



HEALTH PROMISING NUTRITIONAL MILLETS (KSHUDRA DHANYA) FOR CARDIOVASCULAR DISEASES AND ITS MODIFIABLE RISK FACTORS: AN EVIDENCE-BASED OVERVIEW.

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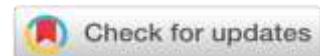
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ABSTRACT

Cardiovascular disease is a leading cause of death worldwide in today's era along with rising risk factors such as diabetes, hypertension, dyslipidemia, malnutrition, etc. Acharyas treats Diet as '*Mahabhaisajya*' (the superior medicine). *Shuka Dhanya Varga* (group of Cereals) is reviewed for their properties for *Santarpanotha* (alleviation of heart diseases by excessively nourishing bodily tissues), heart diseases, and other modified risk factors. This review aims to concisely outline the nutritional essentials and therapeutic characteristics of millets for cardiovascular diseases and the alteration of risk factors associated with heart health. In this review, we have tried to summarize the essential nutrition and therapeutic properties of millets for cardiovascular diseases and modified risk factors for heart diseases. Millets offer numerous health benefits, including the reduction of cardiovascular disease and its associated risk factors contributing to mortality. Millets serve as a great source of essential nutrients and trace elements, playing a pivotal role as catalysts in supporting the optimal functioning of the cardiovascular system.

Moreover, trace elements provided by millets help the cardiovascular system primarily function as catalysts and are a good source. This comprehensive review draws from various authentic sources, including Ayurvedic texts, medical books, and published articles from reputable scientific sources like PubMed, Google Scholar, and Science

Direct. This article reviews the various authentic sources from Ayurveda texts, medical books, and published articles from scientific sources such as PubMed, Google Scholar, Science Direct, etc. The primary focus of this review is extensive research on the benefits of nutrition, the balance of *Ayurvedic Doshas* (fundamental elements), and a comprehensive evaluation of therapeutic properties. Essentially, the principles are adopted from value-added research of nutritional benefits and research along with Ayurveda dosha balancing and centred review of therapeutic properties. The evidence-based review of research shows that *Kshudra Dhanya* (millets) have been proven for anti-atherosclerotic, anti-hypertensive, hypoglycemic, and anti-dyslipidemia properties.

Keywords: Millet, Heart disease, *Kshudra Dhanya*, modified risk factors

INTRODUCTION

Cardiovascular complications are the leading cause of death worldwide, affecting millions of people worldwide and causing approximately 17.9 million deaths each year, according to a 2020 report from the World Health Organization. The main habits that cause heart attacks and stroke include malnutrition, physical inactivity, smoking, and alcohol consumption. Due to behavioural risk, humans may develop obesity, hyperglycemia, and hyperlipidemia. Millet has been used as a source of nutrients and part of nutrition in Ayurveda since ancient times. *Samhita Kala* belongs to the "*Kshudra Dhanya*" (Millets). One of the best medicinal uses of this grain is *Pathya* (healthy preparation) in treating various ailments. According to the International Journal of Food Science and Nutrition, Millet is divided into two types, small-grained and large-grained, according to their size. Pearl millet and finger millet are the main millets. Small millet, rice, small millet, rice millet, kodo millet, barnyard millet, etc. includes.[1]

Ayurvedic perspective (Review on Ayurvedic literature)

In Ayurveda, *Kshudra Dhanya* (millets) refers to trim or minor grains and cereals. They are considered an essential part of a balanced diet. Millets are recommended in Ayurvedic dietary guidelines due to their unique properties and health benefits. *Acharya Bhavmishra* has mentioned the description under *Dhanya Varga* (cereals group). Millets are referred to by various synonyms in *Ayurveda*, such as "*Kudhanya*," as described by *Acharya Charaka*, signifying their categorisation as inferior among cereals. *Acharya Bhavmisra* termed them "*Kshudra Dhanya*," high-

lighting their small-sized grain nature, while *Kaidev Nighantu* refers to them as "*Trina Dhanya*," emphasising their origin from grasses.

Generally, millets are *Rasa* (taste) *Kashaya* and *Madhura* (sweet and astringent), *Guna* (quality) - *Laghu* (light), *Ruksha* (dry or absorbing energy), *Veerya* (potency) - *Sheeta/Anushna* (cold, not hot), *Vipaka-Katu* (pungent), *Karma* (action) - *Lekhana* (scrapping), *Vrishya* (aphrodisiac), *Kledashoshana* (soothes excess moisture), *Malabaddhata* (fecal impaction). The effects of *Tridosha* and *Dhatu* are *Kapha-Pittahara* (calms *Kapha* and *Pitta Dosha*), *Vatala* (causes aggravates *Vata*), and *Rakta Shaamaka* (purifies blood). [2]

As for *Hridroga*, millet is recommended for *Rakta Dushti* (blood impurity), *Pittaja Hridroga*, and *Kaphaja Hridroga*. [3] The consumption of millet can affect the balance of the unctuousness of *Kapha Dosha* in Ayurveda. Therefore, millets will benefit *Sthoulya* (Obesity), *Medodoshti* (Vitiated Fat metabolism), and *Rakta Dushti* (Vitiated blood *dhatu*). Millets should be avoided during Pure *Vataja Hridroga* treatment because they can worsen the condition. In this regard, the main indications for eating millet are *Sthoulya* (obesity), *Madhumeha* (diabetes), *Medoroga* (diseases caused by excess lipids - *Dhamani Praticchaya*), and other things *Santarpanajanya* (diseases caused by one or more nutrients many organizations). This is generally a poor lifestyle. Advising according to each person's *Agni Bala* (digestive capacity) is important. Beneficial effects of millets include *Lekhana* (scrapping) and *Kleda Shoshana* (over-drying), which can help cure *Santarpanajanya Vyad-*

hi (diseases caused by excessive consumption of diet and lifestyle). Although millets are challenging to digest, their general properties include *Laghu* (lightness). This shows that when appropriately absorbed, it gives the body a feeling of lightness. (See individual Ayurvedic pharmacodynamics and properties in Table 2) (See Figure 1: Overview)

Materials and Methods

Study period:

The review's search strategies are taken from all the published studies through December 2022, taken from a database of WHO, Medline, PubMed, the Digital Helpline of *Ayurveda*, *Charaka Samhita*, *Sushruta Samhita*, *Bhavprakash Nighantu*, *Kaideva Nighantu*, the *Priyavata sharma* book of *Dravya Guna*, and other ayurveda resources. (See Table 1 for the search strategies and keywords.)

Inclusion Criteria:

Research studies conducted on people, as well as animal models with all types of millets counting sorghum, finger millet, pearl millet, small millet, kodo millet, barnyard millet, foxtail millet, proso millet, were included independently. The study was extracted from the review on cardiovascular disease along with its modified risk factors with particular reference to Blood sugar level, Insulin secretion and resistance, Lipid profile, Hypertension, Atherogenic action, and other trace elements required for cardiac health in optimum quantity.[4]

Exclusion Criteria:

The studies that were irrelevant to cardiac health and lacked numerical values were excluded.

Bioactive compounds of millets with relation to cardiovascular disease:

The variety of millets major as well as minor millets are selected from the classical database. The important nutritional properties essential for the prevention and cure of heart diseases and behavioural risk factors are mentioned. Multiple studies on the cardiovascular properties of millets and their associated risk factors (See Tables 3 and 4).

RAGI (FINGER MILLET- *Eleusine coracana*)

The high dietary fiber content of *Ragi* helps eliminate *Ama* (toxins from poorly digested diets). Dietary fiber

prevents *Ama* from adhering to these blood channels and causing blockages in the channels. Thus, it facilitates free blood flow and nutrients to the heart. *Ragi* has the highest calcium content among all millets (344 mg/100 g).

It is experimentally demonstrated that finger millet controls the renin-angiotensin system by diminishing angiotensin-converting chemical levels and suppressing renin mRNA expression in the kidney. The finger millet has also illustrated striking enhancements in vascular remodeling, particularly turning around the average thickening and decreasing the media thickness/lumen diameter proportion within the aorta. These discoveries recommend a powerful nutraceutical for effectively regulating the renin-angiotensin system while concurrently inhibiting oxidative stress, highlighting its potential as a promising therapeutic intervention for hypertension.[6]

NALI (PEARL MILLET- *Pennisetum glaucum*)

Pearl Millet is high in magnesium, which benefits the cardiovascular system by lowering blood pressure and minimizing the risk of cardiac attack or stroke. Magnesium could be a vital mineral that is crucial in various natural capacities, including blood pressure control.

Magnesium in the pearl millet enhances nitric oxide production (a signaling molecule that relaxes blood vessels) in the vasculature. Pearl millet also contains plant lignans, which are transformed into animal lignans in the body and help to prevent heart diseases. The highest levels of niacin in pearl millet help to prevent and treat heart diseases and associated risk factors. It works as a probiotic nutrition for the microorganisms in the bodies and stops them from becoming constipated. Niacin decreases cholesterol with phytates, polyphenols, and other antioxidants. It is also effective in lipid and lipoprotein abnormalities linked with cardiovascular risk. Pearl millet is associated with insulin secretion, a reduction in plaque formation, and a lowering in blood cholesterol levels because it is an excellent source of phytic acid. Phytic acid supplementation in pearl millet helps to lower blood glucose levels, which is beneficial for controlling diabetes. [8, 9,10]

YAVANAALA (SORGHUM- *Sorghum bicolor*)

JWARA

Numerous studies on sorghum have indicated its potential role in preventing cardiovascular diseases. In expansion, sorghum could be a wealthy source of folate, iron, copper, magnesium, and zinc, alongside vitamins E and various B-complex vitamins, making it a nutritionally different grain with several health benefits.[11] When compared to other millets, it encompasses a high energy content. Sorghum protein in vitro hydrolysis has been examined for its peptides and their affiliation with antihypertensive effects. In an in vivo model, enzymatic absorption of sorghum kefiran may increase the formation of bioactive peptides along with antioxidant action that assimilates and is transported into the circulatory system, resulting in advantageous effects on its lipid profile. The in vivo examination demonstrated that sorghum kefiran lowered Add up to Cholesterol levels while increasing High-Density Cholesterol levels in hyperlipidemic rats, suggesting that sorghum kefiran division helps decrease cardiovascular disease risk. [12] Research has demonstrated that consuming sorghum flour at the tested levels prevents the development of atherosclerotic properties associated with heart diseases. The fibers discovered that consuming whole sorghum decreases fasting blood glucose level, glycemic index, and the efficacy of medications for postprandial hyperglycemia in type 2 diabetes individuals, indicating that these results are due to fibre in it. It has the property of delaying gastric emptying, intestinal transit time, and retention of carbohydrates. Consuming dietary fiber lowers blood glucose levels. Sorghum has potential components for lowering cholesterol levels, including increasing cholesterol excretion in faeces or reducing cholesterol synthesis within the liver. [13,14,15]

KANGU/PRIYANGU (*Setaria Italica*)

KANGANI

Foxtail millet is sweet and astringent. It increases *Vata Dosh*a but balances *Pitta*, *Kapha*, and *Rakta* (blood tissues). It contains foxtail millet bran peroxidase, which decreases the uptake of lipids by both cell types and smooth muscle cell migration. The fox-

tail millet bran peroxidase in the diet reduces lipid uptake by various cell types, inhibits smooth muscle cell migration, and exerts anti-atherosclerotic effects, preventing blood platelet clumping. As a result, the risk of brain stroke and coronary artery disease is reduced. Scientific findings support the prominent recognition of foxtail millet as an essential source of vitamin B12, which plays a vital part in promoting generally well-nourished health. Vitamin B12 deficiency has been established as a critical factor in heart health, as it links with conditions such as fatal coronary artery disease, myocardial infarction, and stroke. Hyperhomocysteinemia disrupts the hemostasis process, damages endothelial cells, and diminishes artery flexibility, exacerbating inflammation and amplifying the adverse impacts of risk factors such as smoking, hypertension, and lipid metabolism. It also affects the process of hemostasis, damages endothelial cells, and reduces the flexibility of arteries. Magnesium plays an essential role in regulating ion transporters, including potassium and calcium channels, which in turn influence neuronal excitation and cardiac conduction, and control vascular tone, myocardial contraction, atherogenesis, thrombosis, vascular calcification, and the expansion and migration of endothelial and vascular smooth muscle cells. [16,17]

KODRAVA (KODO MILLET-*Paspalum scrobiculatum*)

KODRO

Kodo millet originated in India. By partially blocking the enzymatic digestion of complex carbs, millet, which contains phenolics like alpha-glucosidase and pancreatic amylase, reduces postprandial hyperglycemia. According to Hegde and Chandra (2005), millets have a higher level of free radical scavenging activity, which reduces the risk of cardiovascular illnesses. [18,19]

SHYAMAKA (BARNYARD MILLET-*Panicum Frumentaceum*)

SANWA

Barnyard millet is a nutritious grain that boasts excellent levels of macronutrients and dietary fibre, making it a healthy choice for those seeking a balanced diet. It also reduces fasting plasma glucose levels in

diabetic individuals, demonstrating increased carbohydrate tolerance.

Barnyard millet possesses remarkable properties that can effectively raise HDL (high-density lipoprotein) levels while significantly reducing triglyceride levels and total cholesterol. This grain, abundant in magnesium, prevents cardiovascular diseases and maintains healthy blood pressure levels. As LDL-C is a risk factor for Cardio cardiovascular diseases, barnyard millet balances it. Barnyard millet protein (58 to 74 grams/day) decreases the risk of atrial fibrillation and other cardiovascular disorders like stroke. (American College of Cardiology). [20,21]

Shyamaka (Little millet-*Panicum sumatrense*)

Samalu

Little millet, rich in magnesium, actively prevents cardiac health issues. It also boasts an abundance of niacin, which is beneficial for cholesterol reduction. Additionally, its phosphorus content supports weight loss, tissue healing, and energy regeneration after intense exercise in body detoxification. Processing little millet into flakes offers cooking convenience and allows one to harness its advantages, including a medium glycemic index, absence of trans fats, and an extended shelf life. [22,23]

CHINAKA (PROSO MILLET- *Panicum miliaceum*)

Proso millet grains contain an abundance of niacin, B-complex vitamins, folic acid, phosphorus, calcium, zinc, iron, essential amino acids (methionine and cysteine), starch, and phenolic compounds such as antioxidants and beta-glucan. All these components play a crucial role in maintaining cardiovascular health. Proso millet is a rich source of protein measured by the Essential Amino Acid List, surpassing wheat at 51%. The study results indicate that administering proso millet protein concentrate to mice on a high-fat diet significantly elevates high-density lipoprotein cholesterol and adiponectin. Flakes of proso millet offer several advantages, including a medium glycemic index and the absence of trans fats, making them a healthy choice for those seeking nutritious and convenient processed foods with an extended shelf life. [22]

DISCUSSION

Ayurvedic interventions aim to address the root cause of heart diseases by restoring balance to the *Doshas*, improving digestion, and promoting heart health through diet, lifestyle modifications, herbal formulations, and specific therapies. Among all the causative factors, excessive intake of the *Guru* (Heavy) diet and *Ama* leads to vitiation of *Agni* (digestive fire). Contemporary science also describes that excessive use of alcohol, smoking, and taking junk food with a sedentary lifestyle causes vitiation of *Doshas* developing gradual sluggishness in channels with accumulation of lipids. This vitiation of *Doshas* with *Dushya Rasa* and *Meda* after *Agnimandhya* (weakened digestive fire) causes *Santarpanottha vikaras* (diseases caused by overnourished). Millets are considered a dietary option that can prevent cardiovascular diseases and mitigate their modified risk factors due to their inherent properties. The *Laghu Guna* takes lightness in the *Srotas* (structural or functional channels). The property of *Lekhana* helps to absorb excessive unctuousness from the channels. *Katu Vipaka* (transformation after digestion in pungent taste) helps to mitigate *Kapha Dosh* and *Meda Dhatu* in the channels as they are dominant for *Vata* (air element) and *Akasha* (ether element).

Consuming an appropriate quantity of *Ahara* (diet) is beneficial and suitable for people when aligned with their *Agni*. This approach ensures that the food acts swiftly, undergoes easy metabolism, and benefits the body. In doing so, it aids in removing obstructions that can impair bodily functions and optimizes the function of channels at a cellular level, actively influencing metabolic activities. Contemporary scientific research has firmly established the connections between heart diseases like hyperlipidemia and inflammation (consequences of *Ama*), which can lead to lipotoxicity and the progression of cardiovascular conditions. Biomarkers such as adiponectin, leptin, and interleukin-6 (IL-6) have been identified as potential indicators of endothelial dysfunction, underscoring the importance of dietary interventions. In-

creasing dietary fiber intake and unsaturated fatty acids can enhance satiety levels and positively impact these risk factors. When considering contemporary scientific findings and Ayurvedic principles, millets emerge as an exceptional dietary choice for mitigating the pathogenesis of heart diseases in both macro and microchannels. This dietary shift may contribute to reduced calorie consumption. Millets exhibit various properties, including antihypertensive, anti-atherosclerotic, anti-dyslipidemia, and anti-diabetic effects, in addition to their role in balancing body weight and BMI. Millets, therefore, stand as a significant dietary source for promoting heart health and managing associated risk factors.

CONCLUSION

The systematic review conducted in this study strongly suggests that incorporating millets into one's diet can improve blood lipid profiles and offer noteworthy benefits in managing and preventing hyperlipidemia, decreasing blood pressure, weight, and BMI, and decreasing the general risk of cardiovascular diseases. Moreover, millets serve as a fantastic source of protein, vitamins, and fundamental minerals such as calcium, zinc, and magnesium, all of which contribute to strengthening the heart and moderating diseases influenced by *Kapha Pradhana Tridoshaja Hridroga (Avaranajanya)*.

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TABLES OF MANUSCRIPT:

Table 1: Search strategies and keywords

Criteria	Keywords
1.	Bulletin used: or, and, not
2.	Effectiveness of millets on glucose level, Insulin level, Lipid profile, BMI and weight, Hypertension, micronutrients, The word “millet” is replaced by “Finger millet”, “Pearl millet”, “Sorghum”, “Kodo millet”, “Barnyard millet”, “proso millet”, “foxtail millet”, “little millet”, “kshudra dhanya”
3.	Effect of consuming millet on Sugar level, Insulin resistance and secretion, hypertension, lipid profile, inflammatory biomarkers

Table 2: Ayurveda properties of millet for cardiovascular diseases (*Bhavaprakasha Nighantu* and *Kaideva Nighantu*; *Dhanyavarga*)

Kshudra Dhanya	Scientific Name/ English name	Ayurveda properties
<i>Kangu</i>	<i>Setaria italica</i> (Foxtail millet)	<i>Guna: Guru</i> (heavy for assimilation), <i>Karma: Sangrahi</i> (retains intertemperate liquids and helps for normal formation of fecal waste and enhances digestion), <i>Brumhana</i> (nourishes the body tissues), <i>Shoshana</i> (dries up excessive unctuousness), <i>Bhagnasandhanakrit</i> (Healing), <i>Durjara</i> (troublesome to digest) <i>Vrishya</i> (aphrodisiac)
<i>Shyamaka</i>	<i>Echinochloa frumentacea</i> (Barnyard millet)	<i>Karma: Sangrahi</i> (absorbs excessive liquids and helps for normal formation of feces and improves digestion), <i>Dhatu shoshaka</i> (dries up the body tissues).
<i>Koradusha/ Kodrava</i>	<i>Paspalum scrobiculatum</i> - (Kodo millet)	<i>Rasa: Madhura-Tikta Rasa</i> (sweet-bitter in taste), <i>Guna: Guru</i> (overwhelming for assimilation), <i>Param Graahi</i> (assimilates over the top liquids and defecation and upgrades assimilation), <i>Karma: Vishahara</i> (anti-poisonous), <i>Avrishya</i> (Aphrodisiac) <i>Pathya in Vrana</i> (Best count calories in wounds)
<i>Cheenaka</i>	<i>Panicum miliaceum</i> (Proso millet)	<i>Guna: Guru</i> (heavy for digestion), <i>Karma: Durjara</i> (difficult for digestion), <i>Brumhana</i> (nourishes the body tissues), <i>Bhagnasandhanakara</i> (promotes healing)
<i>Nartaki</i>	<i>Eleusine coracana</i> (Finger millet)	<i>Rasa: Tikta-Madhura -Kahaya Rasa</i> (Bitter, sweet, astringent in taste), <i>Virya: Sheeta</i> (cold in potency), <i>Guna: Snigdha</i> (unctuousness), <i>Balya</i> (promotes strength) <i>Vrishya</i> (aphrodisiac)
<i>Gaveduka</i>	<i>Coix lachryma jobi</i> (Adlay millet)	<i>Rasa: Katu-Madhura Rasa</i> (pungent-sweet in taste), <i>Karma: Karshyakaari</i> (emaciating), <i>Doshaghnata: Kapha Hara</i> (pacifies <i>Kapha Dosha</i>)
<i>Yavanaala</i>	<i>Sorghum vulgare</i> (Sorghum)	<i>Karma: Avrishya</i> (Aphrodisiac), <i>Ruchya</i> (improves taste recognition), <i>Kledaghna</i> (pacifies excessive moisture content)

Table 3: Various studies on the millets having Cardiovascular and developing risk factors associated properties.

Millet extract/ active component	Animal models/ Clinical intervention	Dose and duration	Effects	Mechanism of action	References
Fox Millet	Animal Experimental-prolamin from cooked foxtail millet	70% ethanol solution; 4 weeks Assessment of β cell	Hypoglycemic	function HOMA- β , HOMA-IR significantly higher	Fu Y, Yin R, Liu Z, et al. [23]
Pearl Millet	Animal study on	2.5 L of ethanol	Hypolipidemic	Serum levels of	Alzahrani NS,

	Wistar male rats	(70% purity) Pearl millet powder extract	Hypoglycemic	TGs, CHOL, and LDL-C decreased. reduction in biomarkers and HOMA-β, HOMA-IR	Alshammari GM, El-Ansary A, et al. [24]
Foxtail millet	Clinical trial- Open-label, self-controlled 64 subjects - Diabetic patients	50–150 g of whole grain for week 6 and 12	Anti-diabetic activity	Improved Fasting Blood Glucose level, insulin, fructosamine, fasting C-peptide, TG, and TC HDL-C, LDL-C, apolipoprotein, and other biomarkers	Ren X., Yin R., Hou D., Xue Y., Zhang M., Diao X., Zhang Y., Wu J., Hu J., Hu X., et al. [25]
Sorghum	10 male subjects	50 gm/day 3 weeks	Anti-Diabetic activity	Improved the PBG and insulin	Poquette N.M., Gu X., Lee S.-O. [26]
All millets (60% millets) functional diet	60 patients' millet-based intervention diet	12 weeks	i)Anti-diabetic activity ii)Anti-hypertensive iii)Hypocholesterolemia Improvement in micronutrients	Significant FBS, PPBS, HbA1c. ii. Total cholesterol, VLDL cholesterol, and triglycerides significantly decrease from baseline iii. significant decline in systolic and diastolic blood pressure iv. increase antioxidants and vitamins (A, E, and C, beta carotene) serum calcium and magnesium	Singh RB, Fedacko J, Mojto V, et al. [27]
All millets	i)Meta-analysis systemic review Millet base meal consumption ii) two cross-sectional studies	i)17 studies once a day for 3 months; ii) more than 2 years of millet consumption	Hypocholesterolemia	plasma triacylglycerol levels reduced from a hypertriglyceridemic (>150 mg/dl) condition to normal (<150 mg/dl); Unsaturated fatty acids help to take baseline lipid profile.	Anitha S, Botha R, Kane-Potaka J, et al. [27]
All millets	i)6-Randomized control trial studies for	i)Consumption of millet meal once a day for	Anti- Obesity property	i)Overweight and obese subject: 7.0% reduction in	Anitha S, Botha R, Kane-Potaka J, et al.

	ii)Two cross-sectional studies	3-4 months ii) two-year consumption of all millets		BMI	[28]
Fox millet	open-label, self-controlled clinical trial	foxtail millet consumption compared with only a regular diet of 12 weeks	Anti-obesity property	i)Reduction in body fat mass; no reduction in muscle mass. ii) blood leptin levels decrease	Hou D, Chen J, Ren X, Wang C, Diao X, Hu X, et al. [29]

Potassium	Adequate potassium supplementation in the prevention of vascular calcification in atherosclerosis [30]
omega-3	Reduce the risk of death from cardiac disease, Increases HDL, Prevents from coronary artery occlusion, Lower resting blood pressure, Improve compliance of arteries, Decreases the arrhythmia, Decreases platelet aggregation. [31]
Magnesium	Intracardiac conduction, myocardial contraction, proliferation and migration of endothelial, vascular smooth muscle cells, regulating vascular tone maintenance Prevention of atherogenesis, thrombosis, vascular calcification, proliferation, and migration of endothelial, vascular smooth muscle cells.[32]
Vitamin C and E combined	Arterial stiffness was reduced with vitamin E and a combined antioxidant supplement.[33]
Vitamin C	Significant improvements in endothelial function [34]
Vitamin C	Reduced systolic and diastolic blood pressure [35]
Vitamin D	Maintains myocardial contractibility Modulation, migration, and aggregation in matrix turnover of cardiomyocytes.[36]
Calcium	Myocardial contraction and relaxation Cardiac rhythm disorders., Maintains blood pressure.[37]
Co-Enzyme Q10	Reduced cardiovascular mortality, Bioenergetic Antioxidant, Anti-inflammatory, Membrane stabilizer Antiatherogenic.[38] Possible effects on Hypertension by Vasodilatation Angiotensin effect adjustment.[38]
Dietary fibers	Reduce their incidence of and mortality from cardiovascular disease. [39]
Folate	Reduce plaque progression, Improve Endothelial Dysfunction [40]
Selenium	Increases enzymatic antioxidant activity, And decreases lipid peroxidation. [41] Reduces Hypertrophy and decreases oxidative stress.[41]

Vitamin E	Antioxidants for primary and secondary prevention of cardiovascular disease are lipid soluble.[42]
Zinc	Homeostasis contributes to coronary heart disease, Myocardiopathy and improves vascular endothelium.[43]
Polyphenols	Atherosclerotic plaque rupture, Platelets bind endothelium leading to aggregation, Thrombus formation Myocardial Infarction prevent. [44]
Table 4: Various Nutrients in millet are essential for cardiovascular diseases and modified risk factors.	

Figure 1: Mechanics of millets on cardiovascular diseases and its modifying risk factors

