of CA and administer immediate aid through CPR and defibrillation is crucial for saving lives. Additionally, further research is imperative to refine our understanding of CAs among young people, evaluate the effectiveness of screening programs, and develop targeted intervention strategies. By delving deeper into the underlying processes and triggers of SCAs, high-risk individuals can be identified, and preventative measures implemented to alleviate the burden of this critical health issue. Concerted efforts towards proactive measures, heightened health awareness, and informed policy initiatives are essential to safeguard the cardiovascular well-being of India's youth and reduce the incidence of SCAs in this vulnerable population. A comprehensive strategy encompassing risk factor management, early identification, immediate intervention, lifestyle changes, and education is crucial for managing and preventing CA. Moreover, the growing number of cases of CA among youth underscores the urgent need for thorough investigation and focused therapies.

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11. Author Contribution

Conceptualization and design: A.M., B.P.; Methodology, formal analysis, investigation, and data curation: MS.; Writing—original draft: MS.; Writing—review, editing, and visualization: MS., A.M., B.P., R.M.; Resources and supervision: MS., A.M., B.P., G.S. All authors have read and agreed to the published version of the manuscript.

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