

Ayurvedic *Dinacharya* and Modifiable Cardiovascular Risk Factors: A Narrative Integrative Review in the Context of the INTERHEART Study.

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ABSTRACT:

Background: Atherosclerotic cardiovascular disease (ASCVD) remains a major cause of morbidity and mortality worldwide. The INTERHEART study identified several modifiable risk factors responsible for a substantial proportion of myocardial infarction risk, highlighting the importance of comprehensive lifestyle modification. Although the INTERHEART study focused on acute myocardial infarction, its identified risk factors are widely used in contemporary preventive cardiology for atherosclerotic cardiovascular disease (ASCVD) more broadly. Ayurveda describes *Dinacharya* or daily regimen, as a preventive framework intended to support physiological, metabolic and psychological health. However, its relationship with contemporary cardiovascular risk factors has not been synthesized.

Objective: To critically examine the potential contribution of Ayurvedic

Dinacharya to the modification of cardiovascular risk factors identified in the INTERHEART study and to evaluate the contemporary evidence supporting its individual components.

Materials and Methods: A narrative integrative review was conducted using classical Ayurvedic texts, including the Charaka Samhita, Sushruta Samhita and Ashtanga Hridaya, together with contemporary literature retrieved from PubMed, Scopus and Google Scholar. Evidence relating to physical activity, dietary regulation, Pranayama, meditation, Abhyanga, sleep-wake regulation and warm-water intake was identified and narratively correlated with the major modifiable risk factors for myocardial infarction identified in the INTERHEART study and discussed in the broader context of atherosclerotic cardiovascular disease (ASCVD) prevention.

Results: The available evidence suggests the strongest concordance for physical

activity, healthy dietary practices, stress reduction and avoidance of harmful behaviours. Exercise-based interventions have demonstrated favourable effects on blood pressure, arterial stiffness, insulin sensitivity, body weight and cardiorespiratory fitness. *Pranayama* and meditation may support autonomic regulation and stress reduction. Evidence concerning *Abhyanga*, warm-water intake, early awakening and the complete *Dinacharya* regimen remains limited, indirect or based mainly on surrogate outcomes. Direct evidence for reductions in myocardial infarction or cardiovascular mortality is currently lacking.

Conclusion: *Dinacharya* may represent a culturally relevant complementary lifestyle framework for addressing several modifiable cardiovascular risk factors. It should not replace established medical treatment or evidence-based preventive cardiology. Standardized, long-term clinical studies are required to evaluate the effects of comprehensive *Dinacharya* interventions on cardiovascular outcomes.

Keywords:

Dinacharya; Ayurveda; cardiovascular risk factors; atherosclerotic cardiovascular disease; INTERHEART; lifestyle medicine

Introduction:

Atherosclerotic cardiovascular disease (ASCVD), including myocardial infarction (MI), ischemic heart disease and related vascular disorders, constitute a major global health burden. The landmark INTERHEART study demonstrated that the majority of myocardial infarction risk is attributable to a limited number of potentially modifiable risk factors, including smoking, dyslipidemia,

hypertension, diabetes mellitus, abdominal obesity, psychosocial stress, inadequate fruit and vegetable intake, physical inactivity and alcohol consumption. Although the INTERHEART study was designed as a case-control study of acute myocardial infarction, its identified risk factors are central to current concepts of atherosclerotic cardiovascular disease prevention beyond MI alone. These findings underscore the pivotal role of lifestyle modification in the prevention of ASCVD.¹

Ayurveda, the traditional system of medicine, emphasizes the preservation of health through appropriate lifestyle practices, among which *Dinacharya* (daily regimen) is regarded as a cornerstone of preventive healthcare. Classical Ayurvedic texts, including the *Charaka Samhita*, *Sushruta Samhita* and *Ashtanga Hridaya*, describe *Dinacharya* as a structured daily routine comprising practices such as early awakening, *Abhyanga* (oil massage), *Vyayama* (physical exercise), dietary discipline and timely sleep. These practices are intended to maintain *Dosha* equilibrium, optimize *Agni* (digestive and metabolic functions), promote mental well-being and preserve physiological homeostasis.

Several components of *Dinacharya* have been supported by contemporary scientific evidence. Regular physical activity, *Pranayama*, meditation, *Abhyanga* and healthy dietary practices have demonstrated beneficial effects on cardiovascular risk factors through improvements in autonomic balance, metabolic regulation, vascular function, insulin sensitivity and stress reduction. However, despite increasing evidence supporting these individual practices, their collective role as an

integrated preventive strategy for ASCVD has not been comprehensively explored.

Therefore, the present review aims to correlate the principles of Ayurvedic *Dinacharya* with the major modifiable risk factors for myocardial infarction identified in the INTERHEART study and to critically appraise the available scientific evidence supporting their role in the prevention of atherosclerotic cardiovascular disease.

Materials and Methods:

This narrative integrative review was conducted using classical Ayurvedic texts and contemporary scientific literature. Classical references related to *Dinacharya* were reviewed from the Charaka Samhita, Sushruta Samhita and Ashtanga Hridaya. Contemporary evidence was retrieved from peer-reviewed articles indexed in PubMed, Scopus and Google Scholar. Search terms included combinations of “Dinacharya,” “daily routine,” “Ayurveda,” “lifestyle,” “cardiovascular,” “hypertension,” “diabetes,” “obesity,” “lipid,” “myocardial infarction,” “Pranayama,” “Abhyanga,” and “Surya Namaskara.” Relevant experimental studies, randomized controlled trials, systematic reviews, meta-analyses and observational studies evaluating the effects of individual *Dinacharya* components (including *Abhyanga*, *Vyayama*, *Pranayama*, *meditation*, *warm water intake*, dietary regulation and sleep) on major cardiovascular risk factors (dyslipidemia, hypertension, diabetes mellitus, obesity, psychosocial stress, physical inactivity and vascular function) were included. Animal studies were considered only for mechanistic insights. Editorials, narrative reviews without primary data and articles

without clear relevance to cardiovascular risk factors were excluded.

The nine modifiable risk factors for myocardial infarction identified in the INTERHEART study were used as a framework to discuss the potential role of *Dinacharya* in the prevention of atherosclerotic cardiovascular disease more broadly, not limited to myocardial infarction. The available evidence was critically reviewed and narratively correlated with these risk factors. No formal quality assessment or meta-analysis was performed.

Correlation of Dinacharya with Modifiable Risk Factors Identified in the INTERHEART Study:

The INTERHEART study identified nine major modifiable risk factors responsible for the majority of myocardial infarction cases worldwide. The principles of *Dinacharya* described in Ayurveda address many of these behavioural and metabolic risk factors through a holistic daily lifestyle regimen. The correlation between the major risk factors for myocardial infarction identified in the INTERHEART study and the corresponding components of *Dinacharya* is summarized in Table 1. These risk factors are also central to contemporary strategies for atherosclerotic cardiovascular disease (ASCVD) prevention. The scientific evidence supporting each component of *Dinacharya* is discussed in detail below.

3.1 Dyslipidemia and Regulation of Agni

Dyslipidemia is one of the most important modifiable risk factors for myocardial infarction and atherosclerotic cardiovascular diseases (ASCVD). The INTERHEART study identified abnormal

lipid levels as one of the strongest predictors of acute myocardial infarction across diverse populations.ⁱ In Ayurveda, although dyslipidemia is not described as a distinct disease entity, its pathogenesis may be interpreted in terms of *Agnimandya* (impaired digestive and metabolic function), leading to the formation of *Ama*, vitiation of *Meda Dhatu* and subsequent *Srotorodha* (obstruction of channels), which closely resembles the pathological processes underlying atherosclerosis.

Dinacharya advocates daily practices that preserve Agni and maintain metabolic homeostasis. *Ushna Jala Pana* (warm water intake), recommended in Ayurvedic classics, is believed to facilitate digestion and improve metabolism. Supporting this concept, Vij and Joshi demonstrated that water ingestion increases resting energy expenditure through water-induced thermogenesis and contributes to reductions in body weight and body mass index among overweight individuals.ⁱⁱ Although this study did not evaluate lipid parameters directly, improved energy expenditure and weight management may indirectly contribute to cardiovascular risk reduction.

Ahara Vidhi, another important component of *Dinacharya*, advocates regular meal timings, mindful eating and avoidance of overeating to preserve digestive efficiency and metabolic balance. While direct clinical evidence evaluating the effect of *Ahara Vidhi* on dyslipidemia is limited, these principles are consistent with healthy dietary practices recommended for cardiovascular risk reduction.

Daily *Abhyanga* (oil massage) has been reported to improve peripheral blood flow and reduce subjective stress. Ayurveda also describes *Abhyanga* as a practice that

nourishes body tissues and maintains physiological homeostasis. However, no direct clinical evidence currently demonstrates that *Abhyanga* improves lipid profiles. Its potential contribution to cardiovascular health is therefore likely to be indirect, through improved circulation and overall physiological well-being.ⁱⁱⁱ

Overall, *Dinacharya* incorporates several lifestyle practices that support metabolic homeostasis and may help address factors associated with dyslipidaemia. However, current evidence primarily evaluates these interventions individually and direct clinical studies investigating the effect of a comprehensive *Dinacharya* regimen on lipid profiles and cardiovascular outcomes are lacking. Further well-designed randomized controlled trials are required to establish its role in the prevention of dyslipidaemia and ASCVD.

3.2. *Dinacharya* Strategies for smoking-Related ASCVD Risk Reduction:

Cigarette smoking is one of the most important modifiable risk factors for atherosclerotic cardiovascular disease (ASCVD). The INTERHEART study demonstrated that current smokers have an approximately two- to three-fold higher risk of myocardial infarction than non-smokers highlighting smoking cessation as a cornerstone of primary cardiovascular prevention. Ayurveda similarly discourages exposure to Dhuma (smoke), except in the context of specific therapeutic procedures, thereby advocating avoidance of unnecessary smoke inhalation as part of a healthy lifestyle.

Within *Dinacharya*, *Prāṇāyāma* is recommended as a daily practice for maintaining respiratory health and physiological balance. Although it should

not be regarded as a substitute for smoking cessation, regular pranayama has been associated with improvements in pulmonary function in healthy adults. A randomized controlled trial by Dinesh et al. reported significant improvements in FEV₁, PEFR, and other spirometric parameters after 12 weeks of both slow and fast pranayama training.^{iv}

Similarly, Kakkar et al. demonstrated that even a single supervised pranayama session produced immediate improvements in pulmonary function, including FVC, FEV₁, and PEFR, suggesting beneficial acute respiratory effects.^v

The combined practice of Prāṇāyāma and Sūrya Namaskāra for two months has also been associated with significant improvements in vital capacity, tidal volume, expiratory reserve volume, PEFR, and breath-holding time among healthy medical students.^{vi}

Beyond pulmonary function, pranayama may favourably influence cardiovascular physiology. In a randomized controlled trial involving patients with chronic obstructive pulmonary disease, Kaminsky et al. observed significant improvements in exercise tolerance and inspiratory capacity following a 12-week pranayama intervention, together with favourable changes in inflammatory and oxidative stress markers.^{vii}

Regular practice of pranayama combined with meditation has also been shown to reduce sympathetic activity and enhance parasympathetic modulation, as demonstrated by improvements in heart rate variability (HRV) among healthy individuals.^{viii}

Comparable improvements in cardiac autonomic function have been reported in patients with primary hypertension practising Śītalī Prāṇāyāma, with significant enhancement of HRV parameters indicative of increased vagal activity.^{ix}

Pranayama may additionally contribute to vascular health. Bhavanani et al. reported acute reductions in blood pressure following Praṇava Prāṇāyāma, which have been attributed, in part, to enhanced endogenous nitric oxide bioavailability, suggesting a potential mechanism for improved endothelial function and vascular relaxation.^x

Although current evidence primarily demonstrates improvements in surrogate physiological markers rather than major cardiovascular outcomes, these findings support the potential role of regular pranayama as an adjunctive lifestyle practice within Dinacharya for reducing cardiovascular risk.

In addition to these physiological interventions, Ayurveda emphasizes Sadvṛtta, which promotes ethical conduct, self-discipline and avoidance of harmful habits. This behavioural framework may complement modern smoking cessation strategies by encouraging sustained adherence to healthy lifestyle practices. Smoking cessation remains the primary evidence-based intervention for reducing smoking-related risk of myocardial infarction and ASCVD; regular Prāṇāyāma and adherence to Sadvṛtta may serve as supportive lifestyle practices within Dinacharya but should not be considered substitutes for smoking-cessation treatment.

3.3. Dinacharya Strategies for Hypertension-Related ASCVD Risk Reduction

Hypertension is one of the major modifiable risk factors for atherosclerotic cardiovascular disease (ASCVD). The INTERHEART study identified elevated blood pressure as a significant contributor to myocardial infarction risk. Ayurveda similarly emphasizes the maintenance of physiological homeostasis through Dinacharya, which incorporates daily practices that may support healthy blood pressure regulation by influencing circadian rhythm, autonomic function, vascular physiology, and physical fitness.

Brahma Muhurta (early morning awakening) is an important component of Dinacharya. Cortisol secretion follows a distinct circadian rhythm characterized by a rapid increase within 30–45 minutes after awakening, commonly referred to as the cortisol awakening response (CAR).^{xi}

The magnitude of the cortisol awakening response is influenced by the time of awakening, with healthy individuals waking earlier demonstrating a more pronounced physiological cortisol response than late awakeners.^{xii}

Similarly, individuals with a morning chronotype exhibit a greater post-awakening cortisol rise than evening chronotypes, suggesting that alignment with the natural circadian rhythm may support optimal hypothalamic–pituitary–adrenal (HPA) axis regulation.^{xiii}

Abhyanga (therapeutic oil massage) is another important component of Dinacharya that may contribute to blood pressure regulation through autonomic modulation. A pilot study by Basler et al.

demonstrated that a one-hour Ayurvedic Abhyanga massage significantly reduced heart rate and subjective stress, indicating reduced sympathetic nervous system activity.^{xiv}

A conceptual analysis proposed that stimulation of cutaneous mechanoreceptors during Abhyanga may enhance parasympathetic activity, reduce sympathetic overactivity, and improve arterial and venous circulation, thereby promoting vascular relaxation.^{xv}

Vyayama (regular physical exercise) is another essential component of Dinacharya with well-established antihypertensive and cardiovascular benefits. A systematic review and meta-analysis of randomized controlled trials demonstrated that aerobic exercise significantly reduced pulse wave velocity (PWV) and augmentation index, indicating improved arterial stiffness.

A subsequent systematic review reported that aerobic exercise consistently improves arterial stiffness in both normotensive and hypertensive adults.^{xvi}

Among older adults with type 2 diabetes, hypertension, and hypercholesterolaemia, three months of aerobic exercise significantly reduced arterial stiffness measured by pulse wave velocity despite minimal changes in body weight or blood pressure.^{xvii}

Similarly, increasing the frequency of aerobic exercise for eight weeks significantly reduced central arterial stiffness in middle-aged and older women.^{xviii}

Regular exercise also improves cardiorespiratory fitness, enhances myocardial efficiency, lowers blood pressure, improves lipid profile, and

contributes to overall cardiovascular risk reduction.^{xxix}

Collectively, Brahma Muhurta, Abhyanga, and Vyayama represent complementary components of Dinacharya that may favourably influence circadian rhythm, autonomic regulation, vascular function, and physical fitness. These daily lifestyle practices closely align with evidence-based strategies for blood pressure control and support the prevention of hypertension-related cardiovascular risk. Although the INTERHEART study focused on myocardial infarction, hypertension is a well-established risk factor for ASCVD in general.

3.4. Dinacharya Strategies for Diabetes-Related ASCVD Risk Reduction:

Diabetes mellitus is a major modifiable risk factor for atherosclerotic cardiovascular disease (ASCVD). The INTERHEART study demonstrated that diabetes substantially increases the risk of myocardial infarction. Ayurveda describes *Prameha* as a lifestyle-related disorder associated with *Santarpana* (overnutrition), physical inactivity, excessive sleep, and inappropriate dietary habits. Accordingly, *Dinacharya* emphasizes regular physical activity and healthy daily routines to maintain metabolic homeostasis and prevent disease progression.

Vyayama (regular physical exercise) is a fundamental component of *Dinacharya* and plays a central role in maintaining glucose homeostasis. Recent evidence indicates that regular exercise improves insulin sensitivity through multiple cellular and molecular mechanisms, including enhancement of insulin signalling pathways and increased glucose uptake by skeletal muscle.^{xx}

Exercise also promotes translocation of glucose transporter type 4 (GLUT4) to the skeletal muscle cell membrane, thereby facilitating insulin-mediated glucose disposal and improving glycaemic control.^{xxi}

In addition to improving glucose utilization, aerobic exercise attenuates chronic low-grade inflammation by suppressing pro-inflammatory mediators that contribute to insulin resistance.^{xxii}

Regular physical activity has also been shown to reduce oxidative stress while enhancing endogenous antioxidant defence systems, thereby improving insulin sensitivity and metabolic function in individuals with diabetes.^{xxiii}

Experimental studies further suggest that exercise improves hepatic insulin sensitivity by modulating negative regulators of insulin signalling, including protein tyrosine phosphatase 1B (PTP1B), highlighting additional mechanisms through which physical activity may improve metabolic health.^{xxiv}

The antioxidant and anti-inflammatory effects of long-term exercise further contribute to the prevention of insulin resistance and may delay the development and progression of type 2 diabetes mellitus.^{xxv}

In addition to regular exercise, Ayurveda recommends the intake of *Uṣṇodaka* (warm water) as part of *Dinacharya*. Although modern evidence directly evaluating warm water intake and glycaemic control remains limited, Ayurveda considers *Uṣṇodaka* beneficial for supporting Agni (digestive and metabolic function), facilitating digestion, and preventing *Āma*

accumulation, thereby promoting metabolic homeostasis.

Collectively, Vyayama and other Dinacharya practices aimed at maintaining healthy metabolism closely align with contemporary lifestyle recommendations for improving insulin sensitivity and reducing diabetes-related ASCVD risk identified in the INTERHEART study.

3.5. Dinacharya Strategies for Obesity-Related ASCVD Risk Reduction

Obesity, particularly central or abdominal obesity, is a major modifiable risk factor for atherosclerotic cardiovascular disease (ASCVD). The INTERHEART study demonstrated that abdominal obesity is strongly associated with an increased risk of myocardial infarction. Ayurveda similarly recognizes Sthaulya as a lifestyle-related disorder resulting from excessive nourishment, physical inactivity, inappropriate dietary habits, and excessive sleep. Accordingly, Dinacharya emphasizes daily practices that promote energy balance and healthy body weight.

Uṣṇodaka Pāna (warm water intake) is traditionally recommended to support digestion and metabolism. A randomized controlled trial reported that consumption of 200–250 mL of warm water after each meal for three months resulted in significant reductions in body weight and body mass index (BMI) compared with consumption of regular water among overweight adults, suggesting a potential role in weight management.^{xxvi}

Vyayama (regular physical exercise) is another integral component of Dinacharya and is classically advised to be performed daily up to Ardhaśakti (half of one's physical capacity). Contemporary evidence

consistently supports regular physical activity as a cornerstone of obesity management by increasing energy expenditure, improving body composition, preserving lean muscle mass, and reducing cardiometabolic risk.^{xxvii}

The Ayurvedic concept of Ardhaśakti Vyayama emphasizes moderate, sustainable exercise tailored to an individual's capacity, thereby promoting long-term adherence while minimizing physical exhaustion.^{xxviii}

Ayurveda advises avoidance of *Divāsvapna* (daytime sleep), particularly in individuals with *Kapha* predominance or obesity, as it is considered to promote *Kapha* accumulation and *Meda* (adipose tissue) increase. Contemporary evidence supports this concept. A recent systematic review and meta-analysis reported that prolonged daytime napping, particularly for more than one hour, was associated with a significantly higher risk of obesity.^{xxix}

Several biological mechanisms have been proposed to explain this association. Daytime napping may activate the sympathetic nervous system, thereby contributing to obesity through increased sympathetic activity.^{xxx}

It may also prolong bedtime, reduce thermogenesis and energy expenditure, and consequently promote weight gain.^{xxxi}

Furthermore, excessive daytime napping has been associated with depressive symptoms, which may indirectly contribute to obesity through behavioural and neuroendocrine pathways.^{xxxii}

Prolonged daytime sleep may also worsen nocturnal insomnia, while sleep fragmentation has been associated with

increased body mass index and a greater risk of obesity. (34)

Circadian disruption associated with excessive daytime napping may alter hormonal homeostasis. Elevated evening cortisol levels have been linked to increased insulin resistance, impaired glucose regulation, abnormal lipid metabolism, and altered fat distribution, all of which may contribute to adiposity. ^{xxxiii xxxiv xxxv}

Finally, excessive daytime napping may reflect insufficient or poor-quality nocturnal sleep, which itself has been recognized as an important contributor to obesity. ^{xxxvi}

These observations provide a plausible physiological basis for the Ayurvedic recommendation to avoid habitual *Divāsvapna* as part of *Dinacharya* for maintaining metabolic health and reducing obesity-related ASCVD risk.

Collectively, *Uṣṇodaka Pāna*, *Vyayama* and avoidance of *Divāsvapna* represent complementary components of *Dinacharya* that support healthy body weight and align with lifestyle-based strategies for reducing obesity-related ASCVD risk identified in the INTERHEART study.

3.6. Dinacharya Strategies for Psychosocial Stress-Related ASCVD Risk Reduction

Psychosocial stress is an established modifiable risk factor for atherosclerotic cardiovascular disease (ASCVD). The INTERHEART study identified chronic stress, depression and lack of social support as significant contributors to myocardial infarction risk. Ayurveda similarly recognizes disturbances of the mind as

arising from the predominance of *Rajas* and *Tamas*, while emphasizing *Manasika Śānti* (mental tranquillity) through **Dinacharya** as an essential component of health maintenance.

Dhyāna (meditation) is an integral component of *Dinacharya* that promotes mental calmness and emotional balance. A four-day mindfulness meditation programme significantly reduced serum cortisol concentrations among medical students, indicating attenuation of the physiological stress response. ^{xxxvii}

Reduced cortisol secretion may contribute to improved autonomic balance and regulation of the hypothalamic–pituitary–adrenal (HPA) axis, mechanisms that are closely associated with cardiovascular health.

Abhyanga and *Śiro Abhyanga* are also recommended in Ayurveda to pacify *Vāta Doṣa*, which is closely associated with psychological instability, anxiety, and stress. Through modulation of autonomic function and promotion of relaxation, these practices may help restore mental equilibrium and complement other stress-management strategies.

In addition, regular practice of *Sūrya Namaskāra* has been shown to improve physiological function, enhance cardiorespiratory fitness, and promote autonomic balance, thereby contributing to both physical and psychological well-being. ^{xxxviii}

Ayurveda further advocates daily practices such as prayer (*Prārthanā*), chanting (*Japa*), and self-reflection (*Svādhyāya*) as components of *Sadvṛtta*, fostering emotional resilience and mental discipline. Collectively, these *Dinacharya* practices

promote Manasika Śānti, complement contemporary stress-management approaches, and align with evidence-based strategies for reducing psychosocial stress-related ASCVD risk identified in the INTERHEART study.

3.7. Dinacharya Strategies for Inadequate Fruit and Vegetable Intake-Related ASCVD Risk Reduction:

Inadequate consumption of fruits and vegetables is an established modifiable risk factor for atherosclerotic cardiovascular disease (ASCVD). The INTERHEART study demonstrated that regular consumption of fruits and vegetables was associated with a significantly lower risk of myocardial infarction. Ayurveda similarly recognizes Āhāra as one of the Trayopastambha (three pillars of life) and considers appropriate dietary practices an essential component of Dinacharya for maintaining health and preventing disease.

Āhāra Vidhi Vidhāna (Ayurvedic dietary guidelines) emphasizes not only the quality of food but also its quantity, timing, method of preparation, sequence of consumption, and mental state during eating.

These principles advocate the consumption of freshly prepared, wholesome, warm food in appropriate quantity, eating only after complete digestion of the previous meal, and mindful eating in a calm environment to preserve Agni (digestive and metabolic capacity) and optimize nutrient utilization.

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Contemporary Ayurvedic reviews have highlighted remarkable similarities between Āhāra Vidhi Vidhāna and modern concepts of healthy eating, including meal timing, portion control, digestive

physiology, circadian nutrition, and mindful eating.^{xi}

Ayurveda further advocates the regular intake of fresh, wholesome, and seasonal fruits and vegetables according to an individual's Prakṛti, Agni, Rtu (season), and Deśa (habitat), thereby promoting balanced nutrition and metabolic homeostasis.

These recommendations closely parallel contemporary dietary guidelines encouraging increased consumption of plant-based foods for cardiovascular protection.

Modern evidence consistently demonstrates the cardiovascular benefits of higher fruit and vegetable consumption. A meta-analysis of 47 prospective cohort studies involving approximately 1.5 million participants reported that greater fruit and vegetable intake was associated with a significantly lower risk of cardiovascular disease, with a clear dose-response relationship.^{xli}

A subsequent systematic review and dose-response meta-analysis of 95 prospective studies demonstrated that each additional 200 g/day of fruit and vegetable consumption was associated with reduced risks of coronary heart disease, stroke, cardiovascular disease, and all-cause mortality, with maximal cardiovascular benefit observed at an intake of approximately 800 g/day.^{xlii}

Another large systematic review and meta-analysis involving more than four million participants further confirmed inverse associations between total fruit and vegetable intake and the incidence and mortality of cardiovascular disease. Green leafy vegetables, cruciferous vegetables, citrus fruits, and apples or pears

demonstrated particularly favourable cardiovascular associations.

The cardioprotective effects of fruits and vegetables are primarily attributed to their high content of dietary fibre, potassium, vitamins, antioxidants, and polyphenolic compounds, which improve endothelial function, reduce oxidative stress and systemic inflammation, favourably influence blood pressure and lipid metabolism, and thereby reduce cardiovascular risk.^{xliii}

Collectively, adherence to Āhāra Vidhi Vidhāna, together with regular consumption of fresh fruits and vegetables, represents an important Dinacharya strategy that closely aligns with evidence-based dietary recommendations for reducing ASCVD risk identified in the INTERHEART study.

3.8. Dinacharya Strategies for Physical Inactivity-Related ASCVD Risk Reduction

Physical inactivity is an established modifiable risk factor for atherosclerotic cardiovascular disease (ASCVD). The INTERHEART study identified lack of regular physical activity as an independent predictor of myocardial infarction. Ayurveda similarly emphasizes Vyayama (physical exercise) as an indispensable component of Dinacharya, recommending its daily practice to preserve health, enhance physical endurance, and prevent disease.

According to classical Ayurvedic texts, Vyayama should be performed regularly up to Ardhaśakti (half of one's physical capacity), as excessive exercise may lead to exhaustion, whereas moderate exercise promotes strength, improves digestion

(Agni), reduces Kapha, and maintains physiological balance.^{xliv}

Contemporary evidence consistently supports regular physical activity as a cornerstone of cardiovascular disease prevention. The 2020 World Health Organization Guidelines on Physical Activity and Sedentary Behaviour recommend at least 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity aerobic physical activity per week, demonstrating that regular exercise substantially reduces cardiovascular morbidity and mortality.^{xlv}

Similarly, the 2021 European Society of Cardiology Guidelines on cardiovascular disease prevention in clinical practice emphasize regular physical activity as a fundamental lifestyle intervention for ASCVD prevention, with favourable effects on cardiovascular risk factors and overall cardiovascular health.^{xlvi}

Traditional Ayurvedic exercises such as Sūrya Namaskāra provide a practical means of incorporating daily physical activity into Dinacharya. A comparative study by Bhavanani et al. demonstrated that regular practice of both slow and fast Sūrya Namaskāra produced significant improvements in cardiovascular and respiratory physiological parameters, supporting its role as an effective mind-body exercise.^{xlvii}

Beyond improving physical fitness, regular exercise enhances insulin sensitivity, improves endothelial function, reduces systemic inflammation, and promotes cardiorespiratory fitness, thereby lowering overall cardiovascular risk.

Collectively, Vyayama and Sūrya Namaskāra represent key components of

Dinacharya that directly address physical inactivity and closely align with contemporary evidence-based recommendations for reducing ASCVD risk identified in the INTERHEART study.

3.9. Dinacharya Strategies for Alcohol-Related ASCVD Risk Reduction:

The INTERHEART study identified alcohol consumption as a modifiable risk factor for myocardial infarction, with heavier or binge drinking associated with adverse cardiovascular outcomes. Alcohol consumption is a modifiable lifestyle factor influencing cardiovascular health. While earlier observational studies suggested possible cardiovascular benefits of low levels of alcohol consumption, contemporary evidence indicates that heavier or binge drinking is consistently associated with hypertension, atrial fibrillation, cardiomyopathy, stroke, and other adverse cardiovascular outcomes. Current cardiovascular guidance therefore emphasizes moderation and does not recommend initiating alcohol consumption for cardiovascular benefit.

Ayurveda discusses alcohol under the concept of Madya and emphasizes that its effects depend upon Mātrā (quantity), Kāla

(appropriate timing), Satmya (individual suitability), Prakṛti, and Agni. Excessive, inappropriate, or indiscriminate consumption leads to Madātyaya, a pathological condition described in the classical texts.^{xlviii}

Ayurvedic literature further recommends that, if alcohol is consumed, it should be taken in moderation, with appropriate food, and only after considering the individual's digestive capacity and constitutional characteristics, thereby minimizing its harmful effects.

Sadvṛtta, an important component of Dinacharya, promotes self-discipline, restraint, and avoidance of behaviours that impair physical and mental health. These behavioural principles closely complement modern recommendations aimed at preventing hazardous alcohol consumption and supporting long-term cardiovascular health.^{xlix}

Collectively, moderation or avoidance of alcohol, together with adherence to Sadvṛtta, represents an important Dinacharya strategy that aligns with contemporary evidence-based recommendations for reducing alcohol-related ASCVD risk.

Table 1. Mapping of INTERHEART Modifiable Risk Factors with Dinacharya Components and Their Proposed Mechanisms in ASCVD Prevention

INTERHEART Risk Factor	Relevant Dinacharya Component(s)	Proposed Mechanism(s)	Key Supporting Evidence
Dyslipidemia	Āhāra Vidhi Vidhāna; Vyayama; Uṣṇodaka Pāna	Promotes healthy dietary practices, improves lipid metabolism, enhances energy expenditure, reduces adiposity, and	Dietary intervention studies, Exercise meta-analyses; dietary cohort studies; classical Ayurvedic references. Evidence: moderate for risk-factor

		supports overall cardiometabolic health.	improvement; limited for direct ASCVD prevention.
Hypertension	Brahma Muhurta Jāgarāṇa; Abhyanga; Vyayama	Maintains circadian rhythm, reduces sympathetic activity, improves vascular function, decreases arterial stiffness, and enhances cardiovascular fitness.	Cortisol physiology studies, Abhyanga studies, and exercise meta-analyses.
Smoking	Prāṇāyāma; Sadvṛtta	Improves pulmonary function, enhances autonomic balance, supports endothelial function, and promotes avoidance of addictive behaviours.	Randomized controlled trials on Prāṇāyāma, HRV studies and COPD trial.
Diabetes Mellitus	Vyayama; Uṣṇodaka Pāna	Improves insulin signalling, enhances glucose uptake, reduces inflammation and oxidative stress, and improves metabolic regulation.	Molecular studies and clinical evidence on exercise and insulin resistance.
Obesity (Central Obesity)	Vyayama; Uṣṇodaka Pāna; Avoidance of Divāsvapna	Promotes energy expenditure, facilitates weight reduction, prevents Kapha–Meda accumulation, and supports circadian metabolic regulation.	Warm water RCT, exercise reviews, and meta-analysis on daytime napping and obesity.
Psychosocial Stress	Dhyāna; Abhyanga; Śīro Abhyanga; Sūrya Namaskāra; Sadvṛtta	Reduces stress hormones, improves autonomic balance, promotes mental well-being, and enhances emotional resilience.	Meditation studies, Sūrya Namaskāra study, and Abhyanga studies.
Inadequate Fruit and Vegetable Intake	Āhāra Vidhi Vidhāna; Consumption of fresh seasonal foods	Improves dietary quality, preserves Agni, enhances antioxidant intake, and reduces	Ayurvedic dietary reviews and systematic reviews on fruit and vegetable consumption.

		oxidative stress and systemic inflammation.	
Physical Inactivity	Daily Vyayama; Sūrya Namaskāra	Improves cardiorespiratory fitness, endothelial function, metabolic health, muscular strength, and overall physical activity.	WHO Physical Activity Guidelines and Sūrya Namaskāra study.
Alcohol Consumption	Sadvṛtta; Principles of Madya Sevana (Mātrā, Kāla, Satmya)	Encourages moderation, behavioural self-regulation, and avoidance of alcohol-related harm.	Classical Ayurvedic texts and contemporary reviews on alcohol consumption.
Integrated Lifestyle Modification	Comprehensive Dinacharya	Simultaneously addresses behavioural, metabolic, circadian, and psychosocial determinants of ASCVD, providing a holistic preventive approach.	Classical Ayurvedic literature and contemporary scientific evidence.

4. Discussion

The INTERHEART study suggests that the majority of myocardial infarctions can be attributed to a limited number of modifiable lifestyle-related risk factors, emphasizing that cardiovascular disease prevention should primarily focus on comprehensive lifestyle modification rather than isolated therapeutic interventions. Although the INTERHEART study focused on myocardial infarction, these risk factors underpin contemporary strategies for prevention of atherosclerotic cardiovascular disease more broadly. The present review suggests that the principles of Dinacharya, as described in Ayurveda, closely correspond to many of these evidence-based preventive strategies,

providing an integrative framework for reducing ASCVD risk.

Unlike disease-specific interventions, Dinacharya adopts a holistic approach that integrates daily behavioural regulation, dietary discipline, physical activity, respiratory practices, mental well-being, and circadian alignment. Collectively, these practices address several major cardiovascular risk factors identified in the INTERHEART study, including hypertension, diabetes, obesity, smoking, physical inactivity, unhealthy dietary habits, psychosocial stress, and alcohol-related behaviours. This multidimensional approach closely parallels the current paradigm of preventive cardiology, which recognizes that simultaneous modification of multiple risk factors provides greater

cardiovascular benefit than targeting individual risk factors in isolation.

The available scientific evidence demonstrates encouraging concordance between classical Ayurvedic recommendations and contemporary biomedical research. Studies evaluating individual components of Dinacharya have reported favourable effects on blood pressure, autonomic function, pulmonary function, endothelial health, insulin sensitivity, body weight, inflammatory markers, and psychological well-being. Although these findings support the biological plausibility of Dinacharya as a preventive lifestyle model, most available studies have evaluated individual interventions rather than the comprehensive

Dinacharya regimen described in Ayurvedic classics.

The principal contribution of this review lies in systematically mapping the components of Dinacharya to the major modifiable ASCVD risk factors identified in the INTERHEART study while integrating evidence from contemporary clinical research. Rather than presenting Ayurveda and modern medicine as separate systems, this review highlights areas of convergence where classical lifestyle principles may complement evidence-based cardiovascular prevention. Such an integrative perspective may facilitate the incorporation of traditional lifestyle practices into contemporary preventive healthcare while encouraging further interdisciplinary research.

Table 2. Clinical Implications of Dinacharya in the Prevention of Atherosclerotic Cardiovascular Disease

Level of Prevention	Potential Role of Dinacharya	Expected Cardiovascular Benefits
Primordial Prevention	Establishes healthy daily routines through appropriate diet, physical activity, sleep, mental discipline, and behavioural regulation.	Prevents the development of cardiovascular risk factors and promotes lifelong cardiovascular health.
Primary Prevention	Addresses major modifiable INTERHEART risk factors through Vyayama, Prāṇāyāma, Āhāra Vidhi Vidhāna, Abhyanga, Sadvṛtta, and healthy daily routines.	May reduce the risk of dyslipidemia, hypertension, diabetes, obesity, smoking-related risk, psychosocial stress, and potentially ASCVD, direct evidence for reduction in myocardial infarction or ASCVD events is lacking.
Secondary Prevention	Complements standard medical therapy by reinforcing healthy lifestyle behaviours and improving long-term adherence.	May improve control of cardiovascular risk factors and quality of life, direct evidence for reduced recurrent myocardial infarction or cardiovascular events is currently lacking.
Public Health Perspective	Provides a culturally acceptable, holistic, low-cost, and sustainable lifestyle model	Reduces disease burden and supports population-level cardiovascular health promotion.

	suitable for community-based prevention programmes.	
Integrative Healthcare	Facilitates evidence-informed integration of Ayurvedic lifestyle principles with contemporary preventive cardiology.	Promotes patient-centred, multidisciplinary, and lifestyle-based cardiovascular care.

5. Limitations

This review has several limitations. First, most available evidence evaluates individual components of Dinacharya rather than the complete daily regimen described in classical Ayurvedic texts. Second, many studies have focused on surrogate physiological outcomes, including blood pressure, autonomic function, pulmonary function and metabolic biomarkers, rather than major cardiovascular endpoints such as myocardial infarction or cardiovascular mortality. Third, the methodological quality and duration of the available studies vary considerably, limiting the strength of clinical inferences. Finally, although efforts were made to integrate Ayurvedic concepts with contemporary scientific evidence, some correlations remain conceptual and require validation through well-designed clinical research.

6. Future Directions

Future research should evaluate comprehensive Dinacharya-based lifestyle interventions using standardized protocols and robust study designs. Large multicentre randomized controlled trials with long-term follow-up are needed to determine their effectiveness in reducing ASCVD risk and improving cardiovascular outcomes. Mechanistic studies exploring the effects of integrated Dinacharya practices on

endothelial function, autonomic regulation, systemic inflammation, circadian rhythm, gut microbiota, and cardiometabolic biomarkers would further strengthen the scientific basis of Ayurvedic lifestyle interventions. In addition, implementation research assessing the feasibility, adherence, and cost-effectiveness of Dinacharya within community and primary healthcare settings may facilitate its integration into preventive cardiology programmes.

7. Conclusion

Atherosclerotic cardiovascular disease remains one of the leading causes of morbidity and mortality worldwide, with the majority of cardiovascular events attributable to modifiable lifestyle-related risk factors. The INTERHEART study provides compelling evidence that comprehensive lifestyle modification is central to ASCVD prevention. The present review demonstrates that the principles of Dinacharya closely align with many of these evidence-based preventive strategies.

Daily practices such as Vyayama, Prāṇāyāma, Abhyanga, Āhāra Vidhi Vidhāna, Sadvṛtta, appropriate sleep–wake routines, and avoidance of unhealthy behaviours collectively address multiple behavioural, metabolic, and psychosocial determinants of ASCVD. While current evidence primarily supports improvements

in intermediate cardiometabolic outcomes rather than definitive cardiovascular endpoints, the observed convergence between classical Ayurvedic concepts and contemporary scientific evidence suggests that Dinacharya represents a practical and holistic lifestyle framework for cardiovascular prevention.

Further high-quality clinical studies are required to evaluate comprehensive

Dinacharya-based interventions using standardized methodologies and long-term cardiovascular outcomes. Nevertheless, integrating Dinacharya with contemporary evidence-based preventive strategies may offer a culturally acceptable, sustainable, and person-centred approach to reducing the global burden of atherosclerotic cardiovascular disease.

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