HIGH CARDIOVASCULAR MENACE IN PATIENTS WITH 
DIABETES- A CHALLENGE FOR AYURVED

Vd. Sushant Sud*1 and Vd. Khyati S. Sud2

*Corresponding Author
Dr. Vd. Sushant Sud
Lecturer, Dept of Agad Tantra, International Centre of Ayurvedic Studies, Shri Gulabkuverba Ayurved Mahavidyalaya, Gujarat Ayurved University, Jamnagar.

ABSTRACT
The public health impact of cardiovascular disease (CVD) in patients with diabetes is already enormous and is increasing. Abundant evidence shows that patients with DM-I or DM-II are at high risk for several cardiovascular disorders like coronary heart disease, stroke, peripheral arterial disease, cardiomyopathy and congestive heart failure. Diabetes confers a high risk of cardiovascular morbidity and mortality and requires aggressive management of all cardiovascular risk factors. It is estimated that the total number of people with diabetes will rise from 171 million in 2000 to 366 million by 2030 and number of adults with hypertension will increase by 60% to a total of 1.56 billion people by 2025. Cardiovascular disease is responsible for 65-75% deaths in people with diabetes. The reason being that DM-II shares several risk factors with cardiovascular diseases. Modern system of medicine is successful in preventing diseases of infective origin but they have not been successful in preventing lifestyle diseases alone with it. Ayurved treatment focuses on an entire change in the lifestyle of the person and thus is foremost in prevention and management of lifestyle disorders. A unique combination of food (Aahar), exercise (Vihar), and herbs (Aushadhi) can help alleviate the symptoms and develop good health in people with CVD along with diabetes. This research paper aims at reviewing co morbidity between diabetes mellitus (madhumeha) and cardiovascular risks associated with it.
KEYWORDS: Cardiovascular risk factors, Diabetes mellitus, Diabetic heart care and Ayurved.

INTRODUCTION
Changes in the human environment, behavior, and lifestyle are contributing to the upsurge in the incidence of diabetes. However, better management has resulted in a longer survival of patients with diabetes, but it is accompanied by long-term chronic complications due to hyperglycemia. The incidence of heart diseases is increasing at an alarming rate in our society due to change in concept of diet and lifestyle as an impact of western culture and civilization. In India, study of current trend, reveals that the cases of CVD may increase from about 3.9 crore in 2010 to about 7.4 crore in 2020. The prevalence is more in urban population and in rural population will reach 14.5% in 2020. The prevalence rate among younger population 40 or above are also likely to increase. The cardiovascular diseases has largest share in non-communicable diseases (31%).

Three hundred sixty six million people have DM in 2011; half of these (183 million people) are undiagnosed. The number of people with DM worldwide is increasing and by 2030 this will have risen to 552 million. DM is a well established risk factor for cardiovascular disease (CVD). People with type 2 diabetes mellitus (T2DM) have a higher cardiovascular morbidity and mortality and are disproportionately affected by CVD compared with non diabetic subjects.

A large body of epidemiological and pathological data documents that diabetes is an independent risk factor for CVD in both men and women. Women with diabetes seem to lose most of their inherent protection against developing CVD. CVDs are listed as the cause of death in 65% of persons with diabetes. Diabetes acts as an independent risk factor for several forms of CVD. To make matters worse, when patients with diabetes develop clinical CVD, they sustain a worse prognosis for survival than do CVD patients without diabetes.

Changes in diet pattern, dietary habits and lifestyle, lack of physical exercise, increased mental & physical stress, certain social and environmental changes (e.g. Pollution) has lead to us in the era of Hypertension, Hyperlipidemia, obesity, cardiac diseases and many more diseases.
This clustering of risk factors, often referred to as the metabolic syndrome, is frequently observed in patients with diabetes, although not all patients with the metabolic syndrome are diabetic. The cause of the metabolic syndrome (and each of its components) is extremely complex. A triad of endothelial dysfunction (mediated by dyslipidaemia and pro-inflammatory cytokines), low-grade vascular inflammation and insulin resistance is of major pathophysiological importance. This in turn leads to hyperinsulinaemia, hypertension and the anti-fibrinolytic state that greatly increase the risk of CVD.\[^{8}\]

Diabetic Cardiac emergencies in most of the cases are fatal. Role of Ayurved in certain condition till date has remained to a limit only, but it has been observed in the texts that these types of conditions can very well be managed on Ayurvedic lines. Other studies opined that prognosis in such cases are variable and depends on various factors, usually low risk patient have better chances of survival than the high risk factors. Over weight, metabolic illness, Hypertension, stressful life style, positive family history, are identified as high risk factors for the disease. It is believed that such condition needs to be attended only by modern medicines, but Ayurved has also a key role to play in such a critical condition. The objective of this review is to highlight the weight of risk factors for CVD in the setting of Diabetes Mellitus and their position in the pathogenesis of the excess CVD mortality and morbidity in these patients. It is essential to know that these risk factors do not act in isolation.\[^{9,10}\]

**Extent of the Problem**

At least 10.3 million Americans carry a diagnosis of diabetes mellitus. Another 5.4 million are estimated to have undiagnosed diabetes. Approximately 90% of patients with diabetes have the type 2 variety. The onset of type 2 diabetes usually precedes clinical diagnosis by several years. An increasing prevalence of type 2 diabetes cannot be divorced from the rising prevalence of obesity and physical inactivity in our society. An estimated 77 million adults in the India are overweight or obese. Furthermore, 75% of adult Indians has minimal physical activity or daily exercise. Both excess body fat and physical inactivity predispose to type 2 diabetes. The growing ethnic diversity, including these groups, contributes to the increasing prevalence of type 2 diabetes in India.\[^{11,12,13}\]

**Diabetes and Attached CVD Risk Factors**

- **Diabetic Cardiomyopathy**

One reason for the poor prognosis in patients with both diabetes and ischemic heart disease seems to be an enhanced myocardial dysfunction leading to accelerated heart failure (diabetic
cardiomyopathy). Thus, patients with diabetes are unusually prone to congestive heart failure. Several factors probably underlie diabetic cardiomyopathy: severe coronary atherosclerosis, prolonged hypertension, chronic hyperglycemia, microvascular disease, glycosylation of myocardial proteins and autonomic neuropathy. Improved glycemic control, better control of hypertension and prevention of atherosclerosis with cholesterol-lowering therapy may prevent or mitigate diabetic cardiomyopathy. An early clinical trial suggested that sulfonyl ureas used for control of hyperglycemia are cardiotoxic and may exacerbate diabetic cardiomyopathy. This side effect, however, was not confirmed in a recent large clinical trial.[14,15]

- **Diabetes and Dyslipidemia**
  Diabetic dyslipidemia is characterized by depressed high density lipoprotein (HDL) cholesterol (<40 mg/dL), elevated triglycerides (≥150 mg/dL) and elevated levels of small, dense LDL particles, which are rendered even more atherogenic through the processes of oxidation and glycation. LDL levels are generally normal or only moderately elevated in diabetic dyslipidemia and often not significantly different from levels in non diabetic persons. However, the relative risk of coronary heart disease (CHD) is substantially increased at any cholesterol level in persons with diabetes, in part due to the increased presence of atherogenic small, dense LDL particles and low levels of the more atheroprotective HDL subtraction. Persons with diabetes often have elevated levels of very low density lipoprotein particles and intermediate density lipoprotein, both of which have been associated with increased atherogenesis.[16]

- **Diabetes and Hypertension**
  Arterial hypertension is present in more than 60% of DM-II patients. This is directly linked to increased rennin-angiotensin-aldosterone system activity, hyperinsulinemia associated to increased renal re-absorption of sodium; and increased sympathetic tone. Aging, obesity and the onset of renal disease also promote an increase in the prevalence of hypertension. Hypertension and DM are additive risk factors for CVD. While the diagnosis of diabetes doubles the cardiovascular risk in men and more than triples the risk in women, hypertension quadruple cardiovascular risk in diabetic patients.[17]

- **Diabetes and Renal Disease**
  Renal disease is a common and often severe complication of diabetes. Approximately 35% of patients with type 1 diabetes of 18 years duration will have signs of diabetic renal
involvement. Up to 35% of new patients beginning dialysis therapy have type 2 diabetes. End-stage renal disease (ESRD) appears to be especially common with diabetes. For patients with diabetes who are on renal dialysis, mortality rates probably exceed 20% per year. When diabetes is present, CVD is the leading cause of death among patients with ESRD.[18]

- **Diabetes and Obesity**

  Generalized obesity assessed by the body mass index (BMI), and abdominal obesity determined by the waist circumference (WC), are related with a variety of CVD risk factors. Clinical guidelines do not indicate whether BMI or the WC measurements have identical utility in predicting cardiovascular risk in individuals with DM-II compared to non diabetic patients. The impact of obesity on both atherogenesis and in novel procoagulant and prothrombotic cardiovascular risk factors is of particular interest in cases of DM-II, as they contribute to increased CVD mortality in these individuals. In diabetic patients the coexistence of multiple variables such as diabetic duration, glycaemic control and the drugs used for achieving it, lipid profile, BP or the existence of risk behaviors such as smoking or alcohol use may confound the impact of obesity on the risk of CVD.[19]

- **Diabetes and Smoking**

  Smoking is linked with deterioration in metabolic control in diabetic patients, which is associated with an increased risk for development of macrovascular and microvascular complications and mortality in DM. Administration of nicotine rise the circulating levels of insulin-antagonistic hormones (growth hormone, catecholamines and cortisol) and also has been proved to affect the autonomic nervous system. Nicotine, via these and possibly also other mechanisms, decreases insulin sensitivity, directly or indirectly. Also smoking increases circulating free fatty acid levels and this is an additional negative factor for the insulin-mediated glucose uptake.[20]

**Evaluation of Major Risk Factors in Diabetic Patients**

- **Cigarette smoking**

  History: Record current and past smoking habits; list smoking duration (years of use) and intensity (number of cigarettes smoked per day); determine passive smoke exposure (at work and at home).[21,22,23]
Blood pressure

History: Record history of blood pressure (BP) and measures of treatment, including current and past antihypertensive agents. Also determine acquired factors affecting BP: body weight, physical activity level, sodium intake and alcohol consumption.

Physical examination: Define current BP from multiple measurements; measure BP supine, sitting and standing in elderly patients; consider 24-hour automated, ambulatory BP monitoring in older patients (detects absence of nocturnal fall in BP [autonomic dysfunction], episodic hypertension, orthostatic hypertension, resistant hypertension).

Serum lipids and lipoproteins

History: Assess dietary habits and alcohol intake, exercise habits, efforts to modify lifestyle habits, use of medications that influence lipoprotein levels, family history of premature vascular disease and dyslipidemia, history of thyroid disorders or pancreatitis.

Physical examination: Check for eruptive xanthomas and lipemia retinalis (signs of severe hypertriglyceridemia), tuberoeruptive xanthomas (sign of dysbetalipoproteinemia), xanthelasma (suggestive of hyperlipidemia) and signs of hypothyroidism.

Laboratory: Measure fasting serum total cholesterol, triglyceride, LDL cholesterol, HDL cholesterol; (optional: total apolipoprotein B*, Lp[a], LDL size), thyroid, renal, liver function tests.

Albuminuria

Measure serum creatinine. Test urine with a dipstick for protein: If dipstick is negative, measure urine albumin-to-creatinine ratio in the first morning urine specimen.

Glycemic status

History: Age of onset of hyperglycemia; course of diabetes management; family history of diabetes, history of diabetic complications.

Physical examination: Cardiovascular status, retinopathy, other diabetic complications.

Laboratory: Fasting plasma glucose (FPG); hemoglobin A1c (periodically); diabetes5FPG.126 mg/dL (×2); impaired fasting glucose5110 to 126 mg/dL (×2).
*Total apolipoprotein B is especially useful if triglycerides are elevated but LDL cholesterol is in the normal range.

**Ayurvedic Approach to Diabetes and related CVDs**

The Ayurvedic science of longevity provides a framework defining cause and conditions of sickness and connects them with healing practices. Common man is moving towards modern medicine because it has strict scientific foundation and the ability to adequately manage symptoms of chronic and terminal diseases. The modern medicines are monitored vigilantly through systematic reviews and meta-analysis. At this juncture unfortunately, traditional medicines in this era are finding themselves poorly equipped to respond to these challenges, even though they may have superior therapeutic potential.\[24\]

Ayurved depicts heart as a vital organ essential for governing emotions and circulating blood to keep a person healthy. According to Ayurved changing lifestyle and increasing stress levels are leading to thickening of arteries (coronary artery disease) or hardening of arteries resulting in angio-obstruction (vata dosha) and chest pain (ruja).\[25\]

The efforts of modern medicine in delineating the pathogenesis of diabetes are paving ways to understand and interpret descriptions of diabetes mellitus and its complications in Ayurvedic texts. Similarly, evaluation of medicines prescribed in Ayurvedic classics utilizing modern scientific tools and techniques, reveals the fact that they are amazingly relevant even today and have the capabilities to take global care of the disease. In the light of recent advances in modern science, this article analyses (i) understanding of diabetic pathogenesis in both Ayurvedic and modern medicine, (ii) therapeutic approach for prevention and treatment, and present views as how therapeutics prescribed in Ayurvedic medicines are still relevant in taking care of preventive as well as therapeutic aspects of this dreaded disease and finally, (iii) challenges posed to traditional medicines like Ayurved, that have to be addressed seriously in order to have proper perspective.\[26\]

Looking into the pathogenesis aspect, the most common is occlusion in any of the coronary vessels may be due to dyslipidemia, atherosclerosis, arteriosclerosis, thrombus, embolus, or plaque. Macrophages and lipids are identified for the atherosclerotic changes in cardiac vessels. Decrease in blood supply to Myocardium damages cardiac muscle. If the blood supply is not restored or if the condition remains untreated it leads to permanent changes in myocardium. It is characterized by typically radiating chest pain to left arm & neck, shortness
of breath (sign of pranavaha sroto dusti), vomiting and/or nausea, sweating, palpitations, compression in chest, etc.\textsuperscript{[27]}

Concept of Diabetic cardiogenic emergency is dealt by Charaka Samhita. It is described that that patient certainly dies due to Hridya Shoola as a major complication of Diabetes. It is usually presented with symptoms of compression type of chest pain, gastric motility is grossly disturbed due to circulatory disturbances i.e. food remains in undigested form for prolonged period, rapid decrease in physical strength (Bala decreases) & excessive thirst (Trishna). This description of Hrid Shoola is very much similar to massive diabetic cardiac arrest and mostly encountered in Anterior Wall Infarct. Anterior Wall comprises of approximately 70% of heart muscles. Thus if the anterior wall is affected, usually it is having fatal outcome. It is clearly mentioned that physician shouldn’t attend the patient as it is certainly leading to death.\textsuperscript{[28,29]}

**Fundamental principles of Ayurvedic management**

Ayurved enforces the qualitative as well as quantitative appropriateness and balance of all tridoshas to maintain normal physiological fuel homeostasis in order to live a healthy life. It emphasizes that any vitiation either due to exogenous or endogenous over-consumption/accumulation or vice versa in these Tridoshas creates an imbalance in normal biochemical/physiological processes. This disturbance inappropriately activates the inbuilt defence and self-sustaining mechanisms, leading to either disproportionate accumulation or depletion of factors responsible for maintenance of normal biochemical/physiological homeostasis. In the absence of appropriate corrective measures therefore, vitiated homeostasis leads to disorderliness in normal physiological functions and hence favours multiple disease. Hence, as a remedy, Ayurved recommends multiple herbo-mineral preparations incorporating appropriate characteristics to manipulate risk factors (doshas) in order to bring physiological homeostasis back into the state of equilibrium. Ayurved further adds that if adequate care is not taken in time to correct these disturbances, the over accumulation or lack of proper nutrients at a systemic or tissue level fans the flames of Vata (oxidative stress) that complicates the disease (diabetes mellitus). Thereafter, treatment becomes difficult.\textsuperscript{[30]}
Ayurvedic Principles of prevention of (Diabetes & CVD)
Ayurved mainly rely upon the principle of ‘Prevention is better than cure’. So, the preventive aspect of the diseases has given first & prime importance in the management of all the diseases including Hridroga as well.  

1) Opening the Channels of Circulation
There are several sources of circulatory blockage, most of which come from areas completely outside the cardio vascular system.

a) Improving nutrition
Certain foods are heavier and more clogging in nature.

b) Strengthening digestion
Even more important than what we eat is our ability for strong digestion.

c) Better elimination
When elimination slows down, impurities which should be removed end up being absorbed. The impurities travel throughout the body and localize in tissues. They not only block vessels but when toxic they can damage vessel walls.

d) Improved metabolism
It is not enough for the body to have strong digestion and elimination. It also needs strong metabolism to build tissues properly and remove waste products created by cells and tissues. Free radicals are an example of toxic waste products that can seriously damage vessel walls if allowed to accumulate

2) Stress Management
Cardiovascular disease is often worsened by the experience of chronic stress. This is due to hormonal changes and other biochemical responses to stress that activate the cardiovascular system and place it under greater pressure. Stress can contribute to many of the risk factors of cardiovascular disease including hypertension, poor eating habits, weakened digestion, slow elimination and increased cigarette smoking.

3) Proper Lifestyle and Daily Routine
When we eat, sleep and exercise in constantly fluctuating and disturbing patterns, the body loses its natural balancing cycles and cannot cleanse or heal itself as effectively. Disruption
of natural biological rhythms is a major factor in weakening the body's natural healing and balancing ability.

4) A unique combination of food (Aahar), exercise (Vihara), and herbs (Aushadhi) can help alleviate the symptoms and develop good health in people with CVD along with diabetes.

**Diet Recommendations (Aahara)**
- Eat cereals such as Barley, wheat, bajra and pulses such as – Green gram, gram
- Vegetables – Neem, mustard, fenugreek, bitter gourd, snake gourd, drumstick, spiny gourd (kantola), Indian Fig (goolar), garlic, banana
- Fruits – Jamun, toddy palm, date
- Seeds – Lotus, water Lilly
- Oils – mustard

**Lifestyle Changes (Vihara)**
- Pranayam such as bhashrika, bhramari, and kapal bhati
- Regular practice of matsyndrasana, vajrasana, yogmudra, pacchimottanasana, sarvangasana, halasana like asanas
DISCUSSION AND CONCLUSION
Primary prevention through improved control of risk factors and therapeutic lifestyle modification (including dietary modification, aerobic exercise and smoking cessation) is a pioneer strategy advocated by the National Cholesterol Education Program in the Adult Treatment Panel III (ATP III) guidelines. Lifestyle interventions have been effective in the improvement of cardiovascular risk factors and the benefits are proportionally higher among those at high risk for cardiovascular disease. However, the paradox in the prevention of cardiovascular complications of DM-II is that, at diagnosis, diabetic individuals are already at an amplified risk of CVD.

The complex interaction of risk factors in DM-II make it necessary to apply a holistic approach to the management of this chronic disorder, and a comprehensive care plan should therefore include modification of all cardiovascular risk factors. Targeting multiple markers of CVD risk hopefully offers the best chance of improving CVD outcomes. There are consistent evidences that optimal glycaemic control, along with control of hypertension, dyslipidaemia, smoking cessation and weight loss are necessary for reducing cardiovascular risk in DM-II patients. Cardiovascular benefits are obtained if the control of traditional cardiovascular risk factors begins early in subjects with short duration of DM and low cardiovascular risk. On the contrary, in elderly subjects with long duration of DM, exposed to hyperglycemia for a long time and high cardiovascular risk, the same is not true. This beneficial or harmful effect could be explained by the hypothesis called as metabolic memory, in which the effect of the early glycemic exposure environment is imprinted in target organs, resulting in long term protective or deleterious long term effects.

Today’s life style has led to the increase in the incidence of cardiac diseases in the society. Hyperlipidemia, Obesity & Diabetes mellitus being the main risk factors for the development of cardiovascular diseases. Ayurved advocates healthy balanced living that views each person as an individual, with a unique mind-body constitution and set of life circumstances. DM-II is increasingly common, primarily because of increases in the prevalence of a sedentary lifestyle and obesity leading to varied degrees of CVDs.

REFERENCES

a. Indryan, Forecasting vascular disease cases & associated mortality in India, NCMH Background papers, Burden of diseases in India, sec.-2, Ministry of Health & family welfare, N. Delhi, Sep. – 2005; Pp.204-216.


