



A REVIEW ARTICLE ON ROLE OF OXIDATIVE STRESS IN NIDANA , SAMPRAPTI AND PREVENTION OF HRIDROGA

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ABSTRACT

Proper nutrition is very essential to maintain positive health. As per Ayurveda, ahara itself can act as causative factor for health and disease. Mental health is attained through proper food. Oxidative stress plays a major role in pathogenesis of Cardiovascular disease. Ayurveda has explained multiple causative factors in disease Hridroga. Majority of the causative factors belonged to ahara and manasika factors which play major role in pathology. All these factors cause vatadi dosha kopa and rasa dushti. Based on dosha, nidana are different for each Hridroga. Each nidana has different pathology and mechanism of action in Hridaya. Guna of ahara like theekshna, ruksha ,sushka usna ,and snigdha can act as oxidative stress in tissues. The possible actions are Endothelial injury, vascular inflammation, haemodynamic stress. Manasika factors also have action in metabolism as increased stress causes rasa dushti and elevated cortisol level. Consumption of ahara by considering its guna and karana is essential as the nutrients are the most concern. Current practice of food intake and food processing involves ruksha ,sushka, Snigdha guna mainly .Thorough understanding of nidana ,samprapti can help to initiate appropriate preventive measures. Oxidative stress factors in ahara and manasika nidana ,samprapti and preventive aspects of Hridroga are discussed in this review.

KEYWORDS : Hridroga, Ahara, Guna, Nidana, Oxidative stress

Introduction:

Cardiovascular diseases (CVD) are the main cause of death globally, taking an estimated 17.9 million lives each year.¹ Obesity, high blood pressure, insulin resistance, and ageing are associated with the development of cardiovascular diseases (CVDs). Currently mortality rates are the consequence of previous exposure to behavioural risk factors such as inappropriate nutrition, insufficient physical activity and increased tobacco consumption.¹

High intake of macronutrients and also increased mental stress can induce oxidative stress and subsequently contribute to inflammation via NF- κ B-mediated cell signaling pathways. Oxidative stress has a central role in the pathogenesis of atherosclerosis and also obesity may induce system oxidative stress.² Lifestyle, environmental, genetic, and epigenetic interactions reflect complex pathological processes in which the oxidative stress caused by reactive oxygen species (ROS) plays a major role in manifestation.³

Nidana of *Hridroga* mentioned in Classics are *Aharaja*, *viharaja* and *manasika* factors. *Hridaya* is *Moola* of *Pranavaha* and *rasavaha* srotas and is also *Adhistaana* for *Chetana*, *Prana*, *Mana* and *para ojas*.⁴ *Virudha* ahara, *adhyasana*, *asatmya* ahara and *manasika* bhava aggravates *Vatadi* dosha and *inturn* vitiates the *rasa* in *Hridaya*. It is the *samprapti* of *Hridroga*.⁵ *Vyana* vata get aggravated by *bhaya* and *harsha* *manasika* bhava thereby impairing the *rasa* dhatu circulation.⁶ Diagnosis can be done well with help of *Nidana panchaka*. Among them, *Nidana* is the important tool which give both knowledge about the causative factor and also helps in prevention by avoiding them. Proper diet and regimens can reduce the *rasa* dhatu vitiation.

AIMS AND OBJECTIVES :

Review of *Samanya* and *Vishesha Aharaja and manasika Nidana, Samprapti and prevention of Hridroga*
Understanding role of oxidative stress factors in the *Nidana* , *Samprapti and prevention of Hridroga*

METHODOLOGY

Literature review on *samanya* and *vishesha aharaja and manasika nidana* , *Samprapti* and preventive aspects of *Hridroga* ,collected from classical texts of Ayurveda. Modern aspects of oxidative stress in CVD taken from various published research papers in Pubmed,scopus.

Samanya Hridroga Nidana (Aharaja and manasika)

Consumption of food which is *Ushna* and *Tikshna* in excess quantity, use of *Virudha* ahara (incompatible food), *apakwa ahara* (uncooked food), *asatmya ahara* (unaccustomed food items) and *manasika bhava* like *Chinta* (worry), *Bhaya* (fear), *Trasa* (stress) leads to *Hridroga*.⁷

Visesha Nidana (Aharaja and manasika)

Vatika Hridroga: Intake of *ruksha* and *sushka ahara* and *upavasa* (*Aharaja*)

Soka (*Manasika bhava*)⁸

Pittaja Hridroga: : *Usna*, *amla*, *lavana*, *kshara*, *katu*, *ajeerna* *bhujana*, *madya* (*Aharaja*)

Krodha (*manasika bhava*)⁹

Kaphaja Hridroga: Excessive intake of *Guru*, *Snigdha ahara* (*Aharaja*)¹⁰

Krimija Hridroga- *Tila*, *Ksheera*, *Guda* and *madhura ahara* (*Aharaja*)

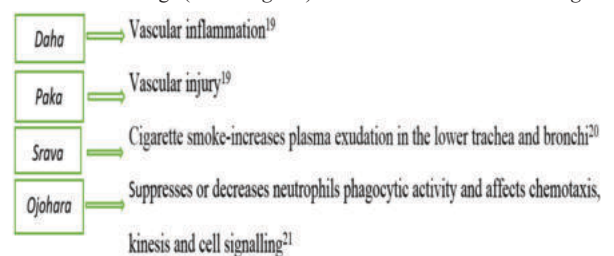
Discussion:

Tikshna dravya :

Tikshna dravya are having actions like *daha*, *paka*, *sravana*¹¹ and also causes *ojohara*. *Madya*, *lavana*, *kshara* and *sukta* preparations are having *tikshna guna* .Alcohol consumption, excessive salty food ,pickle preparation, smoking can be considered as *tikshna dravya sevana*. Excessive alcohol consumption, and smoking have been correlated with a higher incidence and prevalence of CVD and Diabetes. Excessive alcohol consumption cause oxidative stress and free radical damage which inturn causes cardiac and liver diseases.¹² Smoking potentially increases the risk of acute coronary and cerebrovascular events, including myocardial infarction, stroke and sudden death. The major mechanisms of smoking-induced CVD are: 1) oxidative injury 2) endothelial damage and dysfunction, 3) enhanced thrombosis, 4) chronic inflammation, 5) hemodynamic stress, 6) adverse effects on blood lipids. Oxidative damage occurs by endothelial cell activation, dysfunction and damage (both reducing bioavailability of nitric oxide [NO] and depleting endogenous antioxidants.^{13,14,15,16,17,18}

Implicated mechanism in the body by *tikshna guna* :

Effects of smoking (*Tikshna guna*) as a causative factor for *Hridroga*



Chintabhayatrasa

Hridaya is the seat of manas, para ojus and one among Dasa pranayatana.²² Protection of ojas is essential to have a healthy heart .Ojas can be considered as drvaya which possess guna ,varna,gandha and rasa also.Prolonged exposure to stress factors like anxiety ,overthinking, fear and sorrow cause rajo manodosha dusti and inturn aggravates the Vyana vata .Impaired Vyana vata circulates vitiated rasa all over the body and Hridaya. Rasa dhatu dushti occurs which can cause the dusti of other dhatu.

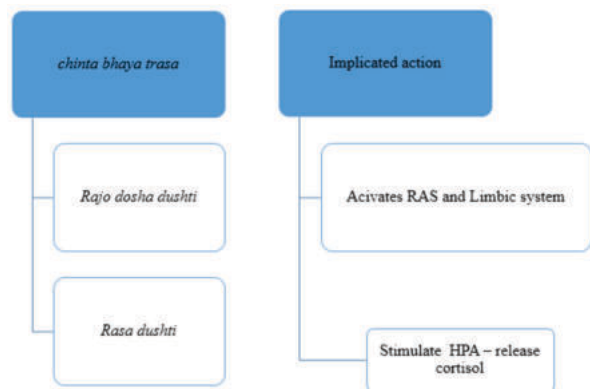
Stress and depression also modulate the production of hormones such as adrenaline, corticoids, and catecholamine that in turn influence the immune system Stress also cause increases in Norepinephrine which is associated with elevated plasma levels of TC, LDL-C, and HDL-C. Stress induces an atherosclerotic lipid profile with oxidation of lipids that may result in arterial thrombosis²⁴ .Oxidative stress has been increased in the response to stress.²⁴

On the whole the Function of Hridaya and implicated mechanism due to Manasika bhava as illustrated in the Figure 1 and 2

Figure .1 Function of Hridaya



Figure. 2 Effect of Manasika bhava on action of Hridaya

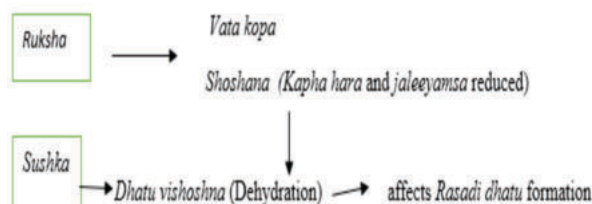


Visesha nidana in Hridroga

Vataja Hridrga nidana: ruksha and sushka ahara and upavasa (Aharaja)

Soka (Manasika)

Intake of ati ruksha and sushka causes shoshana and akledanam respectively.²⁵ Prolonged use leads to vata prakopa and lead to dhatu kshaya and karshana. Food items like deep fried, charred, processed and tinned food can be correlated to ruksha and sushka ahara in which jaleeyamsa are less. Ultra proceesed and charred food increases the CVD risk. Excessive restriction of calories causes dysregulation of hormone mechanism.²⁶ During hypohydration, elevated plasma [Angiotensin II] elicits vasoconstriction in small arterioles to increase total peripheral resistance get contribute to endothelial dysfunction. Ang II infusion elicits endothelial dysfunction and stimulates Nicotinamide adenine dinucleotide phosphate (NADPH) oxidase (NOX)-mediated increase in reactive oxygen species (ROS) in smooth muscle cells from human resistance arterioles.²⁷ Suboptimal water intake (less than highest standard) has been demonstrated to enhance serum- and glucocorticoid-inducible kinase 1 activity (SGK1), which participates in the pathophysiology of a number of disease like hypertension, thrombosis, stroke, and cardiac fibrosis.²⁸



Current Food Practice (Example Of Vataja Dosha) Are Depicted In Table 1

Table .1 –Apathya of Vataja Hridroga

Apathya ⁸	Current Practice
Ahara:Sushka ,Ruksha,intake of less food,Suska mamsa,,sushka Saka	Charred, tinned, Ultra processed, Deep fried food
Ayasa,Atyadhwa,Ratri Jagarana	Over exercise ,Athelete, Night Shift work

Pitta visesha nidana

Pittaja Hridroga Nidana: *Ati lavana,katu,Usna ahara and madya (Aharaja),Ajeerna bhojana*

Krodha(Manasika)

Excess consumption of *lavana ahara* causes weakness of body²⁹ and it involves degenerative process. Spicy food intake can cause central abdominal obesity , imply fat energy intake as a potential mediator linking the increased prevalence of abdominal obesity and increased blood pressure.³⁰ Excessive alcohol consumption cause oxidative stress and free radical damage which inturn causes cardiac diseases.³¹ Anger has association with coronary artery disease .³² Diet that is based on high –heat treated foods can be considered as *ati usna* ahara and also it increases markers associated with an increased risk of type 2 Diabetes and CVD.³³ *Ajeerna bhojana* leads to ama formation and *rasa dusti*. GERD is associated with an increased risk of developing CHD.³⁴

Atilavana causes *rakta vardhana* and it has *visha guna* and this affects *indiya*.³⁵ High salt intake affects vascular function as there is elevated oxidative stress and impaired vasodilatation of the small vessels .These terms can be discussed in following aspects.

Rakta vardhana- As the salt intake increase, the vasoconstriction occurs and causes expansion of blood volume by retaining fluids in the venous circulatory system

Visha guna – Over consumption leads to salt toxicity like hypernatraemia.³⁶

Indriya uparunadhi- *Indiya* are *karmendriya* and *jnanendriya* that can be correlated as nervous system. Chronic increases in dietary salt intake enhance sympathetic nerve activity and arterial blood pressure (ABP).²⁷ **Current food practice (Example of Pitttika dosha) are depicted in table. 2**

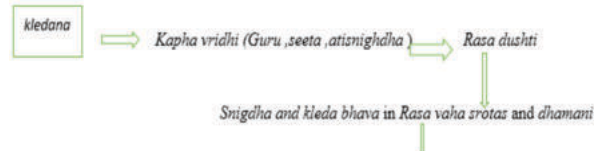
Table .2 -Apathya of Pittaja Hridroga

Apathya ⁹	Current practice
Ati katu,lavana ahara,usna ahara	Spicy Food, Salted chips ,fishes and fruits, Sauce, Ultra processed food ,deep fried
Atapa, Krodha	Labourer work, Steel industry, Chemical industries, Work stress

Kapha visesha nidana

Kaphaja Hridroga Nidana : *Atyadana, Ati guru and snigdha ahara (Aharaja)*

Snigdha ,guru ahara are the dietary factors .*Snigdha* can produce *kledana* in the *dhatu* and *guru guna* is having *brimhana sakti*.over consumption of saturated fatty acid and oily food increases LDL and atherosclerotic effects.³⁸ Increased frequency of meal is associated with CVD.³⁸Increased calorie intake makes triglycerides raised.



Current Food Practice (Example Of Kaphaja Dosha) Are Depicted In Table 3

Table .3-Apathya of kaphaja Hridroga

Apathya ¹⁰	Curren practice
Atyadana ,Guru snigdha ahara	Increased frequency of meals ,use of Pastries, Trans fatty acid food, Pizza ,Burger, Butter ,Vanaspathi ghee, Large portion size of food

Krimija Hridroga

Hridroga nidana: Tila, Ksheera, Guda and madhura ahara (Aharaja) Sweetened food and refined sugars can promote atherosclerosis. Increased consumption of sweet has a chance of getting dental caries. Dental caries was significantly related to cardiometabolic risk factors (e.g. lipid profile, body mass index, and waist circumference) in adolescents.³⁹

Prevention

As the *nidana* of *Hridroga* involved are *manasika, aharaja* and *viharaja* factors. These cause inflammation, oxidative stress and oxygen deprivation in myocardium. Preventive aspects can be incorporated to maintain cardiac health, maintenance of *ojas*. This is needed to protect *hridaya* which can be attained through proper *ahara* and *vihara*. Here discussion is regarding the preventive role of *aharaja* and *manasika bhavas* in *Hridroga*.

Hridya: *Hridya dravya* is conducive to *Hridaya*.⁴⁰ *Hridya ahara* includes *dhanya, phala, saka, taila, vyanjana, Ksheera, kritanna*

Ojasyam: The *dravya* which are conducive to *ojas* and helps in the formation of excellent *dhatu*. It can be attained through *pathya ahara* and *vihara*. Eg; *Ksheera, Jeevaniya Oushadha, Rasa*.⁴¹

Balya: The *dravya* which are conducive to *bala*. Proper *poshana* and *vihara* helps in attaining good *bala*; *Yuktikritabala* is attained through proper *ahara* and *chesta*.⁴² *Balya ahara* are *mamsa rasa, saktu, tila*

Jeevaneeya: The drugs which are having *jeevaneeyna* and *ojasya*⁴³ properties. Food includes *Mamsa rasa, Ksheera, Jeevani*

Rasayana: Drugs which augments the *dhatu* and also way to attain excellent formation of *dhatu*. *Brahma Rasayana, Amalaki Rasayana, Shilajeet Rasayana, Agastya Haritaki, Chayavanprasha Rasayana* are *pathya* in *Hridroga*.⁴⁴ *Amalaki* and *Ksheera* have *rasayana* properties

Table.4- Preventive aspects of Hridroga

Preventive Aspects ^{45,46,47,48,49}	Action of selected Ahara
Hridya Aahara: Dhanya: Purana rakta Sali, Yava Mudga, Kulatha Saka: Sunti, patola, Karavellaka Phala: Drakasha, Dadima Kritanna: Laja manda, Vilepi, Yusha Vyanjana: Saindhava	Mudga-rich in polyphenols, flavonoids and anthocyanin- Antioxidant effect ⁴⁵ Karavellaka- possesses high phenolic content, i.e., gallic acid, alkaloids, saponins, flavonoids, hypoglycemic and hypolipidemic activities ⁴⁶ Dadima- Bioactive constituent - punicalagin Antioxidant and free radical scavenging actions ⁴⁷
Ojasyam: Ksheera, Rasa	Ksheera: not contribute CVD, contains vitamin K and Vit D47
Balya: Mamsa rasa, saktu, Tila, Kilata	Kilata: dairy and fermented dairy products - Vit A and Vit K, Reduces LDL cholesterol ⁴⁹
Jeevaneeya: Gavya Ksheera, Mamsa rasa	
Rasayana: Amalaki, Ksheera, Chayavanprasha Rasayana	Having antioxidants and free radical scavenging effect

Conductive cooking method food preparation

Microwave cooking caused the greatest loss of vitamin K. Steaming and boiling retains the vit K comparatively.⁵⁰ Preparations like *yusha, peya, vilepi, raga* are *hridya*.

CONCLUSION

Hridroga mentioned in *Ayurveda* is multifactorial disease. *Aharaja* and *manasika* factors cause oxidative stress in the cell and tissue of the body and are having primary role in atherosclerosis. Attributes or *Guna* like *ati theekshna, usna* and *guru* have effects like vascular inflammation, Endothelial injury and oxidative stress. Mental factors have role in cortisol cholesterol level production and causation of oxidative stress. A thorough understanding of *nidana* are very essential form application of preventive aspects of *Hridroga* with special emphasis on oxidative stress.

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