

Research Article

# A Retrospective Observational Study on Aetiological Factors in Twenty-one Pre-diagnosed Cases of Coronary Artery Disease (*Hridroga*)

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## I N F O

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## A B S T R A C T

**Introduction:** Coronary artery disease (CAD) is a common non-communicable disease and a leading cause of death worldwide causing inadequate supply of blood and oxygen to the heart due to occluded arteries and serious consequences. Due to changes in lifestyle and eating habits, its prevalence is increasing day by day. This study explores the diet and lifestyles of CAD patients and the relevance of the *nidanatmaka* concepts of *hridroga* as found in the classical Ayurvedic compendium in the current scenario.

**Methods:** Twenty-one pre-diagnosed patients of CAD were enrolled as per inclusion and exclusion criteria. The enrolled patients were subjected to interviews after obtaining ethical approval and written informed consent. Results: *Nidana* of *hridroga* described in Ayurveda were found as causative factors of CAD in the present scenario. *Santarpanajanya* and *aptarpanajanya*, both groups of *nidana* are seen in the patients of CAD. Mansikahetu – shoka, chinta, bhaya, and trasa are identified as important causative factors of *hridroga* as described in Ayurveda and are also prevalent in the current era. *Nidana* such as *diwaswapana*, *purishvegadharana*, and *ashruvegadharana* emerged as a new risk factor for CAD in the current scenario.

**Conclusion:** Improper agni leads to vitiation of *doshas*, and *ama* production causing srotorodha hampering the circulation and causing characteristic pain and breathlessness suggesting features of CAD. A large-scale aetiological study may be helpful in planning preventive strategies related to diet and lifestyle to control rising cases of coronary artery diseases.

**Keywords:** Aetiology, Anxiety, Coronary Artery Disease, Constipation, Diabetes, *Hridroga*, Improper Sleep, *Vegavidharana*

## Introduction

Coronary Artery Disease (CAD) or Ischaemic heart disease (IHD) is a narrowing or blockage of the coronary arteries, resulting in myocyte necrosis and functional impairment of the heart.<sup>1</sup> It is the leading cause of death around the globe.<sup>2</sup> Cardiovascular disease accounted for more than 20 million deaths and more than 400 million disability-adjusted life-years (DALYs) lost in 2021, of which, CAD is the most common cause accounting for more than 9.4 million lives and 185 million DALYs.<sup>3</sup> CVDs contributed to 28.1% of total deaths and 14.1% of total disability-adjusted life years (DALYs) in India in 2016.<sup>4</sup> The prevalence of CAD in Indians is higher in diabetics as compared to non-diabetics (21.4% vs 11%)<sup>4</sup> as diabetics are more prone to CAD<sup>5</sup> as compared to other people. An interruption in diagnosis, treatment, and regular check-ups further translates into a higher cardiovascular disease burden.<sup>6</sup> CAD with its ever-increasing incidence requires more and more thorough research and spread of awareness about the onset of disease (aetiopathology) so that disease can be prevented or treated in the beginning without reaching the critical level. This present article emphasises the aetiological aspects in terms of the present dietary and lifestyle practices of CAD patients to explore the *nidanatmaka* concepts of *hridroga* and its relevance in the current scenario.

## Methodology

### Study Design

The present study was a single-group, retrospective observational study conducted at the All India Institute of Ayurveda, New Delhi. Twenty-one patients were enrolled as per inclusion and exclusion criteria from December 2020 to February 2021.

### Inclusion Criteria

Pre-diagnosed patients of CAD between 30 and 70 years of age, of either sex, with or without diabetes and/ or hypertension were selected from OPD in the study group.

### Exclusion Criteria

Those with congenital heart disease, pregnant women, rheumatic heart disease (RHD), sub-acute bacterial endocarditis (SABE), pericarditis, endocarditis, CAD leading to left or right ventricular failure (LVF or RVF), tuberculosis, chronic kidney disease, chronic liver disease, chronic obstructive pulmonary disease, and all malignancies were excluded from the study.

### Ethical Consideration

The present study was approved by the Institutional Ethics Committee and commenced only after registration in the Clinical Trial Registry of India (CTRI). Patients agreeing to

get enrolled in the study were ensured confidentiality and were enrolled after receiving due written informed consent.

### Preparation and Validation of Questionnaire

Exploration of the concept and practical application of *nidana* was done literally. A preliminary list of items was prepared on the basis of *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* and the same was converted into the questionnaire. The conceptual study comprised a review of the available literature in the ancient classical texts, literature in modern science concerned with this principle, scientific journals, dissertations, research papers etc. to develop the concept. A total of 38 variables were selected and arranged in the form of domains and a preliminary questionnaire was prepared. Each variable selected for the question section was further divided into sub-sections and thus the final questionnaire had 64 domains. Different types of *nidana* related to *hridroga* were available in the texts which were divided into dietary, lifestyle, psychological, traumatic and iatrogenic (due to the complication of treatment, or ignorance or improper treatment of disease like *madhumeha*, *medodustijanya vikara*) factors for better understanding of the disease. Each parameter of *nidana* was incorporated for the development of the pro forma being assessed by questions. Some of the classical parameters were assessed by incorporating questions from validated scales, and for other parameters, relevant questions were made after vivid discussion with the experts. The questionnaire was then validated for face and content validity which was found to be acceptable (Annexure 1 given at the end of the article).

### Data Collection

Patients selected for the study were subjected to complete history taking and clinical examination and the data were recorded on the specially prepared pro forma. Complete demographic data (name, age, gender, occupation, marital status, address, socio-economic status and educational status), history of past illness, present illness, and family history were recorded. General physical and systemic examinations were assessed. *Prakriti* was examined as per the established *Prakriti* Analysis Algorithm Tool of Dr Sanjiv Rastogi. The assessment of diet and dietary patterns was done using verbal interviews with the patients about their food and drink patterns and preferences. The *Sannikrishta nidana* (~ precipitating factors) and *Viprakrishta nidana* (~ predisposing factors) were assessed in terms of aahara (~ diet), vihara (~ lifestyle) and Mansik *nidana* (~ psychological factors) in detail through the patient's personal experiences. Data collected after the interview were entered in the 'numerical' format and each response was coded. Data collected were statistically measured in percentages.

## Observation and Results

All the history related to patients descriptions and relevant data information were collected and have been presented in Figures 1 and 2. *Nidana* were assessed in the patients on the basis of quantity and frequency of aetiological factors being consumed or adopted in a less, excess, or faulty manner over a considerable time period, considered as *viprakrishta hetu* and were supposed to develop CAD (Tables 1-3). Different diseases were reported as *Gadaticara*, and were supposed to act as a predisposing factor to develop CAD in the study (Table 4). *Sannikrishta nidana* observed in the patients of CAD were *shoka* (~ grief), *chinta* (~ anxiety), *atibharvahana* (~ heavy weight lifting), and *druta-chankramana* (~ rapid movement), each reported in 9.8% of cases (n = 2). These factors precipitated the symptoms of the disease to which the subjects were already predisposed by intake of the causative factors related to diet and lifestyle. Exposure to *dushivisha* (~ attenuated poison) was reported by a case, who used to work in a chemical factory, in the form of carbon monoxide poisoning for 10 years called *Vyabicharihetu* (~ latent causative factors).

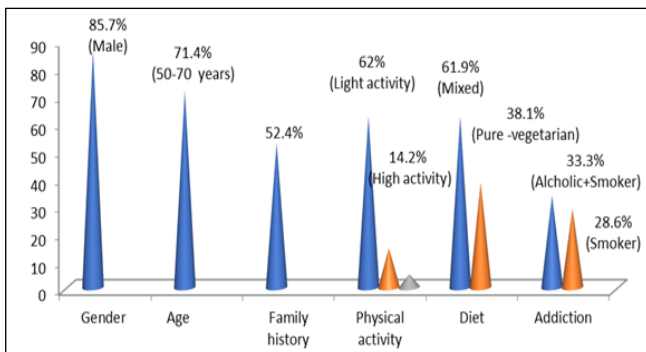


Figure 1. Demographic Data of 21 Patients with CAD

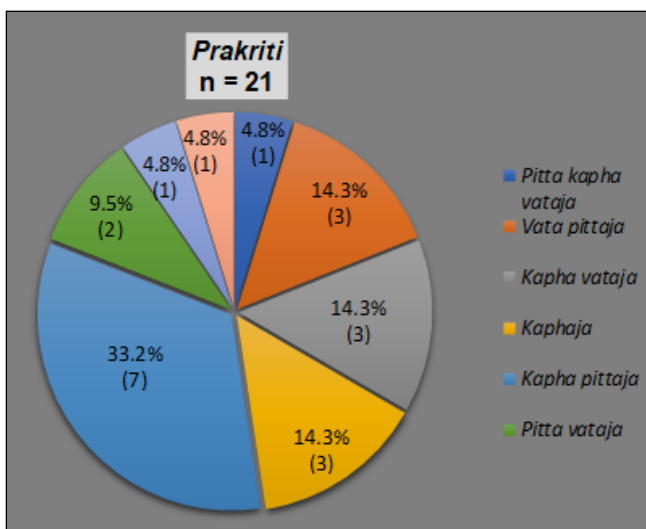


Figure 2. Distribution of 21 Patients based on Prakriti

Table 1. Frequency of Mithaya Aahara Janya Nidana as Causative Factors

Mithaya Aahara Janya Nidana (Viprakrishta Hetu)	Frequency and Percentage for Presence of Nidana in CAD Patients (N = 21) n (%)
Upwasa (fasting) for 12 hours per day	6 (28.6)
Upwasa thrice a week	1 (4.8)
Adhyashana (repeated intake of meals)	2 (9.5)
Alpamatraashana (less quantity of meal)	2 (9.5)
Swabhavaguruashana (heavy in consistency)	4 (19.0)
Atimatra ashana, matra guru (heavy meal in quantity)	7 (33.3)
Atiruksha (devoid or less quantity of ghee)	5 (23.8)
Atisnigdha (more quantity of ghee/ oil)	8 (38.1)
Atishushka (dry meal)	1 (4.8)
Atiushna (excessively hot)	10 (47.6)

Table 2. Frequency of Mithaya Vihara Janya Nidana as Causative Factors

Mithaya Vihara Janya Nidana (Viprakrishta Hetu)	Frequency and Presence of Nidana in CAD Patients (N = 21) n (%)
Atimadyapana (excessive intake of alcohol)	7 (14.3)
Tambakhu sevana (smoking)	13 (61.9)
Ativyayama (excessive exercise)	3 (14.2)
Achesta (less physically active/ sedentary)	14 (66.7)
Aatapasewana (hot environment)	8 (38.1)
Diwaswapana (day sleeping)	8 (38.1)

Shitambupaana in ksudhitavastha (intake of cold water in hunger state)	2 (9.5)
Purishvegadharana (suppression of the urge to defecate)	3 (14.3)
Ashruvegadharana (suppression of tear)	1 (4.8)
Atibharvahana (lifting heavy weight)	7 (33.3)

**Table 3. Frequency of Mansika Nidana as Causative Factors**

Mansika Nidana (Viprakrishta Hetu )	Frequency and Percentage for Presence of Nidana in CAD Patients n (%)
Shoka (grief)	11 (52.4)
Krodha (anger)	12 (57.1)
Chinta (excessive worry)	11 (52.4)
Achinta (tension free)	4 (19.0)
Nidra vikriti (disturbance in sleep)	9 (42.9)
Bhaya (fear)	4 (19.0)
Trasa (humiliation)	5 (23.8)

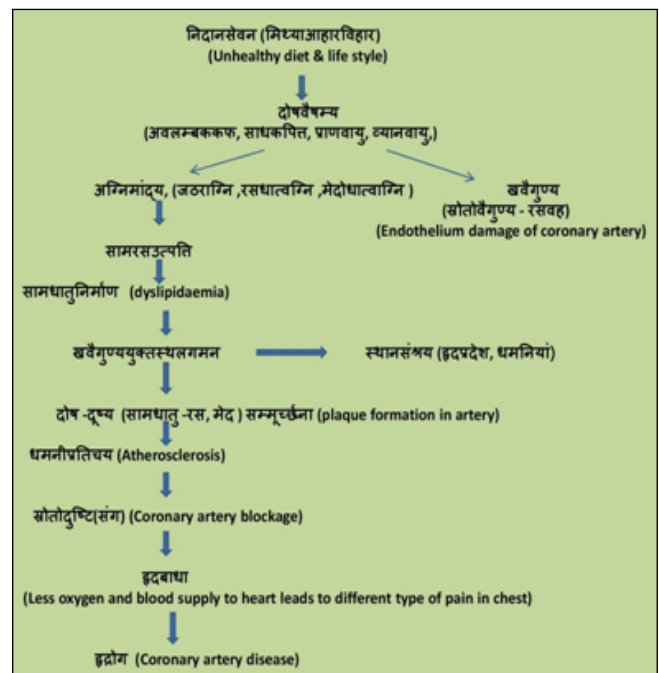
**Table 4. Frequency of Gadatichara/ Co-morbidity as Causative Factors**

Gadatichara (Viprakrishta Hetu)	Frequency and Percentage for Presence of Nidana in CAD Patients n (%)
Purishaavritavata	7 (33.3)
Diabetes	5 (24.0)
Hypertension	17 (81.0)
Dyslipidaemia	11 (52.0)
Obesity	6 (29.0)
Hypothyroid	2 (10.0)

## Discussion

### Ayurvedic Perspective of Heart Physiology to Pathology

Three biophysical entities, *Vyanavata*,<sup>7</sup> *Sadhaka pitta*,<sup>8</sup> and *Avalambakakapha*<sup>9</sup> along with four basic body tissue elements, *Rasa* (~ nutritive component of blood), *Rakta* (~ cellular part of the blood), *Mansa* (~ muscle tissue), and *Meda* (~ adipose tissue),<sup>10</sup> maintain the integrity of cellular structure, and functions of the heart. The heart is also a place of *Ojas* (~ tissue essence vital for life)<sup>11</sup> and root of *pranavahasrotas* (~ circulatory channels for vital energy of the body),<sup>12</sup> so a balance between these elements and normalcy of *Agni* (~ digestive and metabolic power)<sup>13</sup> is a milestone for proper functioning of the heart. Vitiating of this process at any step leads to the production of *aama* (~ toxic material produced after improper functioning of *Agni*),<sup>14</sup> which circulates along with the *rasa dhatu*, and further vitiates the *doshas*, circulatory channels, body systems and deposits, wherever it finds favourable circumstances.<sup>15</sup> The heart being the *moola sthana* (~ root place) of *rasa dhatu*,<sup>12</sup> is particularly predisposed to vitiating by impaired *rasa dhatu*, and consequently further vitiates *Ojas*, leading to different metabolic, biochemical, structural and electrical changes in the heart. *Ojakshaya* is harmful to *hridaya* and leads to unconsciousness and even death of the individual.<sup>16</sup> So, all the nidana causing the vitiating of *Agni* and *rasa dushti* have the potential to develop *hridroga* (CAD).<sup>17</sup> The proposed *samprapti* of *hridroga* is depicted in Figure 3.



**Figure 3. Depiction of Steps Involved in Samprapti of Hridaroga**

*Nidana* vitiates the *dosha* in the body according to the similarities in qualities (*guna*) and functions (*karma*) between them. *Nidana* such as *alpa* (~ less quantity of meal than one's need and capacity), *upwasa* (~ fasting), *ruksha* (~ devoid and less quantity of ghee/ oil), *ativyama* (~ excessive exercise), *ratri jagrana* (~ awakening at night), *vegvidharna* (~ suppression of natural urges), *mansik nidana* like *shoka* (~ sadness), *ati-chinta* (~ excessive anxiety), *bhaya* (~ fear) aggravate *vata dosha*.<sup>18</sup> Similarly, the usage of *atiushna* (~ excessive hot eatables), *atikatu* (~ excessive pungent eatables), *atiamla* (~ excessive sour eatables), *atilavana* (~excessive salty eatables), *atikshara* (~ excessive alkali in nature), *krodha* (~ anger), *chinta* (~ anxiety), *atimadyapana* (~ excessive alcohol consumption) aggravate *pitta dosha*.<sup>18</sup> *Kapha dosha* increases in the body due to consumption of *guru* (~ heavy meal hard to digest), *snighdha* (~ more quantity of oil/ ghee), *atimatra ashana* (~ large quantity of meal than one's digestive capacity), *achinta* (~ tension free), *acheshta* (~ physical inactivity), and *atinidra* (~ excessive sleepiness).<sup>18</sup>

### Influence of Demographic Status on Coronary Artery Disease

85.7% (n = 18) of the patients registered in the study were male, which is also reported in another research that men coping with stressful events may be less adaptive physiologically, behaviourally and emotionally, including excessive alcohol consumption and smoking, contributing to having a higher risk of CAD.<sup>19</sup> Females are protected by oestrogen so there is less chance of suffering from CAD.<sup>20</sup> The two female patients registered in the study were above 40 years of age. One among them was suffering from hormonal imbalance and the other was at the age of menopause (deficient hormone state), which supports the conventional research finding.<sup>21</sup> Ayurveda also says that *rajaswala stri* (~ menstruating women) are protected from *prameha* (~ diabetes)<sup>22</sup> and similar diseases (CAD) which are the consequences of advancing and untreated diabetes. Advancing age as a risk factor for CAD<sup>23</sup> is also supported through the observations of this study. Old age is dominated by *vata dosha* and *dhatu kshaya*.<sup>24</sup> Further aggravation of *vata dosha* speeds up the process of depreciation in the quality and quantity of all *dhatu*s, resulting in structural and functional impairment of the whole body including the heart and related vessels. Ageing is associated with cellular oxidative stress, inflammation and shifts in gene expression, that contribute to increased vascular stiffness, endothelial dysfunction and thrombogenicity.<sup>25</sup> Maximum patients were of *kapha pittaja prakriti* (33.2%) having a tendency to develop CAD due to easy vulnerability towards formation of plaque, haemorrhage and blockage. CAD is one of the diseases which are the outcome of faulty dietary regimens and lifestyles accepted across generations and

entered into a genetic predisposing group known as *beeja dosha* (~ genetic factors).<sup>26</sup> According to Ayurveda, arteries and veins are derived from the paternal part and the part of the zygote<sup>27</sup> which is affected with genetic abnormality will exhibit the same abnormality in the corresponding organ developed from it. In this study, it was observed that 52.4% of cases had a positive family history from the paternal side, supporting the concept of Ayurveda in modern parlance.<sup>28</sup>

Poor and middle-class families and uneducated people were also observed to be affected by the disease in this study. This could be due to poor nutrition, stress, or over-physical activity in that group, which have also been considered as an aetiological factor in the Ayurveda literature.<sup>29</sup> Moreover, due to unawareness of the disease and limited diagnostic facilities, the disease sometimes remains undiagnosed or progresses to a severe stage without being noticed.

### Causative Factors Related to Faulty Dietary Habits

Two groups of *nidana* are classically described and were also reported by the study participants - the first belonging to the category of *santarpanjanya nidana* (~ over nourishment) and the other belonging to *aptarpanjanya nidana* (~ under-nourishment), which vitiates different *doshas* in different manner (Table 5).

**Table 5. Category-wise Distribution of Nidana of Hridroga**

Category of Nidana	Santarpanjanya Nidana	Aptarpanjanya Nidana
Psychological factors	<i>Achinta</i>	<i>Atichinta, shoka, bhaya</i>
Related to the timing and quantity of food	<i>Atimatra ashana, ajirnebhohne, Adhyashana</i>	<i>Alpa-ashana, upwasa</i>
Activity related	<i>Avyayama, Achesta</i>	<i>Ativyayama</i>
Related to the quality of food	<i>Atisnigdha</i>	<i>Shushka, ruksha</i>
	<i>Guru</i>	<i>Laghu</i>
Sleep-related	<i>Nidra sukhamaadhikayam (excessive sleep) Diwaswapana</i>	<i>Ratri jagrana</i>

*Nidana* such as *atimatra ashana*, *guru ashana*, *alpa ashana*, *adhyashana* (~ eating before digestion of previous meal), *virudhashana* (~ dietetic incompatibility), *vishamashana* (~ diet on irregular time and quantity) cause *agnidusti*,<sup>30</sup>

followed by *ajirna* (~ indigestion), which further leads to *vata kapha vikriti* and *aama* formation, repeating the pathogenic cycle. *Aama* acts like a poison (*visha*)<sup>30</sup> in the body. It also causes *srotorodha* (~ obstruction in the channel) due to accumulation in circulatory channels<sup>31</sup> and vitiation of *Vayu* i.e. *Vyana* *vayu* as it is responsible for proper circulation of blood and nutrition to the heart and other body parts<sup>7</sup>. Vitiated *Vayu* due to its *ruksha* (~ dry), *khara* (~ rough), and *sheeta* (~ cold) *guna*<sup>32</sup> cause constriction of the arteries. Moreover, *aama* acts as an unwanted toxic material that bears characteristics<sup>14</sup> similar to plaques and *artheroma*<sup>33</sup> responsible for *srotasalepa* (~ deposition in the arterial lumen) and then blockage of arteries.<sup>31</sup> The Framingham Heart Study showed that high cholesterol level is a major risk factor in CAD and the risk of atherosclerosis increases with the increase in lipid concentration (cholesterol, triglycerides, LDL, and VLDL) except HDL which is inversely related to CAD.<sup>34</sup>

*Atiushna*, *Atiamla*, *Atilavana*, *Atikatu* and *Atikshara* as *nidana* consumption was seen in the study as 47.6%, 42.9%, 28.5%, 33.3%, and 19% respectively. They cause aggravation of *pitta* due to similar *mahabautika* constitution and qualities and vitiate *rakta* and its *srotas*. Vitiated *rakta dhatu*, due to volume overload hampering the normal flow of blood, results in disease in the vessels and hypertension. A similar association of these factors was observed in a previous study.<sup>35</sup>

*Mada* (~ dilemma) and *murcha* (~ fainting)<sup>36</sup> are the post leads of *viruddha ahara*<sup>37</sup> as well as complaints by the patients of CAD in its acute phase. Junk food, such as *momos* with cold drinks, were observed in the study as *satmya*<sup>38</sup> and *deshaviruddha*;<sup>38</sup> *samosa* with cold drinks were observed as *pariharviruddha*<sup>38</sup>. *Moonga dal* (~ green gram lentils), *chana dal* (~ chickpea lentils) and items made up of *besan* (~ gram flour) were taken with milk in breakfast for a long time, and are considered *samyogviruddha*.<sup>39</sup> *Gutka* itself is poisonous to the heart; when taken with alcohol daily, which also is harmful for the heart, it almost doubles the action of vitiation to the heart and circulatory pathways, as was also found in one of the patients in the study. Fish meat, a type of aquatic animal flesh and germinated grain, when taken together, are considered *viruddha*.<sup>40</sup> One patient was taking fish with whisky daily, and since whisky is made from germinated grain,<sup>41</sup> it acts contradictory to the body and causes sequels of incompatible diets, which may be considered as a cause for developing CAD.

### Obesity and Diabetes as Cardinal Risk Factors

Individuals who consume oily and high-calorie food daily, who are habituated to eating even if the previously consumed meal has not been thoroughly digested, who are addicted to the habit of sleeping during the day or to leading a sedentary life, who are averse to taking

any kind of physical exercise which is the main cause of *medovahasrotodusti*, experience an extra amount of fat deposited in the body, which may lead to obesity, and likewise this extra fat deposited in the arterial lumen may cause obstruction and hardness in the lumen.<sup>31</sup> *Sira* (~ arteries and veins) are nourished by *mridupaka* of *Sneha* of *meda dhatu* and if *meda* is formed in *apakwa* state, *aama meda dhatu* (~ bad cholesterol) circulates in the channels. The *sneha* from such *meda* leads to abnormal nourishment of *sira* and *sira kha vaigunya*, which ultimately results in blockage of *sira* and gradually results in *hridroga* over a period of time. The life span of an obese person is short as compared to a non-obese person<sup>42</sup> as the former group is always associated with many serious and terrible diseases which are the leading cause of death.<sup>43</sup>

Diabetes is a host of many diseases.<sup>44</sup> *Oja*, the vital life essence of the body tissues, is expelled out of the body through urine in diabetes,<sup>45</sup> resulting in *Ojokshaya* and the heart being the seat of *oja* is affected due to it. *Dhatukshaya* and *ojakshaya* also aggravate *vata* and other *doshas*. They cause structural, functional and metabolic changes in the body and provide a base for the development of many diseases. Insulin resistance and hyperglycaemia are associated with low-grade inflammation,<sup>46</sup> as well as with chronic enhancement of oxidative stress, triggering endothelial dysfunction and promoting atherogenesis.<sup>47</sup> They are major risk factors for CAD.<sup>48</sup>

### Pattern of Activity and Sleep Influencing Heart

*Avyayama* (~ abstinence from physical activity) causes *agnivikriti* (*jatharagni* as well as *dhatwagni*) and leads to *aama* formation.<sup>31</sup> It is also proven by research that some sort of physical activity is necessary for the normal metabolic function of the body and optimal health.<sup>49-51</sup> Excessive sitting for long hours and less physical activity cause accumulation of fat in wrong places preceded by an inflammatory response<sup>52,53</sup> development of insulin resistance, impaired glucose and lipid metabolism, and the process of atherosclerosis.<sup>54,55</sup> Evidence suggests that *TNF- $\alpha$* , an inflammatory marker, induces insulin resistance directly linked to the initiation of vascular diseases.<sup>56,57</sup> *Ativyayama* (~ excessive exercise) and *Atibharvahana* (~ lifting heavy weight) also aggravate the *vata dosha* in the heart region and cause many serious diseases like CAD.<sup>58</sup> So exercises should be performed to half of one's physical capacity (neither less nor more). Either of the same can produce disease as per the theory of *heena mithya* and *atiyoga* contributing to diseases as advised by the *Aacharya* of *Ayurveda*.<sup>59,60</sup>

*Nidra* (~ proper sleep), along with *Aahara* (~ healthy diet), are the two pillars of health.<sup>61</sup> Proper and timely sleep is necessary for the restoration of body tissues (*dhatu*s), and normalcy of system physiology and homeostasis.<sup>62</sup>

Proper sleep fabricates *kapha* in the body and balanced and immaculate *kapha* is also responsible for *bala* and *oja* in the body.<sup>63,64</sup> *Ratrijagrana* being *ruksha*<sup>65</sup> causes *vataprakopka*,<sup>18</sup> and further *agnivikriti*, *rasadusti*, and obstruction of circulatory channels, disturbing the physiological processes.

*Diwaswapana* (~ day sleep) was observed in the study while assessing the *nidana* but is not yet identified as a risk factor in contemporary science. As per Ayurveda, it should be considered as a matter of concern. Day sleep especially post lunch increases *snigdha*<sup>65</sup> and causes *kaphadusti*,<sup>18</sup> *agnimandhya*,<sup>31</sup> and *aama* formation. It is also the cause of *medovahasrotodusti*.<sup>66</sup> The mechanism interpreted in terms of conventional science could be through dyslipidaemia leading to atherosclerosis, and further to CAD.

### Addictions: Ayurveda & Modern Perspective

Excessive intake of *Madya* (~ alcohol) is one of the risk factors for cardiovascular disease as per Ayurveda, which is already established in many research<sup>67,68</sup> and was also observed in this study. *Madya* owing to its properties is quickly metabolised and reaches the heart, wherein it disturbs its normal functioning. It also affects the body's most subtle essence, *ojas*<sup>69</sup> vitiates and depletes it due to having the opposite quality i.e. *laghu* (~ lightness), *ushna* (~ hotness), *tikshna* (~ sharpness), *visada* (~ conspicuousness), *vikasi* (~ property of substance resulting in quick spread and action), *ruksha* (~ rough), *aasu* (~ swift), *vyavayi* (~ substances with quick spread even without digestion), *amla* (~ sour), and *sookshma* (~ subtle). *Madya* vitiates *pitta*, causes *raktadusti* and affects the *sira* (blood vessel damage) and *ojodusti* causing *hridroga*.

Tobacco, a poisonous factor having *vyavayi*, *vikasi*, *ushna* and *tikshna* properties, can vitiate *rakta dhatu*. The ill effects of tobacco were recorded in the 16th century AD in the ancient treatise of *Yogratnakara* as smoking tobacco being injurious to the heart.<sup>70</sup> In modern science, in the year 1960, Framingham's study found that cigarette smoking increases the risk of heart disease. Carbon dioxide and nicotine in the smoke make the blood thicker facilitating the formation of plaque, and damage the coronary artery, making it narrow with a decreased availability of blood, oxygen and nutrients to the body.<sup>71, 72</sup>

### Psychological Issues Impacting Heart

Psychological causes like *atichinta*, *shoka*, *krodha*, and *bhaya* reported in this study affect body metabolism in different ways by vitiation of *doshas*, *jathagni*, and *dhatwagni*.<sup>73,74</sup> *Aacharya Charka* has stated that *shoka* and *bhaya* increase *vata dosha*, and anger increases *pitta dosha*, which instantly affects the heart.<sup>74</sup> *Atichinta* directly depletes the *ojas* and causes vitiation of *rasa vahasrotas*. The heart, as the seat

of the brain, is involved in emotional response etc. so mental disharmony definitely affects the heart in harmful ways.<sup>75,76</sup> Anger shoots up blood pressure as a fight response by secreting vasoconstrictor hormones like adrenaline.<sup>77</sup> Anxiety and fear increase blood pressure and vascular changes by sympathetic stimulation and reported risk of CAD.<sup>78</sup> *Vishada* (~ depression) leads to various diseases and *Vishado rogavardanam* as mentioned in classical texts also aggravates and complicates the existing disease.<sup>79</sup> Negative emotions increase pro-inflammatory cytokines such as interleukin-6 (IL-6) that have a direct role in cardiovascular diseases.<sup>80,81</sup>

### Suppression of Natural Urges Emerging as A Causative Factor

*Mala veghaavrodha* (~ suppression of urge for defecation), described as a *nidana* of *hridroga*<sup>82</sup> in ancient times, was also observed in the present study. Forcefully suppression of bowel movement due to a busy schedule, increased workload, poor facility of toilets, dirty/ insanitary toilets, and long travelling hours were reported in the study as common reasons for *vegavidharana*. *Malasanchaya* in *pakwashya*, due to voluntary suppression of the urge to defecate, envelops the *vata dosha* (*purishaavrita vata*) as *pakwashya* is the main site of *vata dosha* and dried *mala* after some time obstructs the path and its forceful initiation causes *apanavayu dusti* and its upward movement causes vitiation of *pranvayu* in the heart, thereby harming it.<sup>83</sup> *Koshtha* (~ abdomen) is the place of *samanvayu* and due to improper excretion of flatus and faeces, *samanvayu* envelops *apanavayu* resulting in the symptoms of *hridroga*.<sup>84</sup> *Vayu* controls and regulates the flow of metabolites and contractions; however, when vitiated, it causes altered kinesis in the heart muscles and altered functioning can be correlated as *hriduprodhanam*, *hridroga*, *hridgada*, and *awasthyamhridyam* in Ayurveda. *Vayu*, when suppressed, redirects the flow in the opposite direction, disrupting the normal flow and exerting upward pressure on the diaphragm. This increases intra-thoracic pressure bringing a negative impact on the heart.<sup>85</sup> The association of constipation with cardiovascular events has also been reported in previous research. Straining in stool causes blood pressure rise, which can trigger cardiovascular events such as congestive heart failure, arrhythmia, and acute coronary disease.<sup>86,87</sup> Altered microbiota by constipation can induce atherosclerosis, blood pressure rise, and cardiovascular events.<sup>88,89</sup> *Purishvegadharana* causes *adhmana* (~ bloating) and patients with recurrent complaints of flatulence and fullness of the abdomen are the reported cases of cardiovascular disease.<sup>90,91</sup> A history of haemorrhoids for a long time also accounts for cardiovascular events.<sup>92</sup> Vitiated *vayu* due to *vegavidharana*<sup>18</sup> suppresses digestion and leads to the formation of toxic substances<sup>93</sup> which circulate through *vyanavayu*, vitiate *rasavahasrotas* and

its root place heart.<sup>7</sup> Suppression of tears or inhibition of emotions due to anxiety and sorrow are causative factors for the development of heart disease as mentioned in Ayurveda.<sup>94</sup> Tear suppression causes vitiation of *vayu*<sup>78</sup> as *vayu* is responsible for all types of physiological activities<sup>95</sup> including tear flow as a reflex action. Emotion suppression increases sympathetic activation and stress hormone production which might lead to functional impairment of the heart.<sup>96, 97</sup>

### Conclusion

Nidana of *hridroga* described in Ayurveda was found to be a causative factor of CAD. Nidana such as *diwaswapana*, *purishvegadharana* and *ashruvegadharana* emerged as modifiable behavioural risk factors which are not yet included in contemporary science. Knowledge, awareness, and practice about Vegavidharna is a need of time and promoting it via proper counselling should be considered. The present research work was carried out retrospectively on a very small population in limited time and available facilities. The patients were also having some problems recalling the proper history of nidana for the derivation of a vivid picture of epidemiology. Prospective multicentric studies on a larger cohort are necessary for the establishment of the relevance of Ayurvedic concepts. Awareness of the aetiological factors and preventive principles is the first step towards controlling CAD.

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## Annexure

## Nidana Assessment Questionnaire for Hridroga (Coronary Artery Disease)

1. Have you experienced intense grief in the past day or months for losing your dear ones (death/ divorce), financial loss, failure in life achievement and so on? (Shoka)

a) Yes      b) No      c) Specify

2. Are you interested in fasting? (Upvasa)

a) Yes      b) No      c) Specify

2.1 Please specify the type of fasting -

a) Nirahara (without food)

b) Phalahara (with fruits and dry fruits)

2.2 How many times do you fast in a week?

5 (4)	3 (3)	2 (2)	1 (1)
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2.3 How much time (in hours) do you spend in a day without food?

8 (1)	12 (2)	16 (3)	24 (4)
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3.1 How many times do you take meals/ snacks in a day? (Alpa\*, Adhyashan\*\*)

> 4 (4)	3-4 (3)	2 (2)	1 (1)
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3.2 What is the amount of meal consumed by you most of the time? (Alpa and Matra Guru)

More than my satiety (4)	To my satiety (3)	A little less than my hunger (2)	Considerably less than my hunger (1)
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4.1 How often do you take food which is heavy in consistency (urad ki khichari, made up of urad or chawal flour pitthi, kheer, fish or other aquatic animals, red meat, chicken etc.)? (Guru)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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4.2 How often do you take heavy meals which are more in quantity than their own intake and digestive capacity? (Guru)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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Note: Alpashana - grade 1

Adhyashana - grade 4

5. Are you in a habit of taking food which is devoid of or has less quantity of ghee or oil? (Ruksha)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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6. How often do you take excess ghee, butter or oil in food, fried food - puri kachori, French fries chips, high-fat food, chicken, meat, cashews, walnuts etc.? (Ati Snigdha)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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7. Are you in a habit of taking dry food, not having water or oil in its constituents by nature, like murmure, kheel, chane, toast, popcorn, chiwda etc. in excess quantity? (Shushka)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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8. Do you take hot food/ beverages or items hot in nature like coffee, tea, red chilli, spices, ginger, garlic, til, jaggery etc. in excess quantity? (Ati Ushna)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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9. Do you take sour items or acidic food like achaar, khatai, curd, sauce, vinegar, carbonated drinks, sodas, refined sugar, junk food, processed food, fish, fresh meats, pork, beef, black tea, caffeinated beverages like coffee, tea, citrus fruits etc in excess quantity? (Ati Amla)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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10. Do you take an extra quantity of salt in meals or excess salty food items in your diet like chips, Kurkure, achaar, and preserved and processed food? (Ati Lavana)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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11. Do you take spicy food in excess quantity? (Ati Katu)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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12.1. After how much time (in hours) do you generally feel hungry after taking your full regular meal? (Jaranshakti)

< 3 (1)	3–4.5 (2)	4.5–6.0 (3)	> 6 (4)
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12.2. Do you take your meal again without achieving the symptoms of jirnaahar (udgarshudhi, utsaha, vegutsargayathochita, laghuta, kshut, pipasa)? (Ajrne bhojne)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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13.1. Do you take alcohol (hard drinks), soft drinks etc.? (Madya)

a) Yes      b) No      c) Specify

13.2. How often do you drink?

- Once a week
- Twice a week
- 3 or 4 times a week
- Almost every night
- On specific occasions like marriage etc.
- In a stressful situation

13.3 How many drinks are you likely to have?

1 (1)	2 (2)	3-4 (3)	> 4 (4)
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14. Do you consume tobacco (smoke and/ or smokeless)?

a) Yes      b) No      c) Specify

14.1. How long (in years) have you been consuming tobacco (smoke and/ or smokeless)?

< 1 (1)	1-2 (2)	2-4 (3)	> 4 (4)
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14.2. State of consuming tobacco (smoke and/ or smokeless)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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14.3. How many bidis/ cigarettes/ paan/ gutka etc. do you consume per day?

1. < 5      2. > 5      3. > 10      4. > 20

15. Are you taking any medicines frequently which change your pH balance or alkalise the blood? (Kshara)

a) Yes      b) No      c) Specify

- Calcium pills
- Diuretics
- Antacids
- Laxatives
- Alkaliser

16. Have you suffered from excess vomiting (presenting the features of Ativaman - Trishna, Bhrama, Murchha, features of Rasakshaya or electrolyte imbalance) in the past seven days? (Chhardi)

a) Yes      b) No

17. Have you suffered from excess diarrhoea (presenting the features of Ativirechana - Trishna, Bhrama, Murchha, features of Rasakshaya or electrolyte imbalance) in the past seven days (excessive diarrhoea or Atisara)?

a) Yes      b) No

18. How do you grade your anger? Specify (Krodha)

Calm (0)	Mildly irritated (1)	Annoyed (2)	Furious (out of control) (3)
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19. How would you rate your physical exertion? (Vyayama)

Grade	Intensity	Description
1	Very light	Little to no activity
2–3	Light	Feels like you can maintain activity for hours, easy to breathe and carry on a conversation
4–6	Moderate	Feels like you can maintain activity for hours, breathing heavily but can carry on a conversation
7–8	Vigorous	On the verge of becoming uncomfortable, breathing heavily but still able to speak
9	Very hard	Difficult to maintain exercise intensity, conversation becomes difficult
10	Maximum efforts	Feels almost impossible to continue, no conversation possible

20. Do you spend most of the time of day without being physically active? (Achesta)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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21.1. Have you worked in an excessively hot environment for a long time in the past years? (Ushna, Aatap)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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21.2. How long (in hours) do you work in a hot environment?

1–2 (1)	2–4 (2)	4–8 (3)	> 8 (4)
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22. Do you get easily or excessively tense in unfavourable circumstances? (Chinta)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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23. Do you have a nature of being tension-free or not being bothered at all or little for important and crucial subjects? (Achinta)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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24. Sleep pattern and sleep quality (Alp nidra, nidra sukham aadhikam, ratri jagran)

24.1. At what time do you go to bed every night and wake up every morning?

1. At night      2. In the morning

24.2. How many hours do you sleep on an average night?

1. No sleep at all    2. < 4 hours    3. 5–7 hours    4. 8–10 hours    5. > 10 hours

24.3. How long does it take for you to fall asleep?

< 10 minutes (1)	10–30 minutes (2)	Up to 1 hour (3)	> 1 hour (4)
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24.4. How many times do you wake up each night?

Never (1)	Once per night (2)	2–3 times (3)	Frequently awakening (4)
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24.5. Do you feel refreshed on waking up in the morning?

a) Yes      b) No      c) Specify

24.6. How often do you feel sleepy during the day?

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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25.1. How much do you sleep in the daytime? (*Divaswapana*)

None (1)	0.5–1 hour (2)	1–2 hour (3)	> 2 hours (4)
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25.2. Do you sleep after lunch?

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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26. Mention the things which are not wholesome to the body? (*Viruddha Aahara*)

a) Yes      b) No      c) Specify

27. Do you have a phobia of height, examinations, public gatherings etc.? (*Bhaya*)

a) Yes      b) No      c) Specify

28. Are you humiliated by another person for a long time? (*Trasa*)

a) Yes      b) No      c) Specify

29. Did you experience any injury in the past one year? (*Abhighata*)

a) Yes      b) No      c) Specify

1. A fall with an injury on the chest
2. A fall with massive blood loss
3. Two or more falls

30. Did you have *Atiyoga* of *vamana* (~ emesis), *virechana* (~ purgation) or *vasti* (~ enema) in the past 7 days?

a) Yes      b) No      c) Specify

31. Did you follow the proper *Sansarjana karma* (~ regulated diet and lifestyle) after taking any *Panchkarma* therapy?

a) Yes      b) No      c) Specify

32. Do you exercise, jump, or swim after taking meals?

a) Yes      b) No      c) Specify



Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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33. Do you consume excessive cold water in the hunger state?

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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34. Did you forcefully induce vomiting in the past 7 days?

a) Yes      b) No      c) Specify

35. Do you have a habit of suppressing your Vegas (natural calls/ urges)? (Vega sandharan)

a) Yes      b) No      c) Specify

35.1. Purish vega dharana (suppression of urge for defecation )

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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35.2. Aapana vayu vega dharana (suppression of flatus)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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35.3. Udgara vega dharana (suppression of belching)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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35.4. Pipasa vega dharana (suppression of thirst)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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35.5. Kasa vega dharana (suppression of cough)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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35.6. Ashru vega dharana (suppression of tears)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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35.7. Shwas vega dharana (suppression of breathlessness due to physical exertion)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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35.8. Shukra vega dharana (suppression of natural sexual urge)

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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36. Do you lift heavy weights more than your physical capacity? (Ati bhar vahan)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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37. Do you take sun exposure for some time in a day? (Surya rashmi sewan)

a) Yes      b) No      c) Specify

Rarely (1)	Sometimes (2)	Frequently (3)	Always (4)
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37. Are you suffering from any of the following diseases for a long time? (Gadatichara)

a) Yes      b) No      c) Specify

- Diabetes (Vataj prameha)
- Anaemia (Pandu)
- Gout (Vata rakta)
- Coagulation abnormalities (Rakta pitta)
- Chronic metal poisoning (Dushi visha)
- Worms infestations (Krimi roga)
- Irritable bowel syndrome (Grahni)
- Inflammatory bowel disease
- Chronic constipation (Purish aavrita vata)
- Hypertention (Vyan vayu vaishamya)
- Hypercholesterolemia (Medoj dusti)
- Hypothyroid
- Hyperthyroid