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Patient with Diabetic Cardiovascular Disease and Developing Retinopathy - A Case Study

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ABSTRACT-

Diabetes mellitus is a prevalent global illness characterized by elevated blood glucose levels due to defects in insulin production or the body's inability to adjust adequately. This leads to various health issues, including eye and foot problems, neuropathy, renal disease, and cardiovascular disease. Diabetic cardiovascular disease (CVD) is a serious consequence of diabetes, responsible for both mortality and morbidity in diabetic populations. Obesity is a significant risk factor for cardiovascular and metabolic health, and is directly related to insulin resistance. Cardiovascular events like coronary artery disease, heart failure, arrhythmia, and sudden death are caused by insulin resistance. A 56-year-old woman with a history of both coronary diseases and diabetes mellitus was diagnosed with CVD using laboratory tests and an electrocardiogram. Factors such as stress, improper diet, obesity, and cholesterol accumulation caused blockages in the heart's arteries. In 2023, she underwent bypass surgery due to CVD. Eyedrops are being administered to alleviate diabetic retinopathy symptoms, and a stringent diet and regular physical activity are recommended to maintain cholesterol levels. Yoga and meditation are also being practiced to reduce stress and worry.

Keywords- Diabetic cardiovascular diseases (CVD) , Electrocardiogram (ECG), endothelial dysfunction, arrhythmias, Diabetes mellitus (DM)

1. Introduction

Background : An excessively elevated blood glucose level is a hallmark of diabetes mellitus (DM), one of the metabolic diseases. The specific etiology of most kinds of diabetes mellitus remains unclear. Sugar accumulates in the bloodstream as a result of the pancreas's incapacity to generate enough insulin. Some persons may develop type 1 and type 2 diabetes as a result of a combination of hereditary and environmental factors. According to the 2021 International Diabetes Federation Diabetes Atlas, one out of ten individuals aged 20 to 79 has diabetes. According to the forecasts, this number is expected to rise to 643 million by 2030 and 783 million by 2045. An estimated 10.1 crore Indians are thought to have diabetes, according to the results of a 2023 study conducted by the Indian Council of Medical Research (ICMR INDIAB). [1]

Over three-quarters of adults with diabetes reside in low- and moderate-income nations. This causes several problems, some of which are related to the kidney (nephropathy), heart (cardiovascular disorders), foot (foot ulcer), retina (retinopathy), and neurons (neuropathy). Diabetic cardiovascular disease is only one of the numerous consequences that diabetes may cause. The most common cause of disease and death in populations with diabetes is this condition. Obesity is the main risk factor for high blood pressure, inflammation, glucose intolerance, endothelial dysfunction, type 2 diabetes, increased insulin resistance, and dyslipidemias. Insulin resistance and inflammation are additional risk factors. All of these variables raise the risk of heart failure, arrhythmia, coronary artery disease, cardiovascular events, and sudden death. Obesity also increases the chance of getting these diseases. Stress, a bad lifestyle, and an unregulated food are the main causes of this illness. According to a 2021 research that was released to the public on World Health Day and published in the European Journal of Preventive Cardiology, around 30% of those

with coronary artery disease also have diabetes. According to the World Health Organization (WHO), India has a higher rate of cardiovascular disease (CVD)-related deaths per 100,000 people than the world average of 235 deaths per 100,000. [2]

In Western societies, diabetic cardiovascular disease accounts for just 23% of fatalities before the age of 70, however in India, it accounts for 52%. An investigation carried out in 2022 found that the average risk of cardiovascular disease (CVD) among diabetics in India was 15.3%. There is a great deal of research being done to prevent and treat diabetes since insulin therapy may cause insulin resistance. Among the negative reactions and side effects that might arise from medication therapy are skin rash, nail disease, palpitations, headaches, chills, dizziness, taste problems, diaphoresis, chest discomfort, flushing, palpitations, and a deficiency of vitamin B12. Flatulence, nausea, and diarrhea are other negative responses and side effects. Much research is being done on the creation of new medications to treat cardiovascular disease in diabetics. Furthermore, a large number of articles are being published as a result of the ongoing investigation. [3]

2. Materials and Methods

Case presentations : In 2017, a female patient who was 50 years old and had no family history of diabetes was diagnosed with diabetes mellitus. She was experiencing visual symptoms such as increased thirst and hunger, fatigue, frequent urination, sluggish healing of injuries, and impaired vision. According to the data, the glucose level in the blood was determined to be 175.2 milligrams per deciliter.

Immediately following the diagnosis, the physician began therapy with metformin in the month of May in 2017. For the purpose of alleviating tension and anxiety, the physician recommended engaging in yoga and meditation for a minimum of one hour, as well as managing one's diet by avoiding foods that are sweet, fatty, and spicy, as well as rice, and instead consuming sorghum and red millet, maintaining a regular sleep pattern, and engaging in physical activity. In addition to the fact that obesity is the most significant risk factor, the situation deteriorated as a result of a lack of proper food management, the absence of medication, and excessive stress. Overthinking, feeling nervous, and feeling stressed were all symptoms that the patient, who was a housewife, began to experience. As a consequence, she started forgetting about her meds, which made her disease much worse. During the course of walking and completing duties, the patient started experiencing symptoms such as fatigue, palpitations, shortness of breath, and chest discomfort. (July 2017) The angiography showed that there was a thirty percent lesion in the left anterior descending artery and thirty percent lesion in the right coronary artery. According to the results of a stress test that was carried out in July 2017 to evaluate the functional capability of the heart, the result was positive for inducible ischemia. It was discovered that obesity was a risk factor. The maximal heart rate (HR), followed by angina and a shift in ST, was the reason for termination. [4]

There was a finding that exercise tolerance was around average. There was no evidence of arrhythmia brought on by exercise. Both the hemo and chrono responses were typical. A nutrition plan was recommended by doctors in order to reduce weight, while yoga and meditation were recommended in order to reduce stress and achieve mental calm. The patient was also diagnosed with depression, which was classified as stage 3. Ischemia that was induced by stress was shown to be present in the patient. At 7.02 minutes, the test was stopped because the ST-T was changing, the patient complained of chest discomfort, and the maximum heart rate was really obtained.

As a result of hypocalcemia, the patient began experiencing muscular spasms, intense weariness, a sense of pins and needles, and osteoporosis throughout their body. Calcium supplements were recommended by the doctor in order to raise the amount of calcium that was present in the body. The results of this test, which was conducted in January 2023, indicated that the ESR level was high, which resulted in joint and muscle spasms. Physicians recommended using ibuprofen in order to lower the ESR level. [5]

In January 2023, her blood tests revealed that her hemoglobin (Hb) level was 9.5g/dL, her packed cell volume (PCV) level was 20%, and her lymphocyte level was 6.1%, all of which were considered to be low. Additionally, her white blood cell count was determined to be 15480/cm, and her neutrophils level was 89.1%. A low hemoglobin level was the cause of the patient's symptoms, which included fatigue, weakness, and shortness of breath. Tablets of Ferrous Ascorbate 100 mg + Folic Acid were recommended by doctors to treat a low hemoglobin level. Additionally, tablets of Folic Acid were prescribed to reduce the number of white blood cells. Consuming citrus foods, eggs, beans, papaya, guava, and milk, as well as consuming citrus foods, was another recommendation made by the physician for lowering white blood cell levels. It was discovered that the patient's condition had improved with the administration of the drugs. On the basis of such reports, it was discovered that the white blood cell count had

fallen from 15480 / cm to 13200/cm, and the neutrophil count had decreased from 84.9% to 82.1%. The patient's health has significantly improved, as evidenced by the fact that the percentage of lymphocytes in their blood has increased from 6.1% to 10.8%. [6]

Based on the electrocardiogram readings from January 2023, the patient was found to have 70% stenosis in the left coronary artery (LCA), 90% stenosis in the left anterior descending (LAD) artery, and between 50 and 80% stenosis in the right coronary artery. There were also indications of grade II left ventricular (LV) diastolic dysfunction, an enlarged left atrium, and a moderate amount of concentric left ventricular hypertrophy, as demonstrated by the research. It was observed that there was a little concentric LV hypertrophy. [7]

In January of 2023, the patient submitted to a procedure known as coronary artery bypass graft surgery (CABG) in order to eliminate the embolisms and enhance the circulation of blood throughout the heart. Following the surgical procedure, the physician administered insulin glulisine, aspirin, losartan, metoprolol, and clopidogrel in order to make sure that the patient's cardiac condition and sugar level remained stable. The ESR level was discovered to be elevated once more (70) in April 2023, indicating that the body was suffering an inflammatory state. Additionally, the patient began experiencing the identical symptoms that they had been experiencing in January 2023. In order to bring down the ESR level, the physician recommended Ibuprofen. A favorable reaction to the drugs was demonstrated by a drop in the ESR level, which was 25 after the treatment had been administered for a few days. [7]

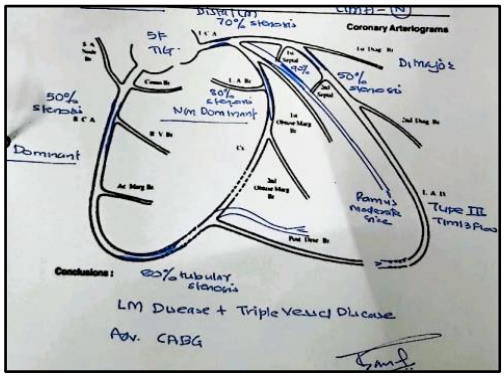

Figure 1. Coronary Arteriograms

In the month of November 2023, it was discovered that the patient's blood sugar level remained elevated. The blood sugar level after a meal was 324.1 mg/dL, whereas the blood sugar level after a meal was 221 mg/dL. In the reports that were made in November 2023, the triglyceride level was shown to be 243.8 mg/dL.

Additionally, hypocalcemia was identified by the physician. In order to decrease the amount of triglycerides in the blood and to raise the amount of calcium, the doctor continued to provide the drugs that were stated above and also added calcium supplements (Calcimax). [8]

The physician recommended Vildagliptin/Metformin in November 2023 in order to regulate the patient's blood sugar level and Losartan, Glimepiride, and Metoprolol in order to treat the patient's heart condition. Each of these medications was intended to improve the patient's condition. Currently, from Jan 2024, the patient is taking Eicosatetraenoic Acid and Docosahexaenoic Acid to support heart health, reduce inflammation, and improve lipid profiles, Methyl cobalamin + Folic Acid + Alpha Lipoic Acid to help improve nerve function and reduce symptoms, Metformin + Glimepiride to control blood glucose level, Losartan to treat high blood pressure, amitriptyline to treat depression, Metoprolol to treat high blood pressure, chest pain, Rosuvastatin + Aspirin to lower cholesterol levels and reduce the risk of cardiovascular events and to reduce the risk of blood clots and heart attacks. Other symptoms of diabetic retinopathy that the patient had in March 2024 were irritation, eye discomfort, trouble seeing in dark, blurred vision, and increasing dryness in the right eye. All of these symptoms are associated with the condition. The doctor recommended eye drops that contained sodium carbomethylcellulose and glycerin and were sold under the brand name Soft drops. Amitriptyline is the medication that she is taking in order to manage her depression with. [9,10]

3. Results and Discussion

In this particular case study, we discovered a number of significant elements that have the potential to have a significant influence on the health state of the patient. The conclusion that can be drawn from this is that obesity is one of the primary variables that considerably raises the chance of developing diabetes and high blood pressure, as well as the cholesterol level. A patient's health can be significantly improved by the management of their diet, which includes avoiding foods that are sweet, fatty, spicy, rice, sorghum, and red millet; maintaining a regular sleep pattern; and engaging in physical activity. Cholesterol is an essential component of what the body does. In the event that cholesterol levels, and more specifically low-density lipoprotein (LDL) cholesterol, reach elevated levels, it has the potential to result in an embolism in the arteries. [11,12] This causes the arteries to become constricted, which in turn cuts off blood supply to the heart muscle. Surgical procedures known as coronary artery bypass graft surgery (CABG) were carried out in order to remove such embolisms and enhance the circulation of blood throughout the heart. The act is carried out on a regular basis. Patients who have coronary disease that affects many vessels have a better chance of survival. Patients who suffer from more severe stages of coronary disease, diabetes, and left ventricular dysfunction are particularly likely to benefit from this treatment. In three years, the death rate for individuals who have left main coronary artery disease that has not been treated is around fifty percent. [12,13]

Diabetes which is a documented independent risk factor, has the potential to raise the mortality rate as well as the problems that might arise during this procedure. The renin-angiotensin-aldosterone system (RAAS) has been shown to have a significant correlation with diabetes, and hyperglycemia has been shown to enhance the activity of angiotensin-converting enzyme as well as the generation of intracellular angiotensin (Ang). Numerous studies have proven this correlation. For individuals who are suffering from multi-vessel disease, left main coronary artery disease (LMCA), and systolic dysfunction, this is the standard of care for urgent vascularization. In addition, we discovered that the difficulties might be increased if drugs are not taken at the prescribed times. As a result of the patient's habit of forgetting to take their prescriptions at the prescribed times, the body experienced a rise in the number of difficulties. Controlling one's stress is another extremely significant factor in maintaining one's health and leading a healthy lifestyle. It is essential to practice yoga and meditation in order to effectively manage stress and anxiety and to maintain excellent mental health. [14,15]

4. Conclusion

The patient is still adhering to her diet, practicing meditation on a regular basis, engaging in regular physical activity, and taking her medicine as prescribed at the appropriate times. Her anxiety and stress levels are decreasing as a result of her meditation practice. Controlling her sugar level has shown a very excellent improvement in her health and lifestyle, which has allowed her to have a better and healthier life. She is able to do this by maintaining her diet, engaging in physical activity, and taking her medicines at the appropriate times. The present blood sugar level after a meal is 180 mg/dL, whereas the blood sugar level after a meal is 160 mg/dL that is fasting.

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