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REVIEW ARTICLE

An Integrative Review of the Pathogenesis (Samprapti) and Therapeutic Approaches in Hridroga (Heart Diseases)

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ABSTRACT:- Background: Cardiovascular diseases (CVDs) remain among the foremost causes of illness and death across the globe. Although modern medicine has achieved significant progress, challenges persist in prevention, sustained management, and holistic care. Ayurveda, the ancient Indian medical science, provides an in-depth framework for understanding heart ailments (Hridroga) through the principles of Dosha, Dhatu, Srotas, and Samprapti (pathogenesis), emphasizing preventive and therapeutic measures. Objective: This study aims to present an integrative review of the Ayurvedic perspective on the pathogenesis (Samprapti) of Hridroga and to assess therapeutic interventions through both Ayurvedic and biomedical viewpoints, identifying possible areas of convergence for improved management. Methods: A detailed literature review was carried out utilizing classical Ayurvedic scriptures—Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya—along with modern biomedical databases such as PubMed, Scopus, ScienceDirect, Google Scholar, and the AYUSH Research Portal. Search terms included 'Hridroga', 'Heart disease', 'Ayurveda', 'Samprapti', 'Cardiovascular therapy', and 'Integrative cardiology'. The inclusion criteria covered classical Ayurvedic references, experimental and clinical studies on cardiovascular treatment, and integrative research. Collected data were analyzed qualitatively to correlate Ayurvedic theories with modern pathophysiological and therapeutic concepts. Results: Ayurvedic texts describe Hridroga as a complex disorder resulting from vitiation of Vata, Pitta, and Kapha, the accumulation of Ama, and blockage in the Rasa-Rakta Vaha Srotas. Modern scientific findings attribute cardiovascular disorders to factors such as endothelial dysfunction, atherosclerosis, oxidative stress, inflammation, and psychosocial imbalance. Comparative evaluation shows conceptual parallels between both systems. Therapeutic modalities like herbal remedies (Terminalia arjuna, Withania somnifera, Tinospora cordifolia), Panchakarma, Rasayana therapies, and lifestyle

correction demonstrate cardioprotective, antioxidant, and anti-inflammatory benefits. Integrative approaches that unite Ayurvedic and modern therapies have shown enhanced clinical outcomes, risk reduction, and better quality of life. Conclusion: Ayurveda offers a holistic paradigm for understanding and treating Hridroga, complementing modern cardiovascular medicine. Combined Ayurvedic and evidence-based modern strategies can provide a patient-oriented, preventive, and therapeutic framework for CVDs. Future work should emphasize well-designed clinical studies, mechanistic research, and formulation of integrative treatment guidelines to ensure safety and efficacy.

Keywords: Hridroga, Ayurveda, Samprapti, Cardiovascular Disease, Integrative Therapy

INTRODUCTION

Cardiovascular diseases (CVDs) remain among the most critical public health concerns of the modern era. According to the World Health Organization (WHO), approximately 17.9 million deaths occur each year due to CVDs, representing nearly 32% of all global fatalities (1). Of these, heart attacks and strokes account for more than four-fifths of cases. The growing incidence of hypertension, diabetes, obesity, sedentary behaviour, and psychological stress has substantially fuelled the worldwide surge in cardiac disorders. In India as well, the burden is alarmingly high, with heart disease emerging as a principal cause of early death in both urban and rural populations (2). Factors such as rapid urbanization, lifestyle transitions, and dietary imbalances have intensified the issue, bringing younger individuals into the high-risk group.

Modern medical science has made remarkable progress in the diagnosis, treatment, and management of cardiac ailments. The use of pharmacological agents—such as anti-hypertensives, anticoagulants, and statins—along with procedures like angioplasty, bypass surgery, and pacemaker implantation, has significantly reduced mortality (3). Nevertheless, modern cardiology continues to face limitations. Long-term drug therapy can lead to adverse effects, poor adherence, and financial strain (4). Furthermore, the prevailing biomedical model is often disease-centred rather than health-oriented, with limited focus on preventive care, lifestyle modification, and psychosocial well-being (5). These limitations have prompted increasing interest in integrative approaches that unite conventional cardiology with holistic traditions like Ayurveda (6).

1.1 Ayurvedic Perspective on Hridroga

Ayurveda, the ancient Indian medical tradition with a heritage of more than 5000 years, provides a distinctive framework for understanding and managing cardiac diseases. The word *Hridroga* derives from '*Hridaya'* (heart) and '*Roga*' (disease). Foundational Ayurvedic texts such as *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* describe *Hridroga* as a spectrum of heart-related conditions rooted in the vitiation of the three doshas—*Vata*, *Pitta*, and *Kapha* (7).

Acharya Charaka attributes *Hridroga* to aggravated *doshas* obstructing the heart's normal function and disturbing the flow of *Prana Vayu*. He classifies it into five categories based on doshic predominance—*Vataja*, *Pittaja*, *Kaphaja*, *Sannipataja*, and *Krimija Hridroga*—each characterized by distinct symptoms such as pain, burning, heaviness, palpitation, or discomfort caused by infestation (8). *Acharya Sushruta* emphasizes that *Hridroga* compromises the body's central vitality and is linked to improper diet, irregular lifestyle, emotional strain, and suppression of natural urges (9). *Vagbhata*, in *Ashtanga Hridaya*, further elaborates on its *Samprapti* (pathogenesis), noting the roles of *doshic* imbalance, *Rasa-Rakta Dhatu Dushti*, and *Srotorodha* (blockage of channels) (10).

Ayurveda's explanation of *Samprapti* is multidimensional, encompassing physical, mental, and lifestyle aspects. Psychological factors like stress and grief are recognized as triggers, reflecting Ayurveda's psychosomatic viewpoint (11). The system perceives *Hridroga* not as a localized cardiac issue but as a systemic imbalance caused by impaired digestion (*Agnimandya*), disrupted tissue metabolism, and unhealthy lifestyle patterns that ultimately lead to cardiac dysfunction.

1.2 Samprapti (Pathogenesis) of *Hridroga*

In Ayurveda, *Samprapti*—the process by which disease develops—is a cornerstone of diagnosis and treatment. It represents a sequential progression from the causative factors (*Hetu*) to full symptom expression (12). *Nidana* -Causative Factors (13), *Dosha Prakopa* -Aggravation of *Doshas* (14), *Dushya Dushti* -Vitiation of *Dhatus* (15), *Srotodushti* -Channel Obstruction (16) and *Vyakti* –Manifestation (17) unfolds for the pathogenesis.

This sequence parallels modern descriptions of atherosclerosis, hypertension, and ischemia, which also involve obstruction, degeneration, and imbalance (18, 19). Thus, Ayurveda provides a complementary framework that aligns conceptually with modern cardio-pathology.

1.3 Therapeutic Approaches in Ayurveda

Management of *Hridroga* in Ayurveda is holistic and multifaceted, involving diet, lifestyle, medication, detoxification, and rejuvenation (20, 21, 22, 23, 24).

These Ayurvedic principles correspond closely to modern preventive cardiology, where dietary control, regular exercise, and stress reduction complement pharmacological management.

1.4 Need for Integrative Approaches

While contemporary cardiology excels in emergency care and surgical management, Ayurveda focuses on prevention, root-cause correction, and lifestyle optimization. Integrating these disciplines can create a more comprehensive cardiac care model (25, 26, 27). Hence, blending Ayurvedic therapies with modern diagnostic and interventional tools can fill critical gaps in managing chronic and lifestyle-related cardiac disorders.

1.5 Rationale of the Present Review

Despite the vast Ayurvedic corpus and growing global research, Hridroga remains underexplored from an integrative cardiology standpoint. Although numerous clinical studies demonstrate the efficacy of specific herbs and therapies, comprehensive reviews correlating Ayurvedic Samprapti with modern cardiac pathophysiology are limited. Moreover, systematic evaluation of integrative therapies is necessary to substantiate their relevance in contemporary healthcare.

1.6. The present review, therefore, aims to:

1. Analyze the classical Ayurvedic interpretation of *Hridroga*, focusing on its *Samprapti*.

2. Correlate Ayurvedic insights with current biomedical concepts of cardiac pathology.

3. Explore integrative therapeutic models combining Ayurvedic and modern cardiological approaches.

4. Identify future directions for research, clinical trials, and interdisciplinary collaboration.

In conclusion, cardiovascular diseases continue to escalate globally, necessitating strategies that transcend conventional treatment paradigms. Ayurveda provides a holistic, time-tested system for understanding and managing *Hridroga*, emphasizing *doshic* harmony, digestive health, lifestyle balance, and the mind-body nexus. By analysing *Samprapti* and evaluating integrative interventions, this review aspires to broaden the scientific understanding of cardiac disorders and contribute to the development of patient-centred, evidence-based integrative models for cardiac care.

METHODOLOGY

This research was structured as a combined narrative and systematic review to investigate the Ayurvedic perspective of *Hridroga* (heart diseases) with a particular focus on *Samprapti* (pathogenesis). It further aimed to evaluate integrative therapeutic modalities by correlating traditional Ayurvedic

principles with recent advancements in modern cardiology.

2.1. The study methodology comprised three principal phases:

(a) collection of pertinent information from classical Ayurvedic texts and authoritative commentaries;

(b) systematic exploration and review of contemporary biomedical literature related to cardiovascular disorders; and

(c) synthesis of the gathered evidence into a comprehensive integrative framework.

2.2. Data Sources

Classical Ayurvedic Literature: Foundational Ayurvedic treatises such as *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, and *Madhava Nidana*, along with other canonical works, were analyzed for descriptions concerning *Hridroga*, its causative factors, *Samprapti*, clinical manifestations, and therapeutic guidelines. Explanatory commentaries by scholars, including *Chakrapanidatta*, *Dalhana*, and *Arunadatta* were also critically examined (28).

Modern Scientific Databases: Contemporary biomedical research was sourced from digital repositories including PubMed, Scopus, Google Scholar, ScienceDirect, AYUSH Research Portal, and the Web of Science. Search terms encompassed '*Hridroga*', 'Ayurveda and heart disease', '*Samprapti of Hridroga'*, 'cardiovascular disease pathogenesis', 'Ayurvedic cardiology', 'Arjuna in heart disease', 'integrative cardiology', and 'Ayurveda and cardiovascular health'. Both preclinical and clinical investigations were incorporated into the review.

2.3. Search Strategy

Timeframe: Studies published between January 2000 and June 2025 were included to ensure coverage of contemporary research, while select earlier landmark studies were reviewed when necessary.

Language: Only literature available in English and Sanskrit was considered.

Search Filters: Included human-based studies, clinical trials, observational research, experimental models, review papers, and case reports addressing Ayurvedic or integrative cardiac interventions.

2.4. Inclusion Criteria

Classical Ayurvedic references detailing *Hridroga*, its types, etiopathogenesis, and treatment modalities.

Clinical or experimental research assessing Ayurvedic drugs, formulations, or therapeutic procedures related to cardiac health.

Studies focusing on integrative approaches combining Ayurveda and modern cardiology.

Review papers exploring the interdisciplinary connection between Ayurveda and cardiovascular science.

2.5. Exclusion Criteria

Research unrelated to cardiovascular disorders.

Publications lacking full text or adequate methodological transparency.

Anecdotal reports with insufficient scientific substantiation.

Non-peer-reviewed materials of questionable authenticity.

2.6. Data Extraction and Analysis

Information from Ayurvedic literature was manually extracted, translated when necessary, and organized under key parameters such as *Nidana* (causative factors), *Samprapti* (pathogenesis), *Lakshana* (clinical features), and *Chikitsa* (treatment guidelines).

Modern scientific studies were reviewed and categorized based on their nature (clinical, observational, or experimental), type of intervention, measured outcomes, and their alignment with Ayurvedic principles.

Integrative findings were synthesized thematically by aligning Ayurvedic explanations of *Samprapti* with modern biomedical models of disease mechanisms, including atherosclerosis, hypertension, and ischemic heart disease. Therapeutic modalities were classified under Ayurvedic (dietary regimen, lifestyle practices, herbal medication, *Panchakarma*, *Rasayana*) and

modern domains (pharmacological, lifestyle modification, and interventional) to identify synergistic potentials.

2.7. Quality Assessment

To ensure scientific rigor, methodological quality was assessed as follows:

• Clinical research: evaluated using the CONSORT (Consolidated Standards of Reporting Trials) criteria (29).

• Review articles: verified through the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (30).

• Ayurvedic sources: authenticated via cross-referencing multiple classical texts and authoritative commentaries.

2.8. Synthesis Approach

Given the diversity of data sources, qualitative synthesis was prioritized over quantitative analysis. A thematic framework was established correlating Ayurvedic *Samprapti* with modern pathophysiological insights. Likewise, therapeutic strategies were systematically categorized into preventive, promotive, and curative domains to elucidate areas of convergence between traditional and contemporary medicine.

RESULTS

The literature reviewed for this study provided substantial insights into the pathogenesis (*Samprapti*) of *Hridroga* as described in Ayurveda, and its parallel understanding in modern cardiovascular medicine. Evidence on therapeutic modalities further demonstrated the potential benefits of Ayurvedic, modern, and integrative approaches. The findings are presented thematically under seven key domains.

3.1. Ayurvedic conceptualization of *Hridroga*

A detailed review of classical Ayurvedic texts—including *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, *Madhava Nidana*, and *Yoga Ratnakara*—revealed that *Hridroga* is a well-recognized clinical entity (31). The term *Hridroga* literally translates to 'disease of the heart,' where *Hridaya* represents both a vital organ and the seat of consciousness, mind, and *Prana*. The heart is considered one of the three principal *Marmas* (vital spots), whose disturbance can lead to severe consequences or death.

According to *Sushruta*, five main types of *Hridroga* are described, based on *Dosha* predominance (32):

• *Vataja Hridroga* – chest pain, palpitations, restlessness, irregular pulse.

• *Pittaja Hridroga* – burning sensations, excessive thirst, fever, fainting, yellowish discoloration.

• *Kaphaja Hridroga* – heaviness, stiffness, drowsiness, excessive salivation.

• *Tridoshaja Hridroga* – severe, often refractory, arising from combined vitiation of all three *Doshas*.

• *Krimija Hridroga* – caused by parasites or pathogenic organisms, less frequently reported clinically.

3. 2. *Samprapti* (Pathogenesis)

Ayurveda emphasizes that improper diet (*Ahara*), faulty lifestyle (*Vihara*), and psychological stress (*Manasika Nidanas*) aggravate the *Doshas* (33). These imbalanced *Doshas* affect the *Hridaya*, obstructing the *Rasa–Rakta Vaha Srotas* (circulatory channels). The resultant *Srotorodha* (channel obstruction), *Dhatukshaya* (tissue degeneration), and *Ama* accumulation (toxic metabolites) collectively impair cardiac function.

Ayurveda integrates both physical and psychological factors, highlighting that disturbances in mental faculties—such as anger (*Krodha*), grief (*Shoka*), and fear (*Bhaya*)—directly contribute to *Hridroga* (34). This psychosomatic perspective offers a holistic explanation of cardiovascular disorders.

3. 3. Modern Understanding of Cardiovascular Pathogenesis

Contemporary biomedical research identifies cardiovascular diseases (CVDs) as a leading cause of global morbidity and mortality (35). Atherosclerosis underpins ischemic heart disease, stroke, and peripheral vascular disease. Key pathological processes include:

• Endothelial Dysfunction: Chronic stress, hypertension, and metabolic disorders impair endothelial function, initiating plaque formation (36).

• Inflammation: Persistent low-grade inflammation promotes lipid deposition, foam cell formation, and plaque progression (37).

• Oxidative Stress: Free radicals contribute to vascular injury, platelet aggregation, and myocardial damage (38).

• Metabolic Syndrome: Obesity, diabetes, and dyslipidemia accelerate cardiac disease progression (39).

• Psychosocial Stress: Anxiety, depression, and chronic stress are strongly associated with cardiovascular morbidity (40).

These findings correspond closely to Ayurvedic concepts of *Ama*, *Avarana* (obstruction), and *Manasika Nidanas*, suggesting that ancient insights anticipated mechanisms now validated by modern research.

3. 4. Integrative Mapping of *Samprapti* and Modern Pathogenesis

Thematic synthesis revealed significant conceptual overlap between Ayurveda and modern medicine (41):

• *Vata vitiation* - palpitations, arrhythmias, ischemic pain (angina)

• *Pitta vitiation* - inflammation, myocarditis, vasculitis, fever-related cardiac issues

• *Kapha vitiation* - lipid accumulation, atherosclerosis, obesity-related cardiac problems

•*Ama* and *Avarana* - endothelial dysfunction, plaque deposition, metabolic residues

•*Dhatukshaya* - myocardial weakening, chronic heart failure

This mapping highlights that Ayurveda provides a systemic, functional framework, while modern medicine elucidates detailed mechanisms; together, they form a comprehensive model of cardiovascular pathology.

3. 5. Ayurvedic Therapeutic Approaches

Dietary Management (*Ahara)*: Heart-friendly diet emphasizing easily digestible foods, avoidance of heavy, oily, or excessively sour meals, and inclusion of *Hridya dravyas* such as garlic, pomegranate, and honey. Arjuna (*Terminalia arjuna*) is particularly noted for cardio-protective properties (42).

Lifestyle (*Vihara*): Balanced lifestyle practices include regulated sleep, moderated exertion, stress management, yoga, and adherence to daily routines (*Dinacharya*) (43).

Herbal Interventions (*Aushadhi*):

• *Terminalia arjuna* – cardiotonic, antioxidant, antihypertensive (44)

• *Boerhavia diffusa* – diuretic, anti-inflammatory (45)

• *Withania somnifera* – adaptogenic, anti-stress (46)

• *Tinospora cordifolia* – immunomodulatory, antioxidant (47)

• *Tribulus terrestris* – diuretic, cardioprotective (48)

Classical formulations validated by modern studies include *Arjuna Ksheerapaka, Hridayarnava Rasa, Pushkaramooladi Yoga,* and *Sarpagandhadi Yoga* (49).

Panchakarma Therapies: *Hridaya Basti, Abhyanga, Swedana*, and *Nasya* enhance circulation, reduce stress, and strengthen cardiac function (50).

Rasayana Therapy: Rejuvenative herbs such as *Amalaki, Guduchi, Ashwagandha*, and *Shatavari* promote cardiac longevity and restore tissue vitality (51).

3. 6. Modern and Integrative Evidence on Therapeutics

• Clinical Trials: *Terminalia arjuna* significantly improved angina symptoms, left ventricular ejection fraction, and lipid profiles (52).

• Experimental Studies: Animal research confirmed cardioprotective, anti-atherosclerotic, and antihypertensive properties of Ayurvedic herbs (53).

• Integrative Studies: Combined interventions of Ayurvedic herbs with yoga and meditation reduced blood pressure, improved autonomic balance, and enhanced quality of life (54).

• Comparative Effectiveness: Ayurvedic adjuvant therapy with modern cardiology resulted in superior symptom control and reduced recurrence of cardiac events compared to conventional treatment alone (55).

3.7. Safety and Tolerability

Ayurvedic therapies were generally safe under proper clinical supervision (56). No severe adverse effects were reported in trials of *Arjuna* or other herbal regimens. Minor gastrointestinal discomfort or constipation occurred in some cases but resolved with dose adjustments. *Panchakarma* procedures were well-tolerated and contributed to overall well-being.

3. 8. Overall Synthesis of Findings

• Ayurvedic Conceptualization Validated: Ancient descriptions of *Hridroga* align with modern cardiovascular disease concepts, especially regarding risk factors, psychosomatic involvement, and systemic manifestations.

• Therapeutic Convergence: Ayurvedic interventions, including *Arjuna*, *Panchakarma*, and *Rasayana* therapy, demonstrate effectiveness in improving cardiac function, reducing risk factors, and enhancing quality of life.

• Integrative Potential: Combining Ayurvedic principles with evidence-based modern cardiology offers a comprehensive, patient-centered approach that emphasizes both prevention and holistic management of cardiovascular diseases.

DISCUSSION

The present review explored the concept of *Hridroga* (heart diseases) through the lens of *Ayurvedic Samprapti* (pathogenesis) and compared it with modern biomedical understanding of cardiovascular disorders. Therapeutic approaches from both systems were examined to identify potential integrative strategies. The synthesis of findings reveals several key insights.

4. 1. Convergence of Ayurvedic and Modern Perspectives on Pathogenesis

Ayurvedic descriptions of *Hridroga* highlight the involvement of vitiated *Doshas*—particularly *Vata*, *Pitta*, and *Kapha*—acting on the *Hridaya* and obstructing the *Rasa–Rakta Vaha Srotas* (circulatory channels). This conceptualization closely parallels modern understandings of endothelial dysfunction, atherosclerosis, oxidative stress, and chronic low-grade inflammation (57).

• *Vata* vitiation manifests as palpitations, arrhythmias, and chest pain, aligning with ischemic heart disease and autonomic dysregulation.

• *Pitta* vitiation corresponds to inflammatory processes such as myocarditis, vasculitis, and hypermetabolic cardiac conditions.

• *Kapha* vitiation aligns with atherosclerosis, lipid accumulation, obesity, and sluggish circulation.

•*Ama* and *Avarana* map onto metabolic toxins, plaque deposition, and impaired vascular function.

This convergence suggests that Ayurveda, while based on functional and holistic models, had identified the systemic and multifactorial nature of cardiac diseases centuries ago. Modern cardiology adds mechanistic clarity, and an integrative interpretation of both systems provides a comprehensive framework for understanding cardiovascular pathogenesis.

4. 2. Holistic Risk Factor Identification

Both systems recognize psychosocial and lifestyle contributors to heart disease. Ayurveda emphasizes *Manasika Nidanas* (mental causative factors) such as anger (*Krodha*), grief (*Shoka*), anxiety (*Chinta*), and fear (*Bhaya*), while contemporary research identifies psychosocial stress, depression, and anxiety as independent cardiovascular risk factors (58).

This underscores Ayurveda's preventive orientation. Unlike modern cardiology, which often intervenes after disease onset, Ayurveda emphasizes early lifestyle correction, stress management, and dietary

regulation, resonating with modern concepts of 'primordial prevention.'

4.3. Therapeutic Insights from Ayurveda

Ayurvedic management of Hridroga encompasses dietary measures (*Ahara*), lifestyle interventions (*Vihara*), herbal drugs (*Aushadhi*), *Panchakarma* procedures, and *Rasayana* therapies.

4.3.1 Herbal Interventions

Terminalia arjuna emerged as the most studied cardioprotective agent. Clinical trials demonstrated improvements in angina symptoms, left ventricular function, and lipid profiles (59). Other herbs such as *Withania somnifera*, *Boerhavia diffusa*, *Tinospora cordifolia*, and *Tribulus terrestris* exert antihypertensive, antioxidant, diuretic, and adaptogenic effects (60).

Despite these promising findings, limitations such as small sample sizes, heterogeneous formulations, and study design issues necessitate more rigorous clinical trials.

4.3.2 Panchakarma and External Therapies

Procedures such as *Hridaya Basti*, *Abhyanga*, and *Swedana* target both local cardiac function and systemic balance. Mechanistically, these therapies improve circulation, activate the parasympathetic nervous system, reduce sympathetic over activity, and enhance stress resilience (61). Emerging studies indicate benefits in lowering blood pressure and improving autonomic regulation.

4.3.3 *Rasayana* Therapy

Rasayana formulations, including *Amalaki* and *Guduchi*, offer systemic rejuvenation and antioxidant effects. These therapies may enhance mitochondrial function, prevent oxidative stress, and support endothelial repair, reflecting Ayurveda's long-term vision for maintaining cardiac resilience beyond acute symptom management (62).

4.3.4. Integrative Approaches: The Way Forward

Integrative strategies combining Ayurvedic therapies with evidence-based modern cardiology appear superior to either system alone (63). For example:

• *Arjuna* combined with standard anti-anginal therapy reduced chest pain more effectively than modern drugs alone.

• Yoga, meditation, and stress management improved heart rate variability and reduced blood pressure in hypertensive patients.

• Dietary regimens emphasizing whole foods and plant-based nutrition align with both Ayurvedic recommendations and modern preventive cardiology guidelines.

These findings suggest that integrative approaches complement rather than replace conventional cardiology. While modern medicine excels in acute and emergency care, Ayurveda provides preventive, restorative, and holistic strategies for long-term management.

4.3.5. Safety Considerations

Ayurvedic drugs and therapies, when used judiciously under clinical supervision, are generally well tolerated (64). *Arjuna* bark extract, for instance, has minimal adverse events. *Panchakarma* therapies are safe when performed by trained practitioners.

However, challenges remain due to lack of standardized formulations, dosage variability, and occasional reports of adulteration or heavy metal contamination. Integrative protocols must prioritize standardization, monitoring, and regulatory oversight to ensure safety and efficacy.

4.3. 6. Limitations of Current Evidence

Despite promising results, several limitations exist:

• Heterogeneity of Studies: Many Ayurvedic trials are small, open-label, or lack placebo control (65).

• Standardization Issues: Variations in dosage, preparation, and formulation complicate reproducibility (66).

• Mechanistic Research Gaps: Biochemical pathways influenced by Ayurvedic interventions remain underexplored (67).

• Integration Challenges: Awareness, interdisciplinary collaboration, and standardized guidelines are limited (68).

4.3.7. Future Directions

To address these gaps, the following are recommended:

• Conduct large-scale, randomized trials on Ayurvedic formulations (*Arjuna*, *Rasayana* therapies) using standardized protocols (69).

• Undertake mechanistic studies exploring molecular effects on inflammation, oxidative stress, lipid metabolism, and autonomic regulation (70).

• Incorporate Ayurveda's lifestyle, dietary, and stress management strategies into preventive cardiology models and public health programs (71).

• Develop collaborative integrative guidelines combining Ayurvedic and modern cardiology expertise (72).

• Strengthen pharmacovigilance, quality assurance, and standardization of Ayurvedic drugs (73).

4.3.8. Broader Implications

This review highlights Ayurveda's potential to not only provide therapeutic alternatives but also reshape our conceptualization of cardiac health. Its emphasis on balance, systemic harmony, and psychosomatic integration complements the reductionist approach of modern medicine.

The broader implication is the development of a patient-centered, preventive, and holistic cardiology paradigm—addressing dietary, psychological, and lifestyle factors alongside pharmacological and surgical interventions.

In conclusion, Ayurveda's *Samprapti* of *Hridroga* aligns closely with modern cardiovascular pathogenesis, offering complementary insights into causation and progression. Classical therapeutic approaches, validated by contemporary studies, demonstrate potential for both prevention and management. With rigorous research, regulatory support, and interdisciplinary collaboration, integrative cardiology, combining Ayurveda and modern medicine, can play a transformative role in addressing the global burden of cardiovascular diseases.

CONCLUSION

Cardiovascular diseases remain a major global health concern, contributing to substantial morbidity and mortality, despite significant advances in modern medical interventions. This review highlights that the Ayurvedic concept of *Hridroga*, with its comprehensive exposition of *Samprapti* (pathogenesis), symptomatology, and therapeutic principles, offers a holistic and preventive paradigm that effectively complements contemporary cardiology.

The comparative evaluation underscores several critical observations: the Ayurvedic understanding of *Hridroga*, characterized by the vitiation of *Vata*, *Pitta*, and *Kapha*, accumulation of *Ama*, and obstruction of the *Rasa–Rakta Vaha Srotas*, mirrors modern pathophysiological mechanisms such as endothelial dysfunction, chronic inflammation, oxidative stress, and metabolic derangements. From a therapeutic standpoint, Ayurvedic interventions—including specific herbal formulations (notably *Terminalia arjuna*), *Panchakarma* procedures, *Rasayana* therapies, and lifestyle modifications—exhibit cardio-protective, antioxidant, and anti-inflammatory properties, many of which have been corroborated through contemporary experimental and clinical studies (74).

Crucially, an integrative strategy that combines traditional Ayurvedic knowledge with evidence-based modern treatments presents a promising avenue for enhanced prevention, management, and long-term cardiovascular wellness. Central to this approach are lifestyle regulation, individualized therapy, and psychosocial interventions, which collectively address both the physiological and psychological dimensions of heart diseases (75).

Despite encouraging findings, challenges persist, including the need for standardized formulations, methodological robustness, and mechanistic validation of therapeutic effects. Future research should emphasize large-scale randomized clinical trials, mechanistic investigations, and the formulation of integrative guidelines to ensure the safe and effective implementation of Ayurvedic therapies in modern cardiovascular care (76).

In summary, Ayurveda offers profound insights into the etiology and management of heart diseases, and its integration with contemporary cardiology can facilitate a comprehensive, patient-centered, and preventive model of care. Such a synergistic approach has the potential to optimize clinical outcomes, improve patient quality of life, and address the escalating global burden of cardiovascular diseases sustainably and holistically.

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