



THEME OF WORLD HEART DAY 2022 : CARDIOVASCULAR HEALTH FOR EVERYONE

The Heart is the beginning of life; the Sun of the Microcosm, even as the Sun in His turn might well be designated the Heart of the world; for it is the Heart by whose virtue and pulse the Blood is moved, perfected, made apt to nourish and is preserved from corruption and coagulation; it is the household divinity which, discharging its function, nourishes, cherishes, quickens the whole body and is indeed the foundation of life, the source of all actions (William Harvey, 1628).

While Cardiovascular Diseases (CVD) may be inherited, many of the risk factors are either preventable or controllable. **Breach of environmental harmony of the Heart leads to CVD.**

About half of adults have some form of cardiovascular disease. It affects people of all ages, gender, ethnicities and socioeconomic levels.

High BP alone kills more people worldwide than all infectious diseases combined.

People having serious heart conditions are at higher risk for severe illness from COVID-19.

CVD : Coronary Heart Disease (CHD) (which causes heart attack and heart failure) and **Cerebrovascular Disease** (which causes Stroke) are the two leading causes of death worldwide (> 18 Million deaths each year). Predominantly affect working-age people (30-64 years). A common conception that CVD impact more people in developed countries who are more reliant on technology and lead sedentary lifestyles is wrong. > 80% of the deaths occur in low-income and middle-income countries (LMICs). The direct and indirect costs of CVD are high: enormous healthcare costs and productivity. Economic systems of countries are impacted by CVD because the cost of treatment is high & failure to treat diseases timely results in exponential health spending, financial hardships, loss of productivity & long absences from duty.

Individuals in higher socioeconomic status (SES) (Education, Occupation, Income) are usually the first to adopt a lifestyle of physical inactivity, smoking, poor diet leading to the development of risk factors (Hyperlipidemia, Hypertension, Obesity, Metabolic Syndrome, Diabetes) and consequently the development of CVD. Association between parental SES, poor childhood environment and increased CVD risk is strong. The causal association of social relationships or relative lack of them is a major risk factor for health and rivals the effect of well-established health risk factors e.g. cigarette smoking, blood pressure, blood lipids, obesity, physical activity, medication non-adherence. The dearth of social relationships is linked to the development and progression of Heart disease. Small social networks and poor functional support, loneliness, poor emotional support are risk factors for cardiac events. There is a gradient relationship between the degree of reduced social support and the likelihood of adverse cardiac events. Social support moderated the association between sleep and circulating levels of interleukin-6 and C-reactive protein (CRP) (measures inflammation). Poor sleep confers a risk of increased inflammation in those who have low social support. The salutary effects of social relationships start early in life. Greater emotional and instrumental support in childhood is associated with less biological dysregulation in mid-life. Poor neighborhoods have fewer health-promoting resources, fewer healthy food options, parks & recreational facilities, fewer supermarkets, fruits & vegetables markets. Adverse social environments affect health behaviour adversely. There is a strong association between neighborhood-built environment and health behaviour e.g. physical activity levels, eating patterns and rate of obesity. Exposure to numerous environmental health threats e.g. toxic chemicals, biological agents, water, air & noise pollution, metals including Lead, Mercury, Arsenic, Cobalt, and Thallium are World's largest environmental cardiotoxic to persons in highly urbanized, densely populated and poor residential spaces. Particulate matter with a mean diameter enters the Tracheo-bronchial tree and larger particles with a mass median diameter of > 10 µm (PM 10) are filtered out of inhaled air in upper airways

and do not penetrate deep into the lungs except when the concentration is so high that normal physiological defenses are overwhelmed as occurs in highly polluted indoor environments in developing World (e.g. post attack on World Trade Center in New York City on 11th September 2001). The pollutants cause Arrhythmia, Hypertension, Peripheral Vascular injury, cardiomyopathy, acute MI, Stroke, Obesity, Metabolic syndrome, sudden cardiac death (SCD).

Two main Epidemiologic models of Psychosocial job stress are job strain (high demands and low control); **effort-reward imbalance** (high effort, low reward and over commitment). Unemployment status, multiple job losses, short periods without work are significant risk factors. The risk of Myocardial Infarction (MI) is more within the first year of unemployment. Medicaid beneficiaries face more barriers e.g. unable to get through on the telephone, difficulty in getting early appointments, long waiting hours in OPD, clinic hours, delayed Primary healthcare, lack of transportation, lack of proximity to the Health Centres, lack of flexibility in work schedules, illiteracy, language & cultural barriers, beliefs and hence, higher Emergency Room (ER) utilization.

A comprehensive multi-level strategy is required to eliminate healthcare disparities.

Heart Disease: It is the leading cause of death for all adults in the United States, responsible for one in every 4 (four) deaths. It kills 647,000 Americans every year i.e. ~ one person every 37 seconds (U.S. Centers for Disease Control and Prevention) (CDC) Atlanta, Georgia, United States. Preventing or controlling Heart disease is the most important health measure to improve life expectancy.

Medicines which can increase the risk of Heart disease are:

Rosiglitazone: Used to treat Type 2 Diabetes. It causes Cardiac Failure (CF), stroke and heart attack.

Rofecoxib: Used to treat arthritis, acute pain and migraine headaches.

Omalizumab: Used to treat severe, persistent allergic asthma and chronic hives. It can cause inflammation of blood vessels.

Common types of Heart disease: 1. Coronary Artery Disease (CAD), 2. Cardiac failure (CF), 3. Cardiac Arrhythmia, 4. Rheumatic Heart Disease (RHD), 5. Congenital Heart Disease (CHD). Heart disease can frequently be silent.

1. Coronary Artery Disease (CAD):

The most common cardiovascular condition is also called Coronary Heart Disease (CHD) or Ischemic Heart Disease (IHD). It is caused by a buildup of plaque on the walls of the Arteries leading to blockages of the Heart's blood vessels. Plaque is made of cholesterol and fatty substances. They can narrow the passageways in arteries over some time reducing or completely stopping the flow of blood through a blood vessel. This condition is called Atherosclerosis. Toxic chemicals, halogenated hydrocarbons including chlorinated, brominated, fluorinated compounds, organophosphate insecticides, nitrates, Carbon disulfide elevate lipid levels and cause accelerated progression of Atherosclerosis. This can lead to a Myocardial Infarction (MI).

Myocardial Infarction (MI) (Heart Attack):

Symptoms: In men: intense chest pain, pain in the left arm or jaw and difficulty in breathing. Women may have some of the same symptoms, but the pain may be more diffuse and inconsistent spreading to the shoulders, neck, arms, abdomen and back or indigestion or unexplained anxiety, nausea, dizziness, palpitations and cold sweat and may be preceded by unexplained fatigue. Women, as compared to men, tend to have more severe first Heart attack which frequently lead to death.

2. **Cardiac Failure (CF)** can result from any heart condition that reduces the ability of the Heart to pump enough blood to meet the body's needs. The cause is usually decreased contractility of myocardium resulting from diminished coronary blood flow. However, failure can also be caused by damaged Heart valves, external pressure around the heart, vitamin B deficiency, primary cardiac muscle disease, or any other abnormality that makes the heart a hypoeffective pump. A moderate increase in body fluid and blood volume is an important factor in helping to compensate for the diminished pumping ability of the Heart by increasing the venous return. If the heart is not too greatly damaged, this increased venous return can almost fully compensate for the heart's diminished pumping ability. When the heart's pumping capability is reduced further blood flow to the kidneys finally becomes too low for the kidneys to excrete enough salt and water to equal salt and water intake. Therefore, fluid retention begins and continues indefinitely, unless major therapeutic procedures are used to prevent this outcome. Furthermore, because the Heart is already pumping at its maximum capacity, this excess fluid no longer has a beneficial effect on circulation. Instead, fluid retention increases the workload on the already damaged heart and severe edema develops throughout the body, which can be very detrimental and can lead to death.

After a heart becomes suddenly damaged as a result of MI, the natural reparative processes of the body begin to help restore normal cardiac function e.g. a new collateral blood supply begins to penetrate the peripheral portions of the infarcted area of the Heart, often causing much of the heart muscle in the fringe areas to become functional again. The undamaged portion of the heart musculature hypertrophies, offsetting much of the cardiac damage.

The degree and extent of recovery depend on the type of cardiac damage. After acute MI, the heart ordinarily recovers rapidly during the first few days & weeks and achieves most of its final state of recovery within 5-7 weeks, although mild degrees of additional recovery can continue for months.

Risk factors: Coronary Heart Disease (CHD), MI, Myocarditis, Dyssynchronous contraction, reduced contractile force, Cirrhotic Cardiomyopathy, Stress-induced Cardiomyopathy, Diabetes, High BP, Kidney disease, Obesity, Aortic stenosis, Pulmonary Hypertension from Pulmonary Embolism (PE) or Chronic Lung disease, Iron deficiency Anaemia, Valvular regurgitation, Atrial septal defect, Ventricular septal defect, Tachycardia, Pericardial constriction, Cardiac Tamponade from Pericardial effusion, HIV, Stress, smoking or tobacco use, Diet high in fats, Cholesterol or Sodium, Physical inactivity, Excessive alcohol use, woman > 55 age, man > 45 age, father or brother had heart disease < 55 age, mother or sister had Heart disease < 65 age.

Most CHD, the number one cause of HF, can be prevented by control of Coronary Risk Factors. The most important factor in the treatment of MI is the observance of absolute bed rest during the recovery phase.

3. **Cardiac Arrhythmia (CA) Risk factors:** CAD, scarring of the Heart muscle, genetic problems, Congenital Heart disease, medicine(s), smoking and stress.

Management: Invasive Electrophysiological studies (EPS) and testing, Implantable Cardioverter-Defibrillator (ICD) therapy.

Incident Atrial Fibrillation (AFib) may be predicted by B-type natriuretic peptide (BNP) or by CRP or galectin-3.

4. **Valvular Heart Disease (VHD)**

5. **Rheumatic Heart Disease (RHD): β -hemolytic streptococcal infection of the pharynx causes Rheumatic fever.** Repeated attacks of rheumatic fever cause chronic rheumatic heart disease which produces rigidity and deformity of valve cusps or shortening and fusion of the chordae tendineae. The Mitral valve is involved in 50 – 60 % of the cases and combine lesions of the Aortic and mitral valves occur in 20% of cases.

Presence of two major criteria (Carditis, Erythema marginatum and subcutaneous nodules, Sydenham chorea, Polyarthritits) – or one major criteria and two minor criteria (fever, polyarthralgia, elevated ESR or CRP, reversible prolongation of PR interval) – establish the diagnosis.

Treatment: Salicylates, Benzathine Penicillin, Corticosteroids.

6. **Peripheral Artery Disease (PAD)** :

Risk factors are same as those for CAD: Atherosclerosis, Tobacco, Diabetes, Hypertension, Hyperlipidemia, Homocysteinemia, CRP. Increased High-Density Lipid proteins (HDL) are protective against PAD.

Investigations: Coronary Angiography (CA), CT Angiography, Magnetic Resonance (MR) Angiography, Duplex ultrasound.

7. **Congenital Heart Disease (CHD)**: Intrauterine diagnosis of CHD is possible.

8. **Pericardial Disease (PD)**: Normally the space between the double layers around the Heart (Pericardial sac) typically contains a thin layer of fluid. Blunt, penetrating trauma and iatrogenic injury to the Myocardium, Aorta or Coronary Vessels can lead to the accumulation of blood within the **double-layered, saclike structure around the Heart i.e. pericardial sac** causing **Pericardial effusion. Cancer Lung is the most common cause of malignant Pericardial Effusion.**

9. **Deep vein thrombosis (DVT)** occurs when a **blood clot (thrombus) forms in one or more of the deep veins in the body, usually in the legs.**

Throbbing or cramping pain in one leg, usually in the calf or thigh, swelling in one leg, warm skin around the painful area, red or darkened skin, warmth in the painful area, swollen veins which are hard or sore, sudden breathlessness, sharp chest pain (may be worse when breathing in) and cough or coughing up blood.

If the clot is large it breaks off and lodges in the lung (pulmonary embolism). It may feel like having a charley horse or cramp in the leg leading to troubled breathing and may cough up blood or feeling dizzy which may be fatal.

Long-term complications of the damage caused by the clot to the Valves in the Vein are called **Post-Thrombotic Syndrome (PTS).**

Investigations: Homan's Test: It consists of lying flat on the back and extending the knee in the suspected leg. Raise the extended leg to 10 degrees, then squeeze the calf. If there is deep pain in the calf, it indicates DVT.

Duplex Ultrasonography is recommended to confirm Superficial Thrombophlebitis (STP).

D-dimer test is used to find out if there is a blood clotting disorder.

Catheter-based Venography is the gold standard.

Treatment: Direct Oral Anticoagulants (DOACs) (Blood Thinners) – First line alternative to Warfarin therapy for acute DVT and PE: Apixaban (Eliquis) (superior to Warfarin in major bleeding), Betrixaban, Dabigatran (Pradaxa), Edoxaban, Fondaparinux (Arixtra), Heparin, Rivaroxaban (Xarelto), Warfarin. Apixaban in Low dose (2.5 mg BD) is as effective as full dose Apixaban (5 mg BD) for preventing Venous Thromboembolism (VTE).

Anticoagulants ease leg pain and inflammation, break up clots and keep new clots from forming. **Non-Steroidal Anti Inflammatory drugs (NSAIDs).**

Low molecular weight Heparin and Fondaparinux at prophylactic or therapeutic doses are therapies to prevent DVT or Pulmonary Embolism (PE) in high-risk patients.

Aspirin is an effective and safe prophylactic against deep vein thrombosis following major elective lower limb surgery.

Ramipril improved pain-free, maximal walking time. **Cilostazol** increases walking distance.

Home remedies: Graduated Compression stockings but do not wear them while sleeping. Elevate the legs above the level of Heart while sitting or lying down, as often one can to reduce swelling and pain. Walking and hot fomentation are helpful. It takes about **3 to 6 months** for a blood clot to dissipate away.

Do not stand or sit in one spot for a long time. Do not wear clothing which restricts blood flow in the legs. Do not smoke. Do not participate in contact sports when taking Blood thinners because of risk of bleeding from trauma.

~ **60% of patients will recover from a leg DVT without any residual symptoms**, 40% will have some degree of PTS which occurs within the first 6 months, but can occur up to 2 years after the clot.

Eat natural pineapple or take a nutritional supplement with bromelain. Increase intake of foods and drinks which may help dissolve blood clots such as **garlic, kiwi, kale, spinach, red wine, grapes, grape juice, Brussels sprouts, chard, collard or mustard greens.** Green tea, cranberry juice, and alcohol can affect Blood thinners. Increase the exercise.

Dehydration causes blood vessels to narrow and hence, contributes to the development of sluggish blood flow and blood thickens raising the risk for clot formation. Take 2100 – 2300 ml of warm water each day for optimal blood flow, more so when mobility is limited for long periods e.g. while traveling.

Moderate amounts of **purple grape juice** daily help keep blood platelets from sticking together and forming clots as they contain powerful antioxidants called **polyphenols**.

Vitamin D 25-hydroxyvitamin D [25(OH)D] has anticoagulant effect.

If discovered early DVT is preventable and treatable.

Contra-indications: Massage because it can dislodge a clot and allow it to travel to the lungs causing PE.

Factors which increase Heart disease risk: Smoking, tobacco, Vaping, High blood pressure, High cholesterol, overweight or obesity, Diet high in Sodium, Sugar, Fat, unhealthy diet, Physical inactivity, Excessive Alcohol consumption, Family history of Heart Disease, Misuse of prescription or recreation drugs, Pre-eclampsia or toxemia, Gestational diabetes, Chronic inflammatory or Auto-Immune Disorders, Chronic Kidney Disease.

In any population, more individuals have CVD due to small concurrent adverse changes in multiple risk factors rather than extreme deviations in any single risk factor:

- 60% of the burden of cerebrovascular disease and ~ one-half of CHD globally is attributable to high **BP**. The major modifiable factors influencing BP levels are dietary patterns (especially salt intake), body weight and physical activity.
- High **cholesterol levels** are responsible for ~ 20% of the global burden of Cerebrovascular disease and 60% of CHD. Determinants of cholesterol levels (intake of saturated and trans-fatty acids, and physical activity) can be modified.

- **Tobacco consumption** contributes ~ one-eighth of the global burden of CVD.
- Globally the number of adults with **diabetes** is projected to rise sharply from 135 million in 1995 to over 300 million by 2025. By 2025 >75% of adults with diabetes will reside in developing countries. The major modifiable risk factors for diabetes are overweight/obesity, unhealthy diet and physical inactivity.

There are > 1 **Billion overweight or obese** people globally. Being overweight and obesity are associated with raised BP and cholesterol levels, and an increased risk of developing diabetes. Excess body fat (generalized or abdominal) accounts for ~ 60% and 20% of the global burden of diabetes and CHD, respectively. Major modifiable determinants of overweight and obesity are **unhealthy diet and physical inactivity**.

Prevention or treatment of risk factors for CVD is effective and sustainable in the long run. It has a favourable impact on other non-communicable diseases (NCDs) which share the same risk factors.

Treatment of established CVD is expensive and resource intensive.

Improve control of high blood pressure from 14% to 50% of the population.

Mitigating the risks to Cardiovascular Health:

Approximately 47% of all Americans have one of the three leading risk factors for Heart disease: smoking, high BP and high cholesterol.

While one can not change a few risk factors (family history, gender or age) there are certain Lifestyle Changes one can adopt to reduce the risk of Heart disease:

1. **Smoking cessation:** The risk of heart disease drops to ~ half that of a smoker after a year without cigarettes.
2. **Minimum 30 to 60 minutes of daily activity:** Moderate resistance training programs are safe in cardiac disease. Resistance training done on a regular schedule is useful for promoting muscle strength, flexibility and functionality but contributes less significantly than does isotonic exercise to cardiovascular health and longevity. Resistance training should be done with care & compassion and in moderation in patients with Aortic disease or Aortic Valvular disease.

Training-induced myocardial adaptations protect against Myocardial ischemia.

Elderly persons should undergo a medical evaluation before initiating an exercise program. This assessment should include focused history, physical examination, identifying psychosocial limitations to participation. For older, healthy-looking persons intending to participate in low-to moderate - intensity activity e.g. walking, an exercise test is not required but it is appropriate for vigorous activities and all cardiac patients.

A combination of endurance and resistance exercise is best for achieving the health and fitness goals of young and elderly subjects. The exercise capacity of elderly subjects before and after exercise training is lower. Musculoskeletal limitations especially arthritis can be limiting. So prescribe an exercise program with low-level energy expenditure during the first weeks with gradual increases later on. They can be encouraged to increase the frequency of exercise with shorter duration several times per day.

Those whose exercise duration is limited to less than 15 minutes per session because of physical or psychosocial limitations should do exercise more frequently.

For those who do not have physical or psychosocial limitations, 45 to 60 minutes of activity increases caloric expenditure, improves risk factors, obesity, lipid abnormalities, elevated glucose levels, and

hypertension. Elderly persons have symptomatic concomitant medical and physical limitations which can be exacerbated by weight-bearing exercises especially higher-impact activities e.g. jogging. **Walking may be difficult for a few older and functionally limited patients.** Select older patients may better tolerate cycling and water exercises. Moderate-intensity activity e.g. brisk walking performed on regular basis confer cardioprotection. More vigorous activity can confer greater cardioprotection. Majority of the benefit is accrued with a moderate level of exertion. **There may be poor adherence rates and more musculoskeletal injuries if high-intensity exercise programs are done and hence, it is generally not recommended.**

Persons of all ages must perform the exercise of moderate-intensity for 30-60 minutes, 4-6 times weekly or at least 30 minutes of moderate-intensity physical activity per day e.g. brisk walking, cycling, and swimming. Duration of any activity should be ≥ 10 minutes and accumulated daily duration ≥ 30 minutes. Sedentary persons should be encouraged to initially perform activity which is comfortable and gradually increase from 30 to 60 minutes of daily activity. It is recommended that resistance training using 8 to 10 different exercise skills with 10 to 15 repetitions (each arm, shoulders, chest, trunk, back, hips, and legs) of moderate- to high-intensity for a minimum of 2 days per week.

60 minutes per day of moderate-intensity exercise on most days prevent weight regain. 60 to 90 minutes of exercise is advised for previously overweight people who have lost weight.

Exercise has a significant role in managing Hypertension, Diabetes, Hyperlipidemia, Metabolic Syndrome, and Obesity. 03 to 04 mmHg decrease in Systolic BP and 2 to 3 mmHg decline in Diastolic BP occur with aerobic and resistive exercise training. Such modest effects on BP significantly reduce CVD mortality. When combined with dietary interventions, exercise decreases the incidence rate of new diabetes in high-risk persons. Exercise lowers plasma triglycerides, very low-density lipoproteins (VLDL), Cholesterol, Low-Density Lipoproteins (LDL) cholesterol and increases High-Density Lipoproteins (HDL) cholesterol.

Diet alone yields 3 kg greater loss than exercise alone. Diet and exercise combination is most effective to lose 8.5 kg weight. Exercise plays crucial role in weight loss maintenance and management of Metabolic Syndrome and hence, decreased risk for diabetes and CVD.

Resistance training particularly high caloric expenditure increases total fat-free mass, muscular strength, resting metabolic rate and mobilizes visceral adipose tissue in the abdomen. Physical inactivity elevates CRP levels. Exercise in HF is safe and well tolerated.

3. **Heart-healthy food plans:** BP is decreased by reduced Sodium intake and by adhering to Dietary Approaches to Stop Hypertension (DASH) diet. Diet rich in very low-fat dairy product, low in saturated and total fats. Consumption of diet low in fat, trans-fatty acids, saturated fatty acids (**found in red meat and full-fat dairy products**), cholesterol, sodium or high in fruit & vegetable, **Monounsaturated fatty acids (MUFA), Polyunsaturated fatty acids (PUFA), fish, dietary fibers, Potassium decrease risk of CVD. Failure to adopt cardioprotective diet results in use of high doses or combination of medicines.**

Mediterranean diet: low in saturated fatty acids, low in trans fatty acids. Replace saturated fats with MUFA, PUFA, Omega-3 fatty acids (oily fish). Beans or other legumes, Whole grains, healthy fats. Replace some fat with soluble dietary fiber, ≥ 5 portions of fruits and vegetables daily.

Reduce dietary intake of salt (Sodium) by 30% i.e. decrease the salt intake (< 4 gm per day), Abstain from Alcohol. No Sugar or processed carbohydrates.

Eliminate artificial trans-fat (found in fried fast food, chips, baked goods) from global food supply. Antioxidant vitamins, minerals or trace elements are not recommended.

Anti-inflammatory Diet: Chia seeds, sesame seeds, almonds, walnuts, sunflower seeds, avocados, olive oil, fatty fishes such as salmon, sardines and tuna, poppy seeds and flax seeds. Take yogurt daily, especially with Lactobacillus. Probiotics like yogurt reduce levels of inflammatory cytokines in the body. Substitute green tea for coffee.

Black pepper, Ginger, Garlic and Turmeric should be added to the food as all these are anti-inflammatory. Black pepper increases the bioavailability of Curcumin from Turmeric.

Identify the cause which triggers inflammation in the body. In inflammatory diseases, exposure to allergens can cause medical emergencies.

Enjoy sitting or walking outdoors in the Sunshine. Sunshine will produce vitamin D in body and this Vitamin has an important role in promoting a healthy immune system which means a reduced chance of developing inflammatory and autoimmune diseases. Maintaining sufficient Vitamin D in the body will protect from developing Heart disease.

Exercise or practice Yoga to control obesity. Reducing harmful fat deposits in the body will give protection from inflammatory diseases.

4. **Maintain healthy body weight so as to reduce high BP, high plasma lipids level and Type 2 Diabetes:** The body mass index (BMI) is used to determine whether a person is overweight or obese. BMI of ≥ 25 is overweight and is associated with higher cholesterol, higher BP, and increased risk of heart disease and stroke.

The risk of Heart disease is higher if the waist circumference is > 40 inches for men, 35 inches for women.

Reducing weight by just 3% to 5% can decrease fats in the blood (triglycerides), lower blood sugar glucose and reduce the risk of Type 2 diabetes.

5. **Good quality sleep is essential to avoid risk of obesity, High BP, Heart attack, Diabetes and depression:** Adults need at least seven hours of sleep each night. Maintaining a sleep schedule and sticking to it is helpful. Sleep in a dark and quiet room.

If sleep is enough but still feel tired throughout the day, then evaluate for Obstructive sleep apnea (OSA), which increases the risk of heart disease. Signs of OSA are loud snoring, stopping breathing for short times during sleep and waking up gasping for air.

Treatment of OSA: losing weight if overweight or using a Continuous Positive Airway Pressure (CPAP) device which keeps the airway open while sleeping.

6. **Psychosocial health Interventions:**

- a. **Cognitive behavioral therapy:** Health education strategies, stress management training, coping strategies, problem-solving skills training, assertive communication and anger management skills training.
- b. **Individual Psycho therapeutic intervention** for one hour per week, treatment is brief and symptoms-focused (8-12 sessions). Six major theoretical categories: Humanistic, cognitive, behavioral, psychoanalytic, constructionist and systemic. Psycho-therapy conceptualizes a way to look at clients and their problems, systematically and holistically taking into consideration the five P's : (1) Presenting problem, (2) Predisposing factors, (3) Precipitating factors, (4) Perpetuating factors, and (5) Protective factors.

- c. **Meditation** gives a sense of calm, peace and balance that can benefit both emotional well-being and overall health. It can also be used to relax and cope with stress by refocusing attention on something calming. Meditation can help in learning to stay centered and keep inner peace.

Meditation: a) awareness of the present moment, b) subduing the negative mind, c) **mindfulness of the meditation object**, d) dawning awareness, e) unwavering commitment.

Types of Meditation: a) Mindfulness Meditation, b) Transcendental Meditation, c) Guided Meditation, d) Vipassana Meditation, e) Loving Kindness Meditation, f) Chakra Meditation, g) Yoga Meditation

7. **Social support/Group support** from a close friend or older children. It is one of the most reliable predictors of better health outcomes, including lower cardiovascular disease morbidity and mortality. Cardiac patients who live alone lack source of emotional support and face a significantly high risk of MI, sudden death than those with adequate sources of support. Spouse plays pivotal influence on lifestyle change and in promotion of Heart healthy behaviour. Lack of support from a spouse leads to non-adherence at Cardiac Rehabilitation (CR) programme. Spouse's ability to deal with cardiac illness impacts the patient's adaptation to illness during the acute event and throughout recovery period in CR because of fear of recovery and impending death. Invite and include cardiac patients' significant family members, and friends to participate in CR process from in-patient to long-term maintenance. The time schedule of CR programme during working hours prohibits family participation, evening sessions, and family-only groups. **Hence, ensure the inclusion of all groups.**
8. **Get regular health screenings:** High BP and high lipids damage the Heart and blood vessels. Regular screening can tell **Numbers (BP, Blood Sugar, Plasma Lipids) and whether any action is warranted.**
- a. **Improve treatment of High BP:** Screening for Hypertension should start at age of 18 and BP should be measured at least once every two years to screen for high BP.

If one is between 18 and 39 and there are risk factors for high BP, then screening for high BP should be done once per year. BP of people aged ≥ 40 should be checked yearly.

- b. **Check and control Plasma Lipids levels:** In adults, plasma lipids should be measured once every five years. Screening should start at age 20, though earlier testing may be advised if there are other risk factors e.g. family history of early-onset of heart disease.
- c. **Type 2 diabetes screening:** If there are risk factors for diabetes (overweight or family history of diabetes), then early screening is advised. If not, screening is advised at age of 45, with retesting every three years.

Following Complementary approaches are essential for the prevention of Cardiovascular diseases:

1. **Population-wide Preventive approach:** It targets the whole community by adopting following preventive measures and aims to shift the entire population distribution of risk factors in a favourable direction :
- a) **Promoting the importance of CVD as a public health priority at all levels.**
- b) **Smoking cessation,** c) **Modifying behaviour relating to diet and physical activity.**

Fruit and vegetable consumption and altered patterns of dietary fat intake provide sustainable benefits in the long run.

2. **Individualized approach:** Mediterranean diet and more physical activity provide a cost-effective strategy to reduce the disease burden and reduce the risk of developing diabetes.

Treatment: Dual Antiplatelet Therapy (DAPT): Clopidogrel (75 mg) and Aspirin (75 to 162 mg daily) is more effective in the prevention of MI or Clopidogrel alone unless there is contra indication to Antiplatelet therapy e.g. high risk of bleeding.

Aspirin, Angiotensin Converting Enzyme Inhibitors (ACEIs), Beta Blockers decrease CVS mortality. Angiotensin Receptor Blocker (ARB) is as effective as ACEIs at decreasing CVS death, MI, Stroke, and hospitalization for Cardiac Failure in those with Peripheral Arterial Disease.

Investigations of CVD:

A: Clinico-Pathological Investigations: to evaluate for acute Coronary Syndrome (Troponin, CK-MB), factors contributing to Ischemia (e.g. Anaemia) and screen for (Serum Homocysteine, Lipoproteins (a) & (b), Lipid Profile) risk factors which increase the probability of CHD (Hyperlipidemia).

B: Specific Investigations :

1. **Radiography:** Modern Imaging Technology began with **Konrad's Roentgen discovery of X-Rays** in 1895 for which he was awarded the Nobel prize in Physics in 1901. Within a year fluorescent screens were available to view cardiac pulsations. Chest X-Ray PA View to know any cardiomegaly.

2. **Baseline ECG, Exercise ECG (TMT)**

Ambulatory ECG monitoring can record ischemic ST-segment depression.

3. **2D-Echocardiography:** Discovery of production of sound waves from Piezoelectric crystals in 1880 and Military use of Sonar for the detection of reflected sound waves during WW-II led to the discovery of ultrasound imaging.

Base line M-Mode & 2D-Echo (for studying Right Ventricular Diameter, Inter Ventricular Septum thickness, Left Ventricular Dimension, Left Ventricular Posterior Wall thickness, Aortic Root Diameter, Left Atrial Dimension, Left Ventricular Volume, Left Ventricular Ejection Fraction, Fractional Shortening, Mitral Valve, Aortic Valve, Tricuspid Valve, Pulmonary Valve, Cardiac Chambers, Pericardium), 2D Study of wall motion of Right Ventricle and Left Ventricle is also done.

Continuous and Pulse Wave Doppler Haemodynamics study [for studying peak velocity (m/sec), Maximum P.G. (mmHg), Mean P.G. (mmHg), Regurgitation of Mitral valve, Aortic valve, Tricuspid valve, Pulmonary valve].

Dobutamine Stress Echocardiography (DSE) study (for determining the target heart rate (THR) achievement, any regional wall motion abnormality at peak exercise, any significant ST-T deviation from baseline ECG during exercise or recovery period, any angina.

Impression of DSE study is noted as to whether it is positive or negative for reversible Myocardial Ischemia at 85% of predicted THR.

Echocardiography has safety and brilliantly illuminated the Heart and its function and is the main imaging tool of choice, given its ready availability, its ease of use and extensive investigation supporting its use as a diagnostic tool. Echo is a mainstay avenue of Cardiologists' tools as they are smaller, pocket size devices which bring the technology to the bedside and the ability of Smartphone technology to allow immediate sharing of high-quality images, thus speeding diagnosis and clinical decision making.

4. **CT scanning** can image the Heart and with Contrast medium and multislice technology the Coronary arteries can be imaged with increasing resolution. If the images are normal then it rules out significant CAD.

5. **Cardiac MRI Scanning** provides high-resolution images of the Heart and great vessels without radiation exposure or use of iodinated contrast material. Gadolinium is used as a contrast agent

for cardiac MRI but may cause necrotizing systemic fibrosis, hence, prior kidney function test is mandatory.

6. Single Photon Emission Computed Tomography (SPECT) imaging can reduce the severity of artifacts. Radionuclides e.g. thallium - 201 or technetium - 99mTc tetrofosmin are used. CT allows the integration of knowledge of Cardiac anatomy with cardiac function. **Imaging of vulnerable Atherosclerotic Plaque which would allow the detection of patients at risk for acute ischemic events remains a laudable but elusive diagnosis.**
7. Positron Emission Tomography (PET) scanning uses tracer fluorodeoxyglucose (FDG) to demonstrate either perfusion or metabolism of the Myocardium.
8. Coronary Angiography became focal point of cardiovascular imaging during 1980s and continues to play a vital role in the diagnosis and management of Coronary Artery disease (CAD) and plays a central role as dominant technique for the diagnosis and treatment of Coronary and imaging Vascular Obstructions.
9. Cardiac Catheterization ability to invasively measure cardiac pressure and Oxygen Saturation and imaging of Cardiac structures using a Cardiac Catheter is the touchstone of Cardiologist. **Werner Forssmann, a 29-year old Surgical Resident in Germany performed self-catheterization in 1929 when he passed Uretral catheter in his Antecubital Vein and confirmed its Right Atrial position using X-Rays and was awarded Nobel Prize in 1956.**

Digital recording has significantly transformed the acquisition, storage & interpretation of studies.

Cardiac Rehabilitation (CR) : By monitoring the exercise programme.

Active Surveillance : by continuous monitoring.

Resolve to Save Lives will fill the gap.

Therapeutic Hypothermia induced by staying in the mountains even for few weeks is used to improve cardiac survival among those patients of Myocardial Infarction in whom sudden Cardiac death (SCD) is suspected as a result of complication.

The Government under the dynamic command and astute leadership of Hon'ble Prime Minister Sh. Narendra Damodardas Modi Jee and Sh. Jagat Prakash Nadda Jee, President of the Bharatiya Janata Party have ensured drastic reduction of Cardiovascular diseases by the inclusion of Cardiovascular Disease Management Interventions in the Universal Health Care Package at all the Health Care Levels including the Primary Health Care (PHC) level and provided easy, affordable and cost-effective access to the appropriate technology.

Sd/
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