Impact Of Complementary And Integrative Medicine In Rehabilitation Of Coronary Heart Disease And Type 2 Diabetes Mellitus Patients

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Abstract: Complementary and Integrative Medicine emphasizes a holistic approach to prevent and treat physical and mental illness. Coronary Heart Disease (CHD) and Type 2 Diabetes Mellitus are lifestyle related diseases. These are leading cause of morbidity and mortality around the world. A special attention is required to treat CHD patients with diabetes mellitus. CHD patients with diabetes have a number of adverse clinical and metabolic features such as severe angina, abnormal endothelial function with the reduction of coronary flow, multi-vessel involvement, and high incidence of left main coronary artery blockage, poor collaterals, and low ejection fraction, which contributes to poor prognosis. Clinical outcomes of coronary angioplasty and coronary bypass grafting (CABG) is also poor in diabetic CHD patients. CHD patients treated with PTCA and CABG procedures have the higher hospitalization rate with major complications, higher restenosis and revascularization chances. Thus to avoid invasive procedures and life-threatening consequences the complementary and integrative medicine approach is required for the management of angina, heart failure and diabetes mellitus. This manuscript will direct the complementary and integrative approaches with special reference to lifestyle and energy medicine in Rehabilitation of Coronary Heart Disease and Type 2 Diabetes Mellitus Patients.

Index Terms: Complementary and Integrative Medicine, Coronary Heart Disease, Diabetes Mellitus, Enhanced External Counter Pulsation, Lifestyle Intervention, Yoga; Meditation

1. INTRODUCTION

Cardiovascular disease (CVD), especially Coronary Heart Disease (CHD) is epidemic in India and the leading cause of morbidity and mortality in patients with diabetes mellitus [1-4]. Currently, it is accounting for 21.9 percent of total deaths and projected to increase to 26.3 percent by 2030 [5]. As per Global Burden of Diseases (GBD) study, deaths from coronary heart disease is doubled in India in last 30 years [6]. The high prevalence (up to 50%) of coronary heart disease in patients with diabetes is documented for more than a century in many countries [7-9]. Framingham study established that diabetes confers an increased risk and predisposing factor for coronary heart disease and due to its higher prevalence rate in pandemic form; it is becoming a global health problem [3, 10-11]. The prevalence of diabetes mellitus in the urban area of India is almost doubled in the last 20 years [12-13]. The current prevalence of diabetes in coronary heart disease is 7.8% in India and cardiovascular mortality rate in Indian diabetic CHD patients is two to four folds higher as compared to non-diabetic coronary heart disease patients [14-16]. Patients with diabetes mellitus and coronary heart disease have the highest risk (20.2%) of myocardial infarction [17]. Ledru et al reported that severity score and narrowing in the coronary artery of diabetic patients were higher as compared to non-diabetic. Additionally, distal lesions and mild to moderate stenosis were more frequently observed on coronary angiography in diabetic patients as compared to non-diabetic coronary heart disease patients [18-20].

The current invasive treatment methods for CHD are very expensive and consume a significant portion of household’s income because of the long duration of hospitalization and treatment complications that further required expensive medicines [21].

2. ASSOCIATION OF DIABETES WITH CORONARY HEART DISEASE

DM with special reference of T2DM has a close relationship with CHD. T2DM is an independent risk factor for atherosclerotic cardiovascular disease (CHD) and remains the principal cause of death and disability around the world. Diabetic patients have two-to-four fold higher chances and are more prone to develop coronary heart disease than individuals without diabetes [22]. CHD accounts for more than 50% of the mortality among T2DM patients. Vigorita et al [23] demonstrated that diabetic patients have the higher number of coronary blood vessels intricate with the diffuse distribution of atherosclerotic lesions as compared to non-diabetic. In the Framingham heart study [24] Kannel [25] and McGee [26] demonstrated a higher prevalence rate of CHD in male diabetic patients was 39.1% as compared to non-diabetic patients was 19.1%. On the other side CHD prevalence in female diabetic patients was 27.2% as compared to non-diabetic patients was 10.2%. Kannel [27] and Mohan et al [28] studies were demonstrated that diabetic patients had 3.5 to 4 fold higher chance of CHD mortality as compared to non-diabetic patients. Burchfiel et al [29] study revealed the higher prevalence of myocardial lesions in diabetic CHD patients as compared to non-diabetic CHD patients. Haffner et al [30] study suggested that diabetic patients had the highest risk of myocardial infarction as compared to non-diabetic CHD patients. The incidence of myocardial infarction was 2 to 3 fold higher in diabetic CHD patients as compared to non-diabetic CHD patients as per Copenhagen City Heart Study [31]. Lee et al [32] reported diabetes as the risk factor for CHD mortality to be 2.5 in women and 1.85 in men. In 2010, Mohan et al [33] reviewed the epidemiology of CVD in T2DM patients in India and confirmed that hyperglycemia is a typical CHD risk factor.

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which may increase three-fold higher chances of CHD mortality in India.

2.1 Pathogenesis of Diabetic and Non-Diabetic Atherosclerosis
Atherosclerosis is a chronic inflammatory condition in which coronary artery wall thickens. The development of atherosclerosis in diabetic and non-diabetic patients follows the same histologic procedure. In the primary stage of atherosclerosis, the intimal tear due to mechanical injury or due to risk factors; diabetes and hypertension. On secondary stage, partial obstruction and accumulation of fatty particles and lipoprotein deposition occurs and in last stage fibrous plaque formed, which formed a clot. In the end, coronary artery, complete occludes and may cause the heart attack [34].

General pathway of Atherosclerosis

LDL cholesterol particles in blood ↓
Entry in Arterial intima ↓
LDL Accumulated ↓
Modification took by Enzyme ↓
Oxidation took place into pro-inflammatory particles ↓
Inflammatory responses provoked in the intima ↓
Fat droplets gathered in cytoplasm of smooth muscles ↓
Adoptive intima thickness ↓
Inflammation prompted ↓
Endothelial cells active & adhesion molecules secrete ↓
Intimal smooth muscle cell affected by chemokine’s ↓
Secretion of ECM-PG collagen elastic fibers ↓
Enticement of macrophages lymphocytes, mast cells, neutrophils into the arterial wall ↓
Macrophages engulfed lipids, as multiple small incisions ↓
Production of Foam cells ↓
An extracellular pool of lipids taken place ↓
Cellularity of inflammatory cells ↓
Death of macrophages & smooth muscle cells ↓
Necrotic Debris - Interrupts structure of intima ↓
Inflammation occurred ↓
Lipid-rich necrotic repairs that dictate central part of the intima ↓
Fibrous cap necrotic repairs under the endothelium at blood boundary ↓
Fibrous plaque lesions ↓
A thin cap Fibro atheroma formed ↓
Cap rupture ↓
Thrombogenic interior arterial wall exposed ↓
Thrombus ↓
Vulnerable plaque with serious clinical events \[35-39\]

2.2 Role of Diabetes in Atherosclerosis
Diabetes mellitus alters the function of endothelial cells, smooth muscle cells, and impaired platelet functions that lead to abnormal coagulation in coronary arteries of diabetic patients.

Endothelial Cell Dysfunction in Diabetes
Diabetes damages endothelial cells and formed atheroma. Hyperglycemia and excess free fatty acid released with insulin resistance in diabetic mellitus patients, stimulate the adverse metabolic events in the endothelium and further damages endothelial cells by increasing vasoconstriction, inflammation, and thrombosis. Reduction of nitric oxide and augmenting endothelin -1, angiotensin II further increase vascular tone and smooth muscle cell growth and migration. Enhancing the activation of NF-Kb, activator protein -1 induces inflammatory gene expression, with the release of chemokines, cytokines, and cellular adhesion molecules. Increase liberation of tissue factor, plasminogen activator inhibitor -1 makes a prothrombotic meilieu, on the other hand, reduced endothelial nitric oxide and prostacyclin leads to platelet activation and thrombus [40].

Vascular Smooth Muscle Dysfunction in Diabetes Mellitus
Type 2 diabetes mellitus patients have diminished nitric oxide-mediated vasodilation that stimulates the anomalies of vascular smooth muscle cell function. Diabetic patients also have reduced vasoconstriction to the infusion of angiotensin, endothelin-1, and peripheral autonomic impairment that decreases arterial resistance. The atherogenic activity of vascular smooth muscle cells stimulated by diabetes, it activates protein kinase C, and nuclear factor Kb. Enhanced migration of arterial vascular smooth muscle cells is cultivated from patients with T2DM. Very few vascular smooth muscles found in advanced atherosclerosis lesions in diabetic patients. Migration and apoptosis of vascular smooth muscle cells in atherosclerotic lesions may regulate by hyperglycemic lipid modification of LDL and oxidized glycated LDL may induce apoptosis of vascular smooth muscle cells. Hence, hyperglycemic condition alters vascular smooth muscle functioning in such a ways that uphold atherosclerotic lesion formation, thrombus, and adverse cardiac events.

Impaired platelet functions in Diabetes
A platelet may modulate vascular functions and significantly participate in thrombus formation. As in endothelial cells, the increased glucose level in platelets leads to activation of protein kinase C, reduced production of platelet-derived nitric oxide, and increases the production of \(O_2\) and show disordered calcium homeostasis. Patients with diabetes
Diabetes mellitus have raised platelet–surface expression of glycoprotein IIB (GpIIB), which mediates platelet-fibrin interaction and binds to von Willebrand factor and GpIIb/IIIa. In the combination of coagulation factors, diabetic abnormalities reduce endogenous inhibitors of platelet activity and enhance intrinsic platelet activation and thus thrombotic potential leads to the blood clot in the coronary arteries.

Abnormal coagulation in Diabetes Mellitus
Diabetes condition enhances blood coagulation activity with potentiating platelet functioning and in the result atherosclerotic plaque rupture and leads to thrombotic occlusion of the coronary artery. T2DM patients have impaired fibrinolytic capacity to enhance the expression of tissue factor, plasma coagulation factors and reduce anti thrombin III and protein C level. Majority of cases such abnormalities increase with the presence of hyperglycemia. Hence, increased the tendency toward coagulation, united with impaired fibrinolysis, favors formation and perseverance of thrombi occurred more vulnerable and ambiguous in diabetes mellitus patients.

2.3 RISK FACTORS ASSOCIATED WITH CORONARY HEART DISEASE
Urbanization is rapidly rising in the Indian sub-continent, this has directed to economic improvement, and consequences of that enhanced the risk of coronary heart disease. Coronary heart disease risk factors can categorize into two classifications; Modifiable risk factors and Non-modifiable risk factors.

Modifiable risk factors
Diabetes mellitus
DM is a disease in which high blood glucose present in blood because of defects in insulin secretion. Diabetes mellitus is mostly classified into 3 types: Type 1 Diabetes Mellitus (T1DM), Type 2 Diabetes Mellitus (T2DM) and Gestational Diabetes Mellitus (GDM). T1DM is also known as juvenile diabetes and usually occur in children and young adults in which body does not produce insulin naturally. T2DM is the most common form of diabetes in which body does not use insulin properly and sometimes called as insulin resistance. Gestational diabetes only occurred during pregnancy, it is because, at the time of pregnancy, the placenta makes hormones that raise blood glucose level and if blood sugar level not controlled by insulin than gestational diabetes occurs. Diabetes mellitus, especially Type 2 Diabetes Mellitus (T2DM) is an important predisposing risk factor for atherosclerosis and coronary heart disease is frequent and associated with morbidity and mortality around the world. Insulin resistance, a typical feature of T2DM is associated with the cluster of metabolic and biochemical abnormal conditions including hyperglycemia, hypertension, dyslipidemia, coronary artery inflammation, endothelial dysfunction, and impaired fibrinolysis, which further leads to atherosclerosis and serious cardiac clinical events [41].

Hypertension
Another major risk factor for coronary heart disease is hypertension. Usually, blood pressure recorded in two numbers; systolic blood pressure and diastolic blood pressure. Systolic blood pressure indicates the pressure of blood is exerting against the arterial wall when the heart beats and diastolic blood pressure shows the pressure of blood is exerting against the arterial wall when the heart is resting between beats. Systolic blood pressure becomes a vital predictor of the risk factor for coronary heart disease. High blood pressure makes the heart work harder and weakens the heart by enhancing the chances of stroke and heart attack due to severe atherosclerosis. Hypertension is an extremely established CHD risk factor because of increasing longevity and the prevalence of contributing factor to obesity [42].

Obesity
Obesity is an abnormal or excessive fat accumulation that leads to serious health issues. It emerged as a prime disorder associated with diabetes and coronary heart disease in developing countries. Obesity and cardio-metabolic risk factors are highly prevalent among urban adults in India. Obesity very often related to premature deaths because it is associated with diabetes mellitus, hypertension, and dyslipidemia, which further leads to atherosclerosis or heart attacks [43].

Hypercholesterolemia
Hypercholesterolemia is the condition of high cholesterol present in the blood. Cholesterol, a soft, waxy substance produced by the liver and consumed in the form of meat, eggs that raise the chances of hypercholesterolemia. It is a strong independent risk factor for the development of atherosclerosis. It established that hypercholesterolemia is accompanying with endothelial cell dysfunction, abrogation in vascular nitric oxide bioavailability, enhanced oxidant stress with the formation of the pro-inflammatory state that increases the risk of coronary heart disease patients.

Hypertriglyceridemia
Hypertriglyceridemia is the condition of elevated triglyceride level in the blood. Triglyceride is a type of lipid present in all types of oils consumed daily and is stored in fat cells. It represents as an important biomarker for the association of atherosclerosis with triglyceride-rich lipoprotein including low-density lipoprotein (LDL) and very low-density lipoprotein (VLDL).

Hypo-alpha-Lipoproteinemia
Hypo-alpha-Lipoproteinemia is a condition of low levels of high-density lipoprotein (HDL) cholesterol in the blood. HDL also called good cholesterol because it acts to scavenge excess cholesterol from tissue and bring it back to the liver and also help to protect the heart from atherosclerosis. A person should have HDL cholesterol more than 40mg/dl and women should have more than 50 mg/dl. Low HDL enhanced the risk of atherosclerosis because of impaired reverse cholesterol transportation [44].

Physical inactivity
A sedentary lifestyle is also one of the major CHD risk factors. Physically inactive individuals have, the more cardiovascular mortality rate as compared to physically active. Sedentariness another name of physical inactivity increases the chances of high blood pressure, diabetes, obesity, hyperlipidemias that further lead to endothelial dysfunction and developed atherosclerosis. Diet is also an important modifiable risk factor for the development of coronary heart disease [45-46].

Smoking
Smoking is the major public health issue and it affects all phases of atherosclerosis from endothelial dysfunction to serious cardiac events, thrombotic or heart attack. It also contributes to the progression of atherosclerosis and CHD morbidity and mortality around the world. Tobacco consumption increases heart rate, vascular resistance; imbalanced myocardiary oxygen demand and supply, hence raise the severity of cardiac events. Excess intake of alcohol may also cause acute cardiac rhythm disturbance or arterial fibrillation and heart failure [47-49].

**Stress**
Stress is another risk factor responsible for the development of coronary artery disease. It adversely affects autonomic and hormonal homeostasis that results in metabolic abnormalities, inflammation, excess platelet aggregation, and endothelial dysfunction. Further, these features lead to atherosclerosis and serious cardiac events, such as heart attack [48].

**Non-modifiable risk factors**

**Ageing**
Increasing age is an un-modifiable CHD risk factor. Male and female more than 50 years old are more prone to get CHD. Age-related changes include diastolic dysfunction; degenerative changes in conduction system, decreased response to catecholamine, sympathetic stimuli, and major alteration in coronary artery make people more prone to atherosclerosis and coronary heart disease. The aging has increased the involvement of more CHD cases to total disease burden [50].

**Gender**
Male sex is the strongest risk factor and well documented for CHD. Men have the highest chance of heart attack as compared to women. A man more than 45 years of age may consider a cardiac risk factor. The rate of CHD events in the male is usually twice that in females [51].

**Family History**
A family history of CHD is a strong risk factor for the development of atherosclerosis. It is also a possible screening tool for early detection, prevention, and control of CHD. Parental history projected as a marker to stratify people for genetic research, which further help to control and manage CHD. The family history of heart attack and stroke is the primary indicator for prevention and management of possible serious cardiac issues [52].

### 2.4 CLINICAL ASSESSMENT AND DIAGNOSIS OF CORONARY HEART DISEASE

**Physical Examination**
Body Mass Index (BMI): It used to classify underweight, overweight, and obese status of a person. A normal BMI range is 18.5 kg/m² to 29.9 kg/m² and person's BMI above 30 kg/m² is considered as obese [53]. Blood Pressure (BP): BP is the estimation of the blood flow in the walls of arteries. Hypertension prompts endothelial dysfunction, aggravates atherosclerosis, and makes, the more atherosclerotic plaque, which is the reason for high morbidity and mortality rate of CHD in developing and developed countries [54].

**Biochemical Assessment**

**Blood Sugar:** Diabetic patients have the highest prevalence of CHD and Framingham study demonstrated 2 to 4 fold higher cardiovascular mortality rate as compared to non-diabetic patients [55].

**Glycosylated hemoglobin (HbA1c):** HbA1c is a diagnostic test for diabetes. It occurs when hemoglobin binds to glucose in the blood and become glycated. This test reflects the average blood sugar control over a period of 3 months. A healthy person usually has the HbA1c level less than 5.7%. In diabetic patients, HbA1c is proven and the valid marker of long-term glycemic control and increase level of HbA1c is an independent risk factor for coronary heart disease [56].

**Lipid profile:** A lipid profile is a lipid panel to measure lipids and fatty substances. These lipid substances are cholesterol, triglycerides, high-density lipoprotein, and low-density lipoprotein. Increase amount of total cholesterol, triglyceride, low-density lipoprotein and low value of HDL is the major risk factors for CHD [57].

**Sign and Symptoms**

**Angina:** Chest pain is known as angina. It is the condition of discomfort in chest occurs when the heart muscle does not acquire adequate oxygen-rich blood due to blockage in coronary arteries. In angina, condition patient may feel pressure or squeeze in the chest and this pain can radiate in shoulders, arms, jaw, and neck. Angina pectoris or stable angina is the most common type of angina that occurs with physical activity and stress, which is due to poor blood flow in coronary arteries. CCS angina classification and grading scale from grade 1 to IV are wildly used and is a valid and reliable tool to evaluate the angina status [58].

**Dyspnea:** It is the condition of shortness of breath and also known as breathlessness. If dyspnea is greater than predicted by the amount of physical exertion then this condition is called the symptom of CHD. Dyspnea can be serious if it starts suddenly without any physical exertion and continues for longer than a few minutes and the same time, becomes the serious sign of heart disease. The Medical Research Council (MRC) breathlessness scale is widely used to describe the effectiveness of an intervention in CHD patients [59].

**Diagnostic Approach**

**ECG:** Electrocardiogram (ECG) is also known as an EKG. This is a test to assess the electrical activity of the heartbeat. At the time of heart pumping or with every heartbeat, the electrical impulse traveling through the heart and a series of electrical waves emits that causes the muscle to contract, relax and pump blood and these waves can be recorded using electrodes. This test is used for angina pectoris and myocardial infarction also known as heart attack. The regular characteristic pattern is seen in a normal healthy heart, but any abnormality in heart will indicate abnormal graphically. A healthy person ECG graph shows the normal pattern of P, Q, R, S, T wave pattern, but in case of angina ST depression and heart attack condition shows the ST elevation pattern in ECG [60].
TMT: Treadmill Test (TMT) is also known as an exercise stress test and it is used to define the impact of physical exercise on the heart and its rhythm (heart rate) at the time of walking or running on the treadmill. This test is designed to diagnose CHD and to detect abnormal heart rhythms. The treadmill is a walking test along with ECG monitoring and observance of heart rate, SpO2, VO2max, angina status and status of ECG (S & T wave) at the time of physical stress. This test requires walking the patient for 9 minutes and electrical activity of heart observed and the results of this test reveal the response of heart at different levels of exertion and physical stress. A positive result indicates the presence of CHD with angina [61].

Echocardiography: An echocardiogram or echo test is done by using high-frequency ultrasound waves to form pictures of the heart. It is also called echocardiography or cardiac ultrasonography test. This test is painless and uses ultrasound waves to generate pictures of the heart in different patterns. Anatomical position and condition of the valves of the heart, chambers, ejection fraction, size, and shape of the heart are assessed through this test. It also identifies blood clots and fluid buildup in pericardium layers of the heart. It is the best test to assess ejection fraction; the pumping power of heart in case of CHD and heart attack [62].

CT Angiography: A Computerized Tomography (CT) coronary angiography is a heart-imaging test that used to looks the percentage of blockage of coronary arteries of the heart. The heart has three major coronary arteries (RCA, LAD & LMCx) for its own blood supply [63-64]. This test is used to diagnose the reason for chest pain (angina) with the percentage of blockage in coronary arteries.

3. MANAGEMENT OF CORONARY HEART DISEASE

Pharmacological Treatment
Pharmacological treatment is based on modern science medicines. There are mainly five types of allopathic medicines used for heart patients. These medicines are anti-angina medicines, the blood thinner; drugs used to reduce oxygen demand of the heart, cholesterol, and triglyceride reducing drugs and drugs, which are used for lower pumping power of the heart.

Anti-angina drugs
Sorbitrate is the most popular medicine that is frequently uses for angina. This medicine action is to increase the blood supply of heart muscle and relieve chest pain. It makes the tube wider and also known as the dilator. It is a very effective emergency medicine and works within a minute. The group of this medicine is; Nitrates, Trimetazines, Nikorandil and Ranolazine.

Drugs for Low pumping power of the Heart
These medicines are used for special cases of the patients having low pumping power of the heart due to heart attacks or cardiomyopathy. These medicines are diuretics (Lasix, Dytor, Tide, Lasilactone, Amifru), heart strengthens medicines (Cardivas, Eptus, Zitanix, Carvidiol) and medicines used to increase the pumping power of the heart (Digoxin, Lanoxin) [65].

Blood glucose managing drugs
Most common drugs for management of T2DM are; Alpha-glucosidase inhibitors, Biguanides, Dopamine agonist, DPP-4 inhibitors, Glucagon-like peptides (incretin mimetics), Meglitinides, Sodium glucose transporter (SGLT) 2 inhibitors, Sulfonlyureas, Thiazolidinediones and Insulin if Blood glucose in very high and uncontrolled.

4. PROBLEMS AND COMPLICATIONS WITH INVASIVE TREATMENT METHODS

After PTCA patient becomes more susceptible to re-blockage, it is because of the stent that aside, is a foreign subject for patient body and his/her immune system act accordingly. This procedure is widely used but re-blockage occurs most frequently in PTCA treated patients as compared to naive [25]. After CABG treatment the symptoms of angina, dyspnea generally improves but some patients get very serious complications. The most important complication of CABG is operative death. Operative death is more common if patients have low pumping power, recent heart attack history, valve problems, and co-morbidity with diabetes and hypertension. Hence, special attention is required to deal with these life-threatening complications [66].

5. NON-INVASIVE TREATMENT METHODS

Enhanced External Counter Pulsation (EECP)
The current non-pharmacological and non-invasive therapy available for chronic stable angina (a symptom of coronary heart disease) and heart failure is Enhanced External Counter Pulsion (EECP). EECP is USA-FDA approved therapy for coronary heart disease patient [67]. The concept of external counterpulsation was first described by Kantrowitz on the principle of “phase shift diastolic augmentation”[68-69] which was further researched by Harken at Harvard in the late 1950’s. In the early 1960’s Birtwell and Claus produced counterpulsation in the form of Intra-aortic Balloon Pump (IABP) [70]. In the late 1960’s research of National Institute of Health scientists demonstrated that positive clinical outcomes can be achieved if blood was expressed in a sequential manner. The beneficial results of pneumatic counter pulsation device in a sequential manner was first reported in the 1980s by Zheng at Sun Yat Sen University in China and it further evolved in 1983 into External Counter Pulsion (EECP) as a noninvasive procedure for the treatment of angina refractory in coronary heart disease patients [71]. Nowadays EECP, an electro-mechanical system is a registered trademark of Vasomedical, Inc, New York, USA and PSK (Chinese Company) is the exclusive distributor of Vasomedical’s EECP devices all over.
The principle of EECP is very simple and based on sequential inflation and deflation process. In EECP treatment 3 sets of pneumatic compressive cuffs are wrapped around calves, lower thighs, and upper thighs of the patients and these are synchronized to inflate during cardiac diastole when the myocardium is in the relaxed state and raising diastolic aortic pressure with increase coronary perfusion pressure. Simultaneously, venous return is increased, which further enhance cardiac output. The cuffs are then rapidly expanded at the beginning of systole of the next cardiac cycle. This rapid drop diastolic pressure significantly unloads the left ventricle and thus the workload of the ventricle to be decreased, which may also enhance cardiac output. EECP decrease the myocardial oxygen demand and increase coronary blood flow with enhanced cardiac outputs. CHD patients usually undergo EECP treatment of 35 consecutive 1-hour sessions over 5–7 weeks. Treatment patient is continuously monitored for cardiac outputs, heart rate and spo2 using ECG and finger plethysmogram which are connected to EECP device [73-74]. EECP is clinically proven, beneficial and safe in Anginal episodes, nitroglycerine usages, exercise duration, peak oxygen consumption. EECP induces higher shear stress to increase blood flow velocity and improves endothelial function by increasing nitric oxide that further promotes angiogenesis and recruits collateral circulation to ischemic regions. That further reduces myocardial oxygen demand and inhibits the inflammatory cytokines, reduces arterial stiffness, proliferation, and migration of smooth muscle cells and inhibits the process of atherosclerosis [75].

EECP EFFECT ON CLINICAL PROFILE AND HEALTH RELATED QUALITY OF LIFE IN CORONARY HEART DISEASE PATIENTS


1. Risk Factors (Weight, Blood Pressure, Fat (Lipids) and Tobacco or Smoking Cessation) Management : Patients have to completely manage heart disease responsible risk factors Weight, Blood Pressure, Lipids or fat, and Smoking or tobacco use through guiding adverse serious effects of these risk factors on cardiovascular system.

2. Plant Based Nutritional diet: Patients have to train to consume plant based / very low fat diet or zero visible oil diet for reversal of coronary artery disease. Relevant information in relation to nutrition and diet is required to made and available to the subjects through expert diet counselor77-83.

3. Physical Activity : Daily (Morning / Evening) walking (35 minutes daily): Patients have to do daily morning or evening walk within their comfortable limits. Duration, intensity, speed of walking will be individualized according to individual patient condition and body response.

4. Yogic Exercise (15 minutes daily): The patients have to undergo training in various yogic exercises by a trained yoga instructor for one week after which they will be instructed to continue these practices daily for about 35 min daily. These are the yogic postures and exercises mainly aimed at stretch relaxation.

5. Stress Management and Preksha- Meditation : Preksha meditation is recommended at least 10 minutes daily for stress management of coronary artery disease and T2DM patients [82-88].

Technique: Perception of Deep Breathing: Breathing is linked with the conscious mind. The mind is always restless; it is extremely difficult to steady the wandering mind directly. An efficient and easy way to control mental activities is concentrated perception of breath. At the same time, the rate of breathing can be reduced from 15-17 per minute to 10-12 per minute and by further practice to 4-6 per minute.

7. INTEGRATIVE ENERGY MEDICINE

Healing Mantra
Ra Ma Da Sa, Sa Say So Hung is a universal healing mantra and also known as Shushmana Mantra. It is related to spine and spiritual energy centers (seven chakras). This mantra act as a diamond, which connects to universal healing sounds.

- RA sound belongs to Sun.
- MA is related to Moon.
- DA provides the ground of action.
- SA is the impersonal infinity. It is repeated 2 times.
- SAY is the totality of experience.
- SO is the personal sense of identity.
- HUNG is the infinite, vibrating and real and it stimulate the divine glands.

These all sounds have healing powers to treat and reverse CHD & DM. Around the globe this healing mantra is practiced to get mental & physical benefits and deal with any illness in the spiritual context.

6. COMPLEMENTARY AND INTEGRATIVE MEDICINE APPROACH FOR CORONARY HEART DISEASE AND TYPE 2 DIABETES MELLITUS PATIENTS

Comprehensive cardiac lifestyle interventions consisting of following segments:

8. EFFECT OF COMPLEMENTARY AND
INTEGRATIVE MEDICINE IN REHABILITATION OF CORONARY HEART DISEASE AND TYPE 2 DIABETES MELLITUS PATIENTS


9. CONCLUSION

Type 2 Diabetes Mellitus and Coronary Heart Disease are lifestyle-related disorders. The permanent solution for prevention, control and treatment is Complementary and Integrative Medicine including plant based balanced diet, daily physical activity, cessation of tobacco and alcohol and other risk factors. Yoga and Medication play a vital role in management of CHD and T2DM. A non-invasive therapy (EECP) may also help in significant improvement in angina episodes, dyspnea, left ventricle ejection fraction functioning, exercise tolerance along with improvement in Body Mass Index (BMI), Heart Rate, Cholesterol, Triglyceride, High-Density Lipoprotein (HDL), Low-Density Lipoprotein (LDL), blood glucose, walking capacity and HR-QoL with reduction of nitroglycerine use & decrease hospitalization rate in coronary heart disease patients with diabetes mellitus. Energy medicine with special reference to kundalini healing mantra (RA,MA,DA,SA,SA,SAY,SOO,HUNG) play a vital role in the prevention and treatment of coronary heart disease with diabetes mellitus. This healing mantra with the combination of complementary and integrative medicine may reverse diabetes and coronary heart disease. Further Rehabilitation Programs and Randomized Controlled Trials are required to validate the effect of complementary and integrative medicine in prevention, control and treatment of Coronary Heart Disease and Type 2 Diabetes Mellitus patients.

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Conflict of Interest

There is no conflict of interest in relation to the publication of this manuscript.

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