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CARDIOVASCULAR DISEASE - AN OVERVIEW

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ABSTRACT

In accordance sociocultural and economic progress, cardiovascular disease is emerged as the most prevalent cause of preterm mortality and morbidity globally by the turn of the 21st century, with 80% of cases emanating from less developed, lower-income countries. Since middle of the 20th century, A great deal for research have been done on the causes and risk factors of CVD. They demonstrated that nine and ten prevalent risk aspects, respectively, explained more than 90% of the risk of stroke and myocardial infarction, and they established the importance of preventive. Heart failure, hypertension, coronary artery disease, and stroke are among the conditions collectively referred to as cardiovascular diseases with determinant like corpulence, diabetes, high BP, and smoking they are a major cause of death globally. Along with medical interventions like medication and surgery, prevention strategies that involve diet and exercising. The consequences of CVDs on patients and healthcare systems can be decreased by using early identification and management strategies. Cardiovascular diseases (CVDs) certain to variety of illnesses affecting arteries and heart like coronary artery disease, hypertension, stroke, etc. They are the main cause of illness and mortality globally. This abstract seeks to offer an overview of CVD prevalence, risk factors, pathophysiology, prevention, and treatment techniques, emphasizing the relevance of lifestyle changes, early identification, and evidence-based therapies in lowering the burden of these diseases.

INTRODUCTION

Throughout the last several decades, there has been an enormous shift in way of living, which has culminated in an increase in non- communicable illnesses (NCDs) and associated nationwide consequence. The vast majority of NCDs are cardiovascular illnesses (CVDs), which conjointly emerge as the most frequent cause of death worldwide. Regardless of

current WHO data, 17.9 million fatalities globally are attributed to CVDs, accounting for 31% of all deaths. Coronary artery disease and stroke account for 85% of all CVD-related fatalities. Over seventy-five per cent of deaths occur in middle-class cultures such as India. Ten diseases have recently been determined to represent the leading cause fatalities from CVD-related causes out of an assortment of diseases which make up CVDs.[1]

Viruses make up a section of the microbiome present with little investigations, in addition to the bacterial microbiome and their metabolites already examined as a pathogenic factor. Among the main causes of strokes is high BP. Uncontrolled high BP can harm blood vessels in the brain, which can result in blood clots forming or weakening of the vessels rupturing, which can result in a stroke.[2] Hemorrhagic strokes happen when a weak blood vessel bursts, whereas ischemic strokes happen when a clot stops blood supply to the brain. Cardiac Failure: The thickening and stiffening of the heart muscle due to hypertension might make it more difficult for the heart to pump blood efficiently.[3] Virus infections have been linked to CVDs over an extended period of time by several epidemiological, serological, molecular, and animal studies. Notably, the COVID-19 pandemic's high rate of cardiovascular symptoms emphasizes the significance of future research into the role of viruses in CVDs. In addition, a recent study found that, in comparison to healthy controls, the microbiome's circulating cell-free DNA in CVDs is more abundant in bacteriophages and eukaryotic viruses. The fact is beyond dispute that some behaviors, like smoking and obesity, raise the risk of CVDs. Those are therefore recognized as current risk factors.[4]

Heart and blood vessel illnesses, or cardiovascular diseases (CVDs), include heart attacks, strokes, hypertension, heart failure, and other conditions. Risk factors such as improp diet, tobacco and excess alcohol consumption contribute to their prevalence, making them one of the world's top causes of mortality. It is essential to handle these risk factors by dietary adjustments and pharmaceutical treatments in order to avoid or cure cardiovascular illnesses.

They are among the most common causes of death worldwide. Prevention such as exercisie, diet and treating risk factors such as hypertension and high cholesterol. Early detection and management are critical to lowering the risk of complications and improving results.[5]

RISK FACTOR

A. Hypertension

It is vital cause of risk as number of cardiovascular illnesses. The following are some of the main cardiovascular conditions that are linked to hypertension:

1. Disease of the Coronary Artery: Atherosclerosis disorder where plaque accumulates in arteries delivering blood to heart, can be brought on by hypertension. This artery constriction can limit blood supply to muscle of heart, increasing the chances of angina (chest pain) & heart attack.

2. Strok: One of the main causes of strokes is high BP. It can harm blood vessels in brain, which can result in blood clots forming or weakening of the vessels rupturing, which can result in a stroke. Hemorrhagic strokes happen when a weak blood vessel bursts, whereas ischemic strokes happen when a clot stops blood supply to the brain.[6]

3. Heart failure: A high blood pressure level implies that the heart has to work greater to pump blood across the body. As a result, the heart's ability to pump enough blood to meet the body's needs is likely to weaken over time, that lead to heart failure.

4. Peripheral artery disease (PAD): Arterial narrowing and hardening in the arms and legs due to hypertension can lower blood flow to these regions. In addition to discomfort and numbness, this may cause tissue damage or, in extreme cases, amputation.

5. Aortic aneurysm: The body's main artery, the aorta, can develop an aneurysm when its walls are weakened by high blood pressure. The internal bleeding could be fatal if the aneurysm bursts.[7]

6. Atherosclerosis: Atherosclerosis is a disorder where fatty deposits (plaques) accumulate behind the artery, narrow them & raising the chance of heart attack and stroke. One key contributing factor to the development of atherosclerosis is hypertension.

B. Obesity

Brain attack and high BP are among the CVD that obesity substantially raises the risk of Overweight is a big contributor to cardiovascular problems since it can cause illnesses including insulin resistance, high BP and high cholesterol. Furthermore, it increases the chances of developing heart related issues & can worsen pre-existing cardiac diseases.[8]

C. Tobacco Abuse

Abuse of tobacco products increases the risk of cardiovascular diseases (CVD) for a number of reasons.

1. Atherosclerosis: The aggeregation of fatty deposits on arterial walls is a disorder known as atherosclerosis. Tobacco smoke carries a number of hazardous substances that can injure the lining of blood vessels. Due to the restriction of flow of blood to heart and other organs, there is an elevated risk of peripheral artery disease, heart attack, and stroke.
2. Reduced Oxygen Delivery: The blood's ability to deliver oxygen is diminished because carbon monoxide in tobacco smoke attaches to hemoglobin in red blood cells more easily than oxygen does. This may result in tissue damage and raise the heart's workload.[9]
3. Thrombosis: Smoking damages blood artery walls and encourages platelet aggregation, which lead to the formation of blood clots (thrombosis). Heart attacks and strokes may result from these clots obstructing blood supply to essential organs.
4. Endothelial Dysfunction: The inner lining of blood vessels, the endothelium, is harmed by tobacco smoking, which affects its capacity to control blood clotting, blood vessel tone, and immunological function. Endothelial dysfunction has a role in the onset and development of cardiovascular disease.
5. Inflammation: Smoking causes the body to respond inflammatorily, which might result in long-term inflammation. The development of atherosclerosis and other cardiovascular disorders is significantly influenced by inflammation.
6. Dyslipidemia: Smoking can disrupt how fat is metabolized, which can result in abnormal alterations in blood lipid levels. These include elevated LDL and lowered HDL, which are linked to a higher chane of CVD.[10]

Types of Cardiovascular Diseases

1. Coronary Artery Disease: This condition is characterized by plaque buildup narrowing or blocking the blood channels supplying to heart, which can result in angina.

2. Hypertension: A chronically high BP increases the chances of coronary artery disease, brain attack.

3. Heart Failure: Heart is unable to carry blood to cover its requirements is what results in this illness. Exhaustion, edema, and dyspnea are among the signs.[11]

4. Stroke: It is known as "brain attack," An ischemic or hemorrhagic stroke results in a disturbance in blood vessels to a part of the brain, which might result in brain damage. This condition is known as a stroke.

5. Peripheral Artery Disease: The plaque formation in the peripheral arteries, mostly in legs, narrowing them and causing pain, decreased blood flow, and an increased risk of tissue damage and infections.

6. Arrhythmias: The heart might beat too quickly, too slowly, or erratically due to these irregular heart rhythms. They may result in symptoms including heart palpitations, lightheadedness, syncope, or soreness in the chest.[12]

7. Valvular Heart Disease: This condition is brought on by a malfunction of one or more heart valves and manifests as weariness, dyspnea, chest pain, or ankle and foot edema.

8. Cardiomyopathy: This is a heart muscle condition in which the heart enlarges, thickens, or stiffens, resulting in decreased cardiac function and symptoms like exhaustion, edema, and dyspnea.[13]

9. Congenital cardiac Disease: This category includes cardiac diseases that exist from birth and can vary from straightforward disorders that don't cause any symptoms to intricate conditions that need surgery.

10. Pericardial Disease: This condition causes fever, chest pain, and other symptoms due to inflammation or other issues with the pericardium, the sac that surrounds the heart.[14]

Prevention of cardiovascular disease

1. Healthy Diet: Eliminating the risk of heart disease can be attained with a diet filled with fruits, vegetables, grains, proteins. The decrease in cholesterol, fats, saturated fats, sodium, and added sugars is vital

2. Regular Exercise: A lot of exercise strengthens cholesterol levels, lowers BP, and helps those maintain a healthy weight.

3. Keep Healthy Weight: Late night or obese can greater the chamce of cardiovascular disease. Losing even small amount of the weight can have significant health benefits.

4. Give up Smoking: It damages blood vessels, increases BP and contributes to the buildup of plaque in arteries. No smoking reduces the chance of heart disease and improves overall health.[15]

5. Limit of alcohol Consumption: Excessive alcohol intake can raise blood pressure and contribute to heart disease. Moderation is key – limit alcohol to no more than one drink per day for women and two drinks per day for men.

6. Stress: Persistent stress causes the chances of coronary artery diseases by causing the inflammation and high BP levels. It's critical for heart health to find appropriate means of coping for stress, such as meditation, physical activity, or things to do.

7. Medications: In some cases, medications such as statins, Beta-blocker, angoiotensin convertars enzyme receptor blockers may be prescribed to lower the risk of heart disease or manage underlying conditions.

8. Screening Tests: Tests such as lipid profile, fasting blood glucose, and electrocardiogram (ECG) may be recommended periodically to assess heart health and detect any abnormalities early.[16]

Treatment of cardiovascular disease

Medications

1. Statins: Statins employment by interfering with an enzyme that the liver uses to produce cholesterol, which reductions lipids levels. They are prescribed to minim risk of cardiac arrest and brain attack especially in patients with high cholesterol levels or a history of cardiovascular events.

2. Antiplatelet Agents:

a) Aspirin: Aspirin inhibits platelet aggregation and is commonly used for secondary prevention of cardiac arrest and brain attack in patients with a history of cardiovascular events.[17]

b) Clopidogrel, Ticagrelor, Prasugrel: These are newer antiplatelet agents often used in combination with aspirin for patients with acute coronary syndromes or those undergoing coronary stent placement.

3. Beta-blocker: It slow down the effects of the hormone adrenaline they reduce blood pressure and cardiovascular activity. They are prescribed for various cardiovascular conditions, including hypertension, angina, heart failure, and arrhythmias.

4. ACE Inhibitors and ARBs : These drug help dilate the vessels & reduce BP by inhibiting effects of angiotensin-II. They are commonly prescribed for hypertension, heart failure, and diabetic kidney disease.[18]

5. Ca Channel Blockers: By averting calcium from getting into blood vessel walls and heart muscle cells, inhibitors of calcium channels relax blood vessels and decrease cholesterol levels. They are used to treat hypertension, angina, and certain arrhythmias.

6. Diuretics: It assist to the body's eliminating extra salt and water, which diminishes blood pressure and volume of blood. They are commonly advi for hypertension and heart failure.[19]

7. Nitrates: Vasodilation and enhanace flow of blood to heart by increasing the production of nitric oxide. They are used to relieve symptoms of angina and to prevent angina attacks.

8. Anticoagulants: Anticoagulants, such as warfarin, dabigatran, rivaroxaban, and apixaban, reduce the risk of blood clot formation and minimize stroke in patients with an fibrillation in artery and to treat and prevent blood clots in patients with certain cardiovascular conditions.[20]

9. Statin-Ezetimibe Combination: In cases where statins alone are not sufficient to the hypolipidemia a combination of a statin & ezetimibe may be prescribed to further reduce LDL cholesterol levels.

10. Heart Failure Medications: Medication such as Angiotensin-converting enzyme, diuretics, ARBs, Beta blockers, and aldosterone antagonists are often given to heart failure patients as a way to regulate signs and enhance their chances for recovery.[21]

Surgery

1. Percutaneous Coronary Intervention: It is also known as angioplasty. During PCI, A balloon-tipped catheter will be placed into the choked coronary an artery. In order to widen the artery and compress the plaque, thus restoring blood flow, the balloon is inflated.[22] To keep the artery open and stop it from narrowing again, a stent—a tiny mesh tube—is typically inserted to the vessel.

2. Valve Replacement or Repair: It may be needed to fix damaged valves of heart, which can occur due to conditions such as valvular stenosis or regurgitation. 3. Aortic Aneurysm Repair: Surgery may be necessary to repair an aortic aneurysm, a bulge or weakening of the wall of the aorta (the body's main artery).[23] Based on site and size of aneurysm, surgical options may include open repair (traditional surgery involving a large incision) or endovascular repair (a minimally invasive procedure using a stent graft inserted through blood vessels).

4. Arrhythmia : It may be recommended to act towards certain types of arrhythmia (abnormal heart rhythms) that do not respond to other treatments. Procedures such as catheter ablation, maze procedure, or implantation of a pacemaker may be performed to restore normal heart rhythm.[24]

5. Heart Transplant: In cases of end-stage heart failure or severe heart disease that cannot be managed with other treatments, heart transplantation may be considered.

6. Device implementation: Pacemakers are implantable devices that regulate the heart’s rhythm by sending electrical impulses to the heart muscle. It is used to treat bradycardia and certain types of arrhythmias.[25]

Symptoms

1. Shortness of Breath (Dyspnea): Difficulty breathing or breathlessness, especially during exertion or when lying flat. Can be a sign of heart failure, coronary artery disease, or other cardiovascular conditions affecting the lungs or heart's pumping function.[26]

2. Palpitations: Awareness of abnormal heartbeats, such as rapid, irregular, or skipped beats. May be accompanied by chest discomfort, dizziness, or fainting.

3. Fatigue: Persistent tiredness or weakness, even with adequate rest. Can result from reduced cardiac output, anemia, or other cardiovascular abnormalities.[27]

4. Swelling (Edema): Fluid buildup in the abdomen, ankles, feet, or legs. It may be symptom of heart failure, venous insufficiency, or kidney dysfunction.

5. Cold Sweats: Sudden, clammy perspiration without apparent cause. May occur during episodes of chest pain (angina) or heart attack.[28]

6. Nausea or Indigestion: Feeling of discomfort, bloating, or abdominal discomfort. Can be associated with heart attack, especially in women.

7. Jaw, Neck, Back, or Shoulder Pain: Discomfort or pain in the jaw, neck, back, or shoulders. Can be a symptom of heart attack, particularly in women and older adults.[29]

8. Cough: Persistent cough, especially at night or when lying down. Can be a sign of heart failure or other cardiovascular conditions affecting the lungs.[30]

CONCLUSION

This article provides important information regarding the current landscape of cardiovascular disease treatment, encompassing a wide range of medical, interventional, and surgical modalities. Through advancements in pharmacotherapy, including statins, antiplatelet agents, beta-blockers, ACE inhibitors, and novel therapies, significant strides have been made in reducing cardiovascular risk factors and improving outcomes for patients. Additionally, interventional procedures such as percutaneous coronary intervention (PCI) and surgical interventions like coronary artery bypass grafting (CABG) continue to play pivotal roles in the management of coronary artery disease and its complications. Moreover, lifestyle modifications, including diet, exercise, smoking cessation, and stress management, remain cornerstone strategies in preventing and managing cardiovascular disease. Emerging therapies, such as stem cell and gene therapy and precision medicine approaches, hold promise for further revolutionizing cardiovascular disease treatment by targeting underlying molecular pathways and individualizing patient care. However, challenges such as medication adherence, access to care, and disparities in outcomes persist and require

concerted efforts from healthcare providers, researchers, policymakers, and the broader community to address. In light of these considerations, it is evident that a multidisciplinary and patient-centered approach is essential for the prevention, diagnosis, and medication of cardiovascular disease. Continued research, innovation, & collaboration are paramount to further advancing cardiovascular medicine and ultimately reducing the burden of cardiovascular disease on individuals and society as a whole.

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