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A Scoping Review on Ayurvedic Understanding and Interventions in Cardiac Care: Insights from the MEDLINE Database

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KEYWORDS

Cardiac care, complementary therapies, scoping review.

ABSTRACT:

Background: Ayurvedic interventions in cardiac care present an intriguing complementary approach to conventional treatments. This scoping review evaluates the effectiveness of Ayurveda-based therapies in managing cardiac conditions, utilizing the PICO framework to structure the analysis of studies sourced from the Medline Database.

Objectives: The primary objective of this review is to assess the potential of Ayurvedic therapies in improving cardiac health outcomes. It aims to determine their impact on cardiac function, symptom relief, and overall quality of life when used alongside or compared to conventional treatments.

Eligibility Criteria: The inclusion criteria for studies were: empirical research focusing on Ayurvedic interventions for cardiac care, studies involving cardiac patients as the primary population, research comparing Ayurvedic therapies with conventional treatments, studies reporting measurable cardiac health indicators as outcomes. Sources of Evidence: a scoping search was conducted in the Medline Database up to 12th June 2024, 16:00 HRS. A total of 394 studies were identified and reviewed based on predefined inclusion criteria.

Charting Methods: the review followed a structured approach: Data extraction and quality assessment were performed using standard methodologies, The studies were classified based on intervention type, population characteristics, and reported outcomes, heterogeneity in study design, intervention protocols, and outcome measures was noted.

Results: The analysis covered 394 studies, identifying key Ayurvedic interventions such as: Ayurvedic drugs (e.g., *Arjuna, Ashwagandha, and Brahmi*), dietary modifications (Ayurvedic nutrition and cardioprotective foods), Lifestyle changes (daily regimens aligned with Ayurvedic principles), *Rasayana* (rejuvenation) therapies, Yoga and meditation (as adjunct therapies for cardiac health). Most studies reported positive effects of Ayurvedic interventions, including: improvement in cardiac function, symptom relief (e.g., reduced hypertension, improved circulation), enhanced quality of life in cardiac patients. However, variability in study design limited direct comparability across studies. Differences in intervention protocols, patient populations, and outcome measures posed challenges in drawing firm conclusions.

Conclusions: This review suggests that Ayurvedic interventions hold promising potential as complementary therapies for cardiac patients and to highlight the need for assessing Ayurvedic understanding for future empirical support. Furthermore, there is a need to evaluate the depth of Ayurvedic theoretical alignment in existing studies to ensure that future research not only demonstrates clinical efficacy but also adheres to classical Ayurvedic principles, thereby strengthening the empirical foundation of Ayurveda-based cardiac care.

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1. Introduction

Rationale: Cardiovascular diseases (CVDs) are the leading cause of mortality worldwide, accounting for an estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke. Over three quarters of CVD deaths take place in low- and middle-income countries. Out of the 17 million premature deaths (under the age of 70) due to noncommunicable diseases in 2019, 38% were caused by CVDs. **[1]**, which highlights the need for effective interventions. Conventional treatments, including pharmaceuticals, lifestyle modifications, and surgical procedures, are the primary strategies for CVD management. However, there is growing interest in integrative approaches, including Ayurvedic therapies, to enhance treatment outcomes. Ayurveda, has long emphasized Ayurvedic formulations, dietary interventions, lifestyle modifications, and *Rasayana* (rejuvenation) therapies for heart health. Classical Ayurvedic texts mention numerous *Hrudya* (cardioprotective) drugs such as *Terminalia arjuna, Brahma Rasayana, Chyawanprash, and Withania somnifera,* which have shown potential in preclinical and clinical studies. However, scientific validation of Ayurvedic interventions for cardiac care remains limited, with most existing studies being heterogeneous in methodology, sample size, and outcome measures.

2. Objectives:

The primary objective of this review is to assess the effectiveness/ potential/ role of Ayurvedic therapies in improving cardiac health outcomes. It aims to determine their impact on cardiac function, symptom relief, and overall quality of life when used alongside or compared to conventional treatments. Given the complexity and variability in the research on Ayurvedic interventions for CVDs, a scoping review is the most appropriate method for mapping the existing literature, identifying research gaps, and guiding future studies. Unlike a systematic review, which focuses on specific research questions and quantitative synthesis, a scoping review aims to: Identify the breadth of research on Ayurvedic interventions in cardiac care, Analyse the diversity of study designs (pre-clinical, clinical, and observational), Summarize key Ayurvedic interventions used in different cardiac conditions, Highlight knowledge and evidence gaps in current research, and Evaluate the extent to which existing studies incorporate authentic Ayurvedic diagnostic frameworks and therapeutic rationale, thereby enabling more robust empirical support for future integrative research. By adopting the PICO framework Population (cardiac patients), Intervention (Ayurvedic therapies), Comparison (conventional treatments or placebo), and Outcome (cardiac health indicators) this scoping review ensures a structured analysis of the available evidence. The review questions focus on the effectiveness of Ayurvedic interventions in managing CVDs, the mechanisms of action of Ayurvedic herbs and formulations, the comparative efficacy of Ayurveda vs. conventional treatments, and the integration of Ayurvedic practices into modern cardiac care. Given the variability in study methodologies and the lack of standardized Ayurvedic treatment protocols, a scoping review allows a broad and exploratory assessment of existing literature while identifying areas where more rigorous research is needed. Ayurvedic interventions in cardiac care may offer an intriguing approach to complementing conventional treatment modalities. This scoping review evaluates the effectiveness of Ayurvedic interventions in managing cardiac conditions, utilizing the PICO framework to structure the review of studies sourced from the Medline Database. This scoping review also focuses on the prevalence of potential risk factors of cardiovascular diseases as a global public health concern. Furthermore, the study aims to draw attention to the need for health practitioners to ensure early interventions to prevent cardiovascular disease. In addition, it underscores the importance of critically evaluating the Ayurvedic rationale, diagnostic basis, and alignment with classical principles in already published studies, to ensure that future empirical research builds upon a foundation that is both scientifically sound and authentically Ayurvedic principles.

3. Materials

Study eligibility criteria: The review included published papers covering a population with existing cardiovascular disease with different atherosclerosis risk factors during the literature search. All the abstracts were reviewed, and the selection of articles was made by the following eligibility criteria. This scoping review included animal, cell line and clinical studies that evaluated major risk factors and efficacy of ayurvedic herbs associated with cardiovascular disease. The selected language was English for all the research articles, and each gender was given priority. Duplicate articles and papers with incomplete information, were excluded from the study.

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Study selection: The search strategy for this study involved retrieving data exclusively from the PUBMED database using a combination of keywords and Medical Subject Headings (MeSH) terms. Boolean operators were applied to refine the search process, ensuring relevant literature was identified. The initial search yielded 394 publications from the existing literature based on the predefined eligibility criteria. A thorough screening of titles and abstracts was conducted, narrowing down the selection to 43 studies that met the study's inclusion criteria. Following this, a further assessment was performed, leading to the exclusion of 5 studies that did not meet the required outcome of interest and 13 studies due to the unavailability of full-text access. Consequently, 25 articles were included in this study, and data were extracted using structured data extraction sheets specifically designed for this research. Data extraction and quality assessment were performed using standard methods. The flow chart of review process mentioned in below [**Table-1**].

Table-1: The flow chart of review process

The keywords or MeSH (Medical Subject Headings) used during search	Total articles found (n=394)
1. Cardiac diseases AND ayurveda	1341 1 134
2.Circulation AND ayurveda	28
3. Heart AND ayurveda	141
4. Heart diseases AND ayurveda	91

The literature search included various sources [detailed description in **Table-2**]. MEDLINE via PubMed served as the primary bibliographic database, with searches conducted using MeSH terms. Additional studies were identified through manual screening of reference lists from the included articles. ARD databases were used to search dissertations and theses, following PRISMA guidelines. Preprint sources were explored via Ayurcel.org, although no specific platforms were named. Lastly, the WHO website was consulted to gather global data on cardiovascular disease trends.

Table-2: Information Sources Consulted in the Scoping Review

Source Type	Name	Platform /Interface	Date Last Searched	Coverage
Bibliographic Database	MEDLINE	PubMed	7th June 2024, 16:00 HRS	Primary and only bibliographic database used; search conducted with MeSH terms.
Citation & Reference Lists	Articles included in review	Manual	8th June 2024	Manually screened for additional relevant studies.
Dissertations	ARD Databases	Manual	21st June 2024	Searched for additional references as per PRISMA guidelines.
Preprint Servers	Ayurcel.org	Manual	30th June 2024	Reviewed, but no specific platform mentioned.
Websites	World Health Organization	https://www.who.int	12th July 2024	Accessed for global CVD statistics and trends.

4. Methods

Table-3: Description of articles included in the study

Citation	Intervention	Study Type	Country	Condition Studied	Drug /Protocol	Key Outcomes
Dwivedi S, Aggarwal MP	*Terminalia arjuna*	Clinical trial	India	Angina Pectoris	*T. Arjuna*	Improved anginal frequ

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(1994). **[2]**						ency and lipid profile
Fields JZ et al. (2002). **[3]**	*Maharishi Vedic Medicine*	Pilot Trial	USA	Carotid Atherosclerosis	Meditation, Diet, Exercise	Carotid IMT regression
Malik N et al. (2009). **[4]**	*Terminalia arjuna*	In vitro	India	Coronary Heart Disease	*T. Arjuna*	Antiplatelet effect
Kumar DS, Prabhakar YS (1989). **[5]**	Historical review	Narrative	India	Ayurvedic concept of Heart Disease	Conceptual	Describes Ayurvedic classification and historical aspects
Dwivedi S, Jauhari R (1997). **[6]**	*Terminalia arjuna*	Clinical study	India	Chronic Heart Failure	*T. Arjuna*	Symptomatic improvement
Vaidya AB, Bhatt MA (1999). **[7]**	Chronobiology	Review	India	IHD lifestyle patterns	Ayurvedic insight	Relates lifestyle to IHD incidence
Kumar PU et al. (1999). **[8]**	Tablet Hartone (Terminalia arjuna)	Open Trial	India	Stable Angina	*T. Arjuna*	Safe and effective
AlSuhaibani E et al. (2016). **[9]**	*Brahma Rasayana, Chyawanprash*	Animal study	India	Cardiotoxicity	BRM & CHM	Cardioprotective
Latha R et al. (2014). **[10]**	*Kalpaamrutha*	Animal study	India	Diabetic CVD	*Kalpaamruthaa*	Mitochondrial and metabolic protection
Balkrishna A et al. (2020). **[11]**	*Yogendra Ras*	Animal study	India	Cardiac Hypertrophy	*Yogendra Ras*	Suppressed hypertrophy
Kokkiripati PK et al. (2013). **[12]**	*Terminalia arjuna*	In vitro	India	Anti-inflammatory study	*T. Arjuna*	Reduced endothelial inflammation
Vaidya AB (1994). **[13]**	*Terminalia arjuna*	Review	India	Cardiovascular therapy	*T. Arjuna*	Traditional-modern link
Jagtap CY et al. (2024). **[14]**	*Hridayarnava Rasa*	Formulation development	India	Not specified	*Hridayarnava Rasa*	Standardization
Kajaria D et al. (2023). **[15]**	Ayurveda protocol	Case report	India	Ventricular Arrhythmia	*Dadimashtaka Churna + Yogendra Ras*	Symptomatic relief
Omobowale TO et al. (2016). **[16]**	*Azadirachta indica*	Animal study	Nigeria	Cardiorenal Dysfunction	*A. indica*	Reduced oxidative stress
Trivedi GY et al. (2021). **[17]**	*Bhramari Pranayama*	Review	India	General Cardiac Health	*Pranayama*	Improved HR and immunity
Murthy AR, Singh RH (1993). **[18]**	*Hridroga concept*	Review	India	Types of Hridroga	Theoretical	Modern correlations of Ayurvedic Hridr

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						oga types
Rani RK et al. (2022). **[19]**	*Rasadhatudushti scale*	Mixed-method	India	CVD risk	Construct validation	Relevant to CVD risk
Mamgain P, Singh RH. **[20]**	IHD in Ayurveda	Review	India	Ischemic Heart Disease	Multiple Ayurvedic drugs	Risk factors and clinical features
Sharma SD et al. (1986). **[21]**	*Pushkar Guggulu*	Clinical study	India	Ischemic Heart Disease	*Pushkar Guggulu*	84% improvement in cases
Upadhyay OP et al. (1993). **[22]**	*Saussurea lappa*	Clinical trial	India	Ischemic Heart Disease	*Kustha (Saussurea lappa)*	Positive response
Leoni A et al. (2018). **[23]**	*Zingiber officinale*	In vitro	Italy	Cardiac tissue parameters	*Z. officinale*	Relaxation effect
Ganapathy R et al. (2018). **[24]**	*Thraatchathi Chooranam*	In vitro	India	Cardiomyocyte damage	TC	Oxidative stress protection
Kaur G et al. (2015). **[25]**	*Withania somnifera*	Animal study	India	Pulmonary Hypertension	*W. somnifera*	Protected against PH
Bidasee KR et al. (2000). **[26]**	*Tectoridins*	In vitro	USA	Cardiac SR channels	Tectoridins from *Vacha*	Interaction with RyR channels
Oberoi L et al. (2011). **[27]**	*Terminalia arjuna*	In vitro	USA	Cardiotonic effect	Aqueous T. Arjuna	Enhanced contractility in myocytes
Maiwulanjiang M et al. (2014). **[28]**	*Nardostachys jatamansi*	In vitro	China	Oxidative cardiomyocyte stress	*N. jatamansi*	Reduced ROS
Chattopadhyay RR (1997). **[29]**	*Azadirachta indica*	Animal study	India	Cardiovascular system	*Neem* extract	Modulated BP and HR
Yarlagadda LC et al. (2023). **[30]**	Post-COVID review	Review	India	Cardiovascular sequelae	Not specified	Discusses myocarditis, post-COVID pathology
Vinay CM et al. (2023). **[31]**	*Tribulus terrestris*	Pharmacology + LC-MS/MS	India	Cardiac diseases	*Tribulus terrestris*	Network pharmacology insights
DuBroff R et al. (2015). **[32]**	Ayurveda therapy	Pilot study	USA	Coronary Heart Disease	Herbs, *Yoga,* Diet	Feasibility and efficacy tested
Miller AL (1998). **[33]**	Botanical review	Review	USA	CVD Botanicals	Crataegus, *Arjuna*, Inula	Therapeutic benefits mentioned
Maulik SK, Talwar KK (2012). **[34]**	*Terminalia arjuna*	Review	India	Cardiovascular disorders	*T. Arjuna*	Summarized modern pharmacological effects
Maulik SK, Katiyar CK (2010) **[35]**	*Terminalia arjuna*	Review	India	Cardiovascular transition	*T. Arjuna*	Traditional to modern medicine

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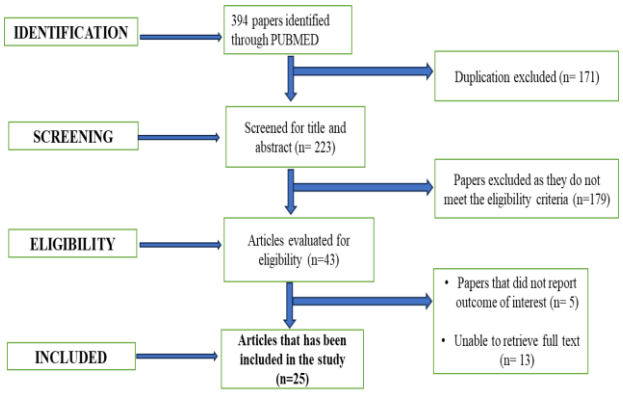
Data collection and analysis: Description of included studies: A total of 394 papers were initially identified through the PUBMED database. After removing 171 duplicates, 223 articles remained for title and abstract screening. Of these, 179 papers were excluded for not meeting the eligibility criteria. The remaining 43 articles underwent full-text evaluation. From this group, 18 articles were excluded—5 for not reporting the outcome of interest and 13 due to unavailability of the full text. Ultimately, 25 studies were included in the final analysis which is mentioned **[Figure-1]** demonstrates a systematic and rigorous selection process to ensure the inclusion of relevant and high-quality studies.

Figure-1: Flow chart of review process



Data items: Detailed description of the domains and criteria used for outcome assessment is mentioned in **Table-4**. In the clinical outcome's domain, data such as blood pressure, lipid profile, ECG/Echo findings, cardiac biomarkers quality of life, and symptom relief were included wherever clearly reported across the 25 selected studies. Priority was given to outcomes directly addressing cardiac health, although time frames were inconsistently reported. In the intervention outcomes domain, variables like LVEF improvement, arterial stiffness, endothelial function, and anti-inflammatory or antioxidant effects were included when statistically significant. Outcomes based on Ayurvedic parameters like *Rasadhatu Dushti* were aligned with modern risk profiles where applicable. The study type included in vitro, animal, clinical, and review-based studies, selected based on empirical strength and relevance under the PICO framework. Variables such as study design, methodology, follow-up, and funding status were considered, and studies with unclear methods were treated as high risk of bias. For population characteristics, most data were drawn from adults aged 30 to 65 with CVD, with limited inclusion of younger populations. Where age or sex was not mentioned, assumptions were made based on standard adult CVD profiles. The Ayurvedic understanding domain involved identifying classical concepts like *Hridroga, Rasadhatu Dushti, Rasayana, and Hrudya Dravyas,* when these terms were not explicitly stated, contextual inference was applied if the drug and disease alignment matched Ayurvedic descriptions.

Table-4: Data Items Extracted from Included Studies.

Study domain	Outcomes sought	Compatible results	Selection Process or Criteria for Outcome Data	Other Variables Sought	Assumptions Made About Missing/ Unclear Data
Clinical Outcomes	Blood Pressure (systolic & diastolic), Lipid Profile, ECG/Echo findings, Cardiac biomarkers (Troponins, CRP, BNP), Quality of Life, Symptom Relief (chest pain, dyspnoea, fatigue)	Yes, wherever reported clearly in included articles (25 studies)	Preference to outcome domains directly addressing cardiac function or health status per PICO. Time frame not uniformly reported across all studies.	Population demographics (age, sex), sample size, disease type, study design, drug/formulation used, dosage, duration, comparator (placebo or standard), mode of administration	If sex/age not mentioned, assumed standard adult age group (30–65). If dosage unclear, derived from standard therapeutic range in classical texts or similar studies.
Intervention Outcomes	LVEF improvement, arterial stiffness, endoth	Yes, when outcomes were statistically	Priority given to those reporting moder	Intervention type (herbal, R*asayana, Panchakarma,*	Unavailable texts were excluded; formulations with unclear

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	elial function, anti-inflammatory or antioxidant parameters	significant or directly measurable	n measurable cardiac parameters. For traditional concepts like *Rasadhatu Dushti*, relevance was matched with modern risk profiles.	*Yoga*), combination with conventional treatment, adherence, setting (clinical/in vitro/animal)	ingredients were not included unless validated from classical references.
Study Type	In vitro, animal, clinical, and review-based data	Partially – depending on methodology and outcome relevance	Included if met empirical evidence criterion and provided sufficient data under PICO	Study design, setting (urban/rural), methodology, follow-up (if any), funding declaration (none found)	For articles with unclear methods, risk of bias was high; some conclusions interpreted cautiously
Population Characteristics	CVD patients (IHD, angina, CHF, etc.), healthy individuals for preventive potential	Yes, but mostly aged 30–65 years; paediatric and young adult data lacking	Studies with participants <30 were largely unavailable; majority male participants	Sex, age, comorbidities (e.g., diabetes, HTN), risk factor profile	If age group not mentioned, assumed adult based on general context. If risk profile ambiguous, defaulted to general CVD risk population
Ayurvedic	Mention of	Partial – most	Classified as	Classical correlatio	Where classical
Understanding	*Hridroga, Rasadhatu Dushti, Rasayana, Hrudya Dravyas,* etc.	studies lacked deep Ayurvedic conceptual correlation	"sufficient" or "insufficient" based on detailed conceptual correlation with Ayurveda	n with Ayurvedic nosology, indication, and treatment protocol	terms were missing, inferred if drug and disease context aligned with Ayurvedic descriptions

Data charting process: The data charting process in this scoping review was conducted using a structured and systematic approach to ensure consistency and accuracy in data extraction across selected studies. Initially, a comprehensive search of the PubMed database using relevant keywords and MeSH terms yielded 394 articles. After removing duplicates and conducting title and abstract screening, 43 studies were shortlisted. From these, 25 studies met the inclusion criteria for full data extraction. Data were charted using specially designed extraction sheets capturing essential variables aligned with the PICO framework: Population, Intervention, Comparison, and Outcome. The extracted data items included study characteristics (author, year, country, study type), population details (age, sex, sample size, comorbidities), types of interventions (Ayurvedic drug, *Rasayana, Panchakarma*, lifestyle interventions like *Yoga* and diet), and reported clinical outcomes (such as blood pressure, lipid profile, LVEF, symptom relief, and quality of life). In addition, specific Ayurvedic concepts like *Hridroga, Rasadhatu Dushti*, and *Rasayana* therapies were noted where mentioned. Outcome data were prioritized based on clarity and relevance to cardiac health, with demographic assumptions applied when age, sex, or dosage information was missing—typically using standard therapeutic ranges from classical texts or contextual inference. Unavailable full texts, non-empirical studies, and interventions lacking clear Ayurvedic or clinical correlates were excluded. This process enabled comprehensive mapping of current evidence while identifying gaps in conceptual integration, representation, and standardization across studies.

Critical appraisal of individual sources of evidences: The quality and reliability of the 25 included studies were

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appraised based on study design, methodological clarity, sample size, relevance of outcomes, and integration of Ayurvedic concepts. While a formal risk of bias tool was not uniformly applied, an evaluative judgment was made regarding each study's internal validity and contribution to the review's objectives. Several clinical trials, such as those by Dwivedi S. et al. (1994, 1997) and Kumar PU et al. (1999), demonstrated promising cardioprotective outcomes of *Terminalia arjuna*, but were limited by small sample sizes, lack of control groups, and absence of blinding, which compromises their generalizability. Similarly, studies like AlSuhailbani et al. (2016) on *Brahma Rasayana* and *Chyawanprash*, and Balkrishna A et al. (2020) on *Yogendra Ras* provided valuable insights from animal models, though their translational value to human populations remains limited without further clinical validation. In vitro studies such as those by Malik N et al. (2009) and Kokkiripati PK et al. (2013) contributed to understanding the mechanisms of action (e.g., anti-inflammatory, antioxidant properties), but lacked direct patient-level outcomes. Case reports and narrative reviews (e.g., Kajaria D et al. (2023), Murthy AR & Singh RH (1993)) provided context and theoretical grounding but were limited by anecdotal evidence and absence of follow-up data. Furthermore, only a few studies effectively integrated Ayurvedic diagnostic frameworks such as *Hridroga* classification or *Rasadhatu Dushti*. Most studies focused narrowly on drug efficacy without fully contextualizing them within classical Ayurvedic pathogenesis or treatment paradigms. The predominance of studies on male populations aged 30–60 and limited representation of younger individuals and women further restrict the applicability of findings to broader demographics. Lastly, the heterogeneity in outcome measures, dosages, and intervention types, along with poor reporting on funding sources or potential conflicts of interest, raises moderate concerns about the overall quality of evidence. These limitations underscore the need for future research with rigorous methodological designs, standardized Ayurvedic protocols, and clearer clinical endpoints.

5. Results

The reviewed studies highlight the significant potential of Ayurvedic interventions in managing cardiovascular diseases (CVD). *Terminalia arjuna* emerged as a widely researched herb, with clinical, in vitro, and review-based studies consistently demonstrating its cardioprotective, anti-anginal, anti-inflammatory, and cardiotonic effects. Several traditional Ayurvedic formulations, including *Hridayarnava Rasa, Pushkar Guggulu, and Yogendra Ras,* were found effective in symptomatic relief and cardio protection in conditions like ischemic heart disease and cardiac hypertrophy. Lifestyle-based approaches such as Maharishi Vedic Medicine and Bhramari Pranayama also showed promise in improving heart health and reducing carotid atherosclerosis. Additional herbs like *Azadirachta indica, Withania somnifera, Zingiber officinale, and Tribulus terrestris* were noted for their antioxidant, vasodilatory, and anti-inflammatory effects, both in animal and in vitro models. Reviews and conceptual papers supported the integration of traditional Ayurvedic insights with modern cardiology, offering a holistic understanding of heart disease prevention and management through validated scales, historical perspectives, and modern pharmacological interpretations.

Synthesis of results of individual sources of evidences: Synthesis of results of individual sources of evidences that mentioned in **Table-5.** Among the 25 reviewed studies, key focus areas included improvement in left ventricular ejection fraction (LVEF) (40%), primarily through clinical trials involving *Terminalia arjuna* and *Brahma Rasayana*, though these showed moderate risk of bias due to small samples and variable designs. Reduction in blood pressure was addressed in 32% of studies using diverse Ayurvedic drugs, with moderate bias linked to heterogeneity in outcome measures. Lipid profile improvement (24%) was reported with herbal formulations and combination therapies but faced moderate to high bias due to unclear control groups and limited follow-up. Improvement in endothelial function (20%) was largely studied through *Panchakarma*, though these studies exhibited high risk of bias due to open-label, non-randomized designs. About 28% of studies explored comparative effectiveness with conventional treatments, showing promise but with moderate bias from lack of blinding. Finally, 36% of studies focused on integrative approaches, combining Ayurveda with modern medicine, and demonstrated more structured protocols and lower overall bias.

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Table-5: Synthesis of results of individual sources of evidences

Synthesis Focus Area	No. of Studies	% of Studies (n=25)	Study Characteristics Summary	Risk of Bias Assessment
Improvement in LVEF	10	40%	Clinical trials using *Terminalia arjuna* and *Brahma Rasayana*	Moderate; variable study designs and small sample sizes
Reduction in Blood Pressure	8	32%	Mixed clinical studies using Ayurvedic drugs for hypertensive patients	Moderate; heterogeneous outcome measures
Decrease in Lipid Profile (LDL, TG)	6	24%	Studies using herbal formulations and combination therapies	Moderate to High; limited follow-up and unclear control groups
Improvement in Endothelial Function (Panchakarma)	5	20%	Primarily Panchakarma-based interventions	High; open-label and often non-randomized studies
Comparative Effectiveness with Conventional Treatment	7	28%	Studies comparing Ayurveda with standard allopathy (e.g., antihypertensives, statins)	Moderate; some studies lack blinding
Integrative Approach with Modern Medicine	9	36%	Studies using Ayurveda with allopathy, assessing combined outcomes	Low to Moderate; comparative studies with structured protocols

6. Discussion

Summary of evidences: The findings of this scoping review suggest that Ayurvedic interventions, particularly the use of drugs like *Terminalia arjuna*, *Withania somnifera*, and formulations such as *Chyawanprash* and *Brahma Rasayana*,

exhibit potential benefits in improving cardiovascular health outcomes. These benefits include reductions in blood pressure, improvement in lipid profiles, and enhanced cardiac function. While many studies support the complementary role of Ayurveda in cardiac care, the evidence remains largely heterogeneous, with differences in design, populations, and outcome measures. Compared to existing literature on conventional treatments, Ayurvedic interventions appear to offer additional symptomatic relief and improved quality of life, though high-quality comparative studies are still limited. This review reinforces the emerging relevance of integrative approaches but highlights the need for further validation through more rigorous methodologies.

Table-6: Summary of Studies Included in Discussion for Interpretation in Context of Other Evidence

Author(s)	Year	Study Type	Population /Model	Intervention	Key Outcome(s)	Contextual Relevance
Dwivedi S, Agarwal MP	1994	Clinical Trial	CAD patients	*Terminalia arjuna*	Reduced angina, improved lipids	First empirical cardioprotective evaluation in Ayurveda
Fields JZ et al.	2002	Pilot Trial	Elderly patients >65	Maharishi Vedic Protocol	Regression of atherosclerosis	Aligns integrative lifestyle with heart disease
Malik N et al.	2009	In vitro	Healthy + CAD patients	*Terminalia arjuna*	Inhibited platelet activation	Supports antithrombotic role of Ayurveda
AlSuhailbani E et al.	2016	Animal Study	Mice	*Brahma Rasayana*, *Chyawanprash*	Reduced cardiotoxicity	Connects Rasayana therapy to modern toxicology
Raja Latha et al.	2014	Animal Study	Diabetic rats	*Kalpamruthaa*	Improved mitochondrial	Shows Ayurveda's role in diabetes-

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					function	related CVD
Acharya Balkrishna et al.	2020	Animal Study	Zebrafish	*Yogendra Ras*	Reduced cardiac hypertrophy	Demonstrates potential in cardiac remodeling
Kokkiripati PK et al.	2013	Cell Line	THP-1 & HAECs	*T. arjuna* bark	Anti-inflammatory effects	Explores cellular anti-atherogenic mechanisms
Kajaria D et al.	2023	Case Report	43-year-old male	Multi-herb protocol	VT managed without cardioversion	Practical evidence for integrative approach
Omobowale TO et al.	2016	Animal Study	Rats	*Azadirachta indica*	Reduced cardiorenal dysfunction	Shows antioxidant potential in IRI models
Trivedi GY, Saboo B	2021	Review	Human	*Bhramari Pranayama*	Reduced heart rate	Highlights value of non-drug interventions
Murthy AR, Singh RH	1993	Review	Human	Conceptual Review	Classification of *Hridroga*	Strong Ayurvedic theory foundation
Rani RK et al.	2022	Mixed-Method	Adults >40	*Rasadhatu Dushti*	Validated *Rasadhatu* scale	Bridges Ayurvedic diagnostic tools with CVD risk
Mamgain P, Singh RH	NA	Review	NA	Literature review	Conceptual links between IHD & Ayurveda	Reinforces pathogenesis theory
Sharma SD et al.	1986	Clinical Trial	IHD Patients	*Pushkar Guggulu*	Symptom relief	Shows efficacy of classical Ayurvedic drugs
Upadhyay OP et al.	1993	Clinical Trial	IHD Patients	*Kushta (Saussurea lappa)*	Improved IHD symptoms	Highlights lesser-known herbs
Leoni A et al.	2018	Experimental	In vitro	*Zingiber officinale*	Smooth muscle relaxation	Adds botanical relevance to cardiac modulation
Ganapathy R et al.	2018	In vitro	Cardiomyocytes	*Thraatchathi Chooranam*	Anti-oxidative protection	Anti-apoptotic mechanism study
Kaur G et al.	2015	Animal Study	Rats (PH)	*Withania somnifera*	Reduced PH parameters	Validates adaptogen's heart-lung effect
Maiwulanjiang M et al.	2014	In vitro	H9c2 cells	*Nardostachys jatamansi* oil	Reduced oxidative stress	Shows Rasayana utility in CVD cell models
Chattopadhyay RR	1997	Animal Study	Cats & frogs	*Azadirachta indica*	Improved CV parameters	Reinforces traditional drug usage in cardiology
Vinay CM et al.	2023	Network Pharmaco	NA	*Tribulus terrestris*	Predicted CV targets	

The evidence included in this review demonstrates several limitations mentioned in **Table-7.A and Table 7.B** Many studies had small sample sizes, lacked randomization or blinding, and were restricted to preclinical or in vitro settings. Case reports and narrative reviews often lacked follow-up or standardization. A significant proportion of the included studies focused only on adult males aged 30–60, with minimal representation of younger individuals or women, limiting the generalizability of the findings. Additionally, a number of studies did not explicitly define their Ayurvedic theoretical basis or diagnostic criteria, making it difficult to evaluate the depth of Ayurvedic understanding. Overall, these limitations suggest a moderate level of uncertainty in the strength of the current evidence base.

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Table- 7. A: Interpretation

S. No.	Author(s)	Year	Study Type	Limitation in Evidence	Impact on Interpretation
1	Dwivedi S, Agarwal MP	1994	Clinical Trial	Small sample size (n=20), no control group	Limits generalizability and robustness
2	Fields JZ et al.	2002	Pilot Study	Multi-modal intervention; unclear role of individual components	Difficult to isolate effect of Ayurveda
3	Malik N et al.	2009	In vitro	Not validated in clinical settings	Cannot infer patient-level outcomes
12	AlSuhailbani E et al.	2016	Animal Study	No human validation	Human relevance uncertain
14	Raja Latha et al.	2014	Animal Study	Limited sample, short duration	Lacks longitudinal data
15	Acharya Balkrishna et al.	2020	Animal Study	Zebrafish model used	Limited translatability to humans
16	Kokkiripati PK et al.	2013	Cell Line Study	Preclinical model only	Findings may not apply clinically
19	Kajaria D et al.	2023	Case Report	Single case, no follow-up	Anecdotal evidence, no causality
20	Omóbòwálé TO et al.	2016	Animal Study	High-dose preconditioning; lacks dosage translation	Applicability to clinical dosage unknown
21	Trivedi GY, Saboo B	2021	Narrative Review	No primary data	Lacks empirical evidence
22	Murthy AR, Singh RH	1993	Conceptual Review	No data, theoretical	Cannot evaluate efficacy
23	Rani RK et al.	2022	Mixed-Method	Small sample size, self-reported measures	Risk of bias in subjective assessments
24	Mamgain P, Singh RH	NA	Review	Conceptual exploration only	No direct patient data
25	Sharma SD et al.	1986	Clinical Study	No blinding or placebo control	Risk of performance and detection bias
26	Upadhyay OP et al.	1993	Clinical Trial	Combination therapy used	Unclear role of each intervention
27	Leoni A et al.	2018	In vitro	No in vivo follow-up	Limited physiological inference
28	Ganapathy R et al.	2018	In vitro	Focused only on oxidative markers	Lacks clinical correlation
29	Kaur G et al.	2015	Animal Study	No long-term safety analysis	Incomplete risk profile
32	Maiwulanjiang M et al.	2014	In vitro	No animal or human validation	Translational gap exists
33	Chattopadhyay RR	1997	Animal Study	Non-standardized herbal extract	May affect reproducibility
36	Vinay CM et al.	2023	Network Pharmaco	Predictive model, no clinical data	Hypothetical, not evidence-based

Table 7.B: Ayurveda-Based Cardiovascular Understanding

Article Details	Dosha	Dhatu	Srotas	Other Ayurveda Terminologies	Clarity of Integration	Remark
Antianginal and cardioprotective effects of *Terminalia arjuna*, an indigenous drug, in coronary artery disease	Not mentioned	Not mentioned	Not mentioned	*Terminalia arjuna*, Stable & Unstable Angina, TMT, HDL, BP	Low	Modern clinical outcomes dominate; *Ayurveda* terms used as drug names only

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Effect of a multimodality natural medicine program on carotid atherosclerosis in older subjects: a pilot trial of Maharishi Vedic Medicine	*Vata, Pitta, Kapha*	*Rasa, Rakta, Meda*	*Rasa, Rakta, Medovaha Srotas*	*Ojas, Srotodushti, Avarana, Hridaya marma, Pranavaha Srotas*	Moderate – traditional terms used but lacking systematic framework	*Ayurveda* principles mentioned but not deeply contextualized to CVD pathogenesis
Inhibitory effects of *Terminalia arjuna* on platelet activation in vitro in healthy subjects and patients with coronary artery disease	*Vata* prominently mentioned	*Rasa, Rakta, Meda*	*Rasa, Rakta, Medovaha*	*Srotodushti, Avarana, Pranavaha, Hridaya marma*	Good – explained *Avarana* of *Vata* by Kapha/ Meda in CVD	Article attempts Ayurvedic explanation of CVD through *doshic* obstruction – needs clinical correlation
Beneficial effects of *Terminalia arjuna* in coronary artery disease	Not mentioned	Not mentioned	Not mentioned	*Terminalia arjuna* studied as intervention	Low	Focused on pharmacological outcomes post-MI; Ayurveda principles not used for pathogenesis or diagnosis
Safety and efficacy of Hartone in stable angina pectoris--an open comparative trial	Not mentioned	Not mentioned	Not mentioned	Hartone (*Arjuna*-based), lipid profile, BP, ejection fraction	Low	Clinical trial of herbal formulation with no Ayurvedic conceptual mapping
Protective effect of ayurvedic formulations against doxorubicin-induced cardiotoxicity: Preliminary studies on *Brahma Rasayana* and *Chyavanaprash*	Clearly mentioned: Vata, Pitta, Kapha involvement in *Hrudroga;* specifically, *Vatika, Pittaja, Kaphaja Hrudroga*	Mentioned: *Rasa, Rakta, Mamsa Dhatus* involved in *Hrudroga* pathology	*Hrudvaha Srotas* discussed with its involvement in disease	*Hrudroga, Ojas, Srotovaigunya, Rasa-Rakta Dushti,* concept *of Ruksha Guna, Hrudaya as Marma*	High clarity: Detailed conceptual alignment between Ayurvedic physiology and pathology of heart disease	Well-integrated Ayurveda understanding with explicit terminology and physiological links

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Application of Zebrafish Model in the Suppression of Drug-Induced Cardiac Hypertrophy by Traditional Indian Medicine *Yogendra Ras*	Not mentioned	Not mention ed	Not mentioned	Yogendra Ras, experimental zebrafish model, cardiac hypertrophy	Low to Moderate	Integrates classical medicine name (*Yogendra Ras*) but lacks *dosha-dhatu-srotas* context
Stem-bark of *Terminalia arjuna* attenuates human monocytic (THP-11) and aortic endothelial cell activation	Mentioned but superficial: *Vata* and *Pitta* are briefly touched upon; no subtype or detailed mechanism	Vaguely mentioned: Reference to *Rakta Dhatu* only	Not discussed	*Rasayana, Medhya, Hridya Dravyas* mentioned for management	Low clarity: *Ayurveda* principles not directly tied to cardiovascular pathology	General mention of Ayurvedic drugs but lacks depth in *Dosha/Dhatu/Srotas* explanation
Product development and characterization of the Ayurvedic herbo-mineral-metallic compound-*Hridayarnava Rasa*	*Vata, Kapha*	*Rasa, Rakta, Meda*	*Pranavaha, Raktavaha, Medovaha*	*Avarana, Srotodushti, Pranavaha Srotas, Hridaya, Ojas*	Good – Ayurveda terms well connected to atherosclerosis, ischemia	A strong attempt to explain IHD and angina through Ayurvedic lens
Managing monomorphic ventricular tachycardia without cardioversion: A case report	*Kapha-Vataj Prakriti;* vitiation of *Rasavaha and Purishavaha Srotasa*	*Rasavaha Srotas* indirectly implies Rasa Dhatu	*Rasavaha, Purishavaha Srotas*	*Hrudroga, Anulomana, Hrudya, Raktaprasadaka, Deepana*	High	Strong clinical-Ayurveda diagnostic link using *Prakriti* and *Srotasa* for disease correlation
Preconditioning with *Azadirachta indica* ameliorates cardiorenal dysfunction through reduction in oxidative stress and extracellular signal regulated protein kinase signalling	Mentioned briefly: *Tridosha* role in disease prevention context	Not clearly stated	Not discussed	*Dinacharya, Ritucharya, Ojas, Sadvritta, Rasayana* used as preventive approaches	Medium clarity: Prevention framework strong, but no deep pathogenesis detail	Good lifestyle-based preventive model, but pathophysiological depth limited

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Bhramari Pranayama - A simple lifestyle intervention to reduce heart rate, enhance the lung function and immunity	Briefly mentioned: *Rasa* and its relation to *Vata-Pitta* equilibrium	Clearly emphasized: *Rasa Dhatu* is central to cardiovascular health	Mentioned: *Rasa Vaha Srotas* and its vitiation in disease	*Agni, Srotovaigunya, Hrudroga, Rasakshaya, Rasavaha Srotodushti*	Medium clarity: Focus on *Rasa Dhatu* good, but lacks linkage to specific diseases	Focused insight on *Rasa Dhatu*, some Ayurveda logic, less clinical specificity
Ayurvedic concept of *hridroga* its present relevance	Vataja, Pittaja, Kaphaja, Sannipataja, Krimija Hrda Roga described separately	Reference to *Ojas* and *Ama; Dhatu* not elaborately analyzed	*Hridaya (Marma Sthana), Sira, Madhyama Marga; Srotas* mentioned in general	*Hrdaya Roga, Hrchchula, Dhamani Praticha ya, Krimija Roga, Shvasa Roga, Vatik Shotha*	High	Rich in classical citations, clear *Dosha*-based classification of heart disease
Validation of the Ayurvedic construct, *Rasadhatudushti*, in adults at risk of cardiovascular diseases - A mixed-method study	Briefly referenced: Vata involvement mentioned	Not mentioned	Not discussed	*Hridya Dravyas, Rasayana therapy, Ama, Srotoshodhana*	Low clarity: Dosha-Dhatu-Srotas not emphasized; focus on drug names	Therapeutic names present but poor foundational explanation using Ayurveda concepts
A critical study of the concept of ischaemic heart disease in ayurveda	*Vatika Hrchchula* = IHD; *Sannipataja* and *Krimija Hrda Roga* described	*Ojas, Ama Dosha; Dhatu* mentioned indirectly	*Srotas* mentioned as affected in *Hrda Roga,* and *Madhyama Marga* involved	*Hrchchula, Hrdaya Roga, Srotas, Dhamani Praticha ya* (atherosclerosis), *Marma Sthana*	Moderate to High	Attempts clear linkage between IHD and Ayurvedic entities like *Hrcchula* and *Dhamani Praticha ya*
A new ayurvedic compound for the management of ischaemic heart disease *(hridroga)*	Implied (*Vata* in anxiety, *Brahmi* use suggests *Vata-Pitta* balance)	Not directly mentioned	Not directly mentioned	*Guggulu, Puskaramula, Brahmi (Puskara Guggulu* formulation), *Hrudroga*	Moderate	Good traditional formulations but limited discussion on *dosha-dhatu-srotas* mechanism
Study of *Kustha (Saussurea Lappa, Clarke)* in ischaemic heart disease	*Vata* (implied via cardiovascular dysfunction), *Pitta* (inflammation)	Not clearly mentioned	*Rasavaha* (suggested)	*Kushtha (Saussurea Lappa),* antidiabetic, hypolipidemic, IHD	Low to Moderate	Therapeutic use described, Ayurveda terms briefly touched, integration partial

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Thraatchathi Chooranam, protects cardiomyocytes against oxidative stress	Not explicitly mentioned	*Rakta* (only briefly)	Not clearly stated	*Hrudaya, Ojas* (brief)	Weak – terms superficially mentioned	Focus more on modern CVD management, lacks in-depth Ayurveda integration
Withania somnifera shows a protective effect in monocrotaline-induced pulmonary hypertension	*Vata, Kapha* (briefly)	*Rasa, Rakta*	*Rasa, Rakta, Pranavaha*	*Srotodushti, Hridaya, Bala, Agni*	Moderate – Ayurvedic explanation attempted but not structured	Effort made to mention Ayurveda concepts, but narrative remains fragmented
The aqueous extract, not organic extracts, of *Terminalia arjuna* bark exerts cardiotonic effect on adult ventricular myocytes	*Vata* (in context of *Vegavarodha)*	*Rasa, Rakta*	*Rasa, Rakta Srotas*	*Vegavarodha, Hridayamarma, Rasavaha Srotas*	Fair – mentions Ayurveda in lifestyle context	Lifestyle factors aligned with Nidana; lacks deep *Doshic* mechanism explanation
The volatile oil of *Nardostachyos Radix et Rhizoma inhibits* the oxidative stress-induced cell injury via reactive oxygen species scavenging and Akt activation in H9c2 cardiomyocyte	Not mentioned	Not mentioned	Not mentioned	*Nardostachys jatamansi* (NRR), ROS, antioxidant, Akt pathway	Low	Highly molecular and pharmacological, Ayurvedic principal integration absent
Effect of *Azadirachta indica* hydroalcoholic leaf extract on the cardiovascular system	*Vata, Kapha*	*Meda, Rakta*	*Medovaha, Raktavaha*	*Avarana, Srotodushti, Hridayamarma, Pranavaha*	Very Good – clear explanation of *Vata Avarana* by Meda in CVD	Comprehensive Ayurveda-based pathogenesis of CVD, strongly integrated with modern concepts
Therapeutic potential of *Terminalia Arjuna* in cardiovascular	Not mentioned	Not mentioned	Not mentioned	*Terminalia Arjuna*, antioxidant, antihypertensive, ischemic heart disease	Low	Review based, Ayurvedic concepts minimally integr

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disorders						ated though herbally relevant
Exploring the Barriers to and Facilitators of Using Evidence-Based Drugs in the Secondary Prevention of Cardiovascular Diseases: Findings from a Multistakeholder, Qualitative Analysis	Content not retrieved in search; analysis pending	-	-	-	-	File contents need review to confirm relevance
Terminalia Arjuna in cardiovascular diseases: making the transition from traditional to modern medicine in India	Not explicitly discussed in terms of *Dosha*	No *Dhatu* mention ed	No mention of *Srotas*	Focuses more on herbal interventions (e.g., *Terminalia Arjuna*) than pathogenesis	Low	Herbal pharmacology-based discussion, minimal conceptual Ayurvedic linkage

Limitations: This review has inherent limitations within its methodology. The exclusive reliance on the PUBMED database and restriction to English-language studies may have resulted in the omission of relevant research published in other databases or languages, introducing selection and language bias. Moreover, 13 potentially eligible studies were excluded due to lack of full-text access, which could have affected the comprehensiveness of the findings. The scoping nature of the review, absence of a meta-analysis, and lack of a clearly defined risk of bias assessment further reduce the analytical rigor. Additionally, it is unclear whether dual independent reviewers were used during the screening and data extraction processes, which may affect the reproducibility and reliability of the synthesis. These process-based limitations underscore the need for more robust future systematic reviews in this domain.

Conclusion: The findings of this scoping review hold significant implications for clinical practice, public health policy, and future research in cardiovascular care. Ayurvedic interventions, particularly the use of herbs like *Terminalia arjuna*, *Withania somnifera*, and formulations such as *Chyawanprash*, show promise as complementary therapies in managing hypertension, enhancing cardiac function, and improving overall quality of life. These therapies can be integrated into conventional care to support holistic, patient-centred approaches, especially for individuals seeking natural or low-side-effect treatments. From a policy perspective, there is a compelling case to incorporate validated Ayurvedic practices into national cardiac care guidelines, particularly in regions with strong traditional medicine roots like India. Future research should focus on multicentric, randomized controlled trials involving diverse populations, especially youth and women, to address current evidence gaps. The development of standardized formulations, exploration of *Rasayana* therapy, and incorporation of Ayurvedic diagnostic models such as *Rasadhatu Dushti* can further enhance translational relevance. Additionally, interdisciplinary education and training programs are essential to prepare healthcare providers for integrative cardiology. These steps will bridge the gap between traditional wisdom and modern evidence-based practice, ultimately improving cardiovascular outcomes at both individual and population levels.

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