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THE IMPACT OF DIABETES MELLITUS ON BLOOD PRESSURE AND CARDIO-VASCULAR DISEASES

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ABSTRACT

Objectives: This study is aimed at showing the probability of individuals with controlled and uncontrolled *Diabetes mellitus* to develop complications in the blood pressure (hypertension) and CVDs. **Methodology:** Using the HbA1C levels of patients, the individuals with controlled and uncontrolled *Diabetes mellitus* were categorized. Lipid profiles and cardiac biomarkers were used to categorize patients with cardiovascular complications while sphygmomanometer was used to check for patients' blood pressure. **Results:** A total of 50 patients were studied where 39 patients had hypertension, and 11 patients had CVDs. 24% of the patients had controlled diabetes and 76% had uncontrolled diabetes. **Conclusion:** In absence of medical intervention and care, age and the duration (time) of the diabetic condition in an individual play a great role in the development of hypertension and CVDs complications in most of the diabetic patients.

KEYWORDS: Diabetes, Hypertension and cardiovascular diseases.

INTRODUCTION

Individuals with *Diabetes mellitus* (DM) is a chronic disease characterized with high concentration of blood glucose, that occurs either due to failure of the pancreas to produce enough insulin or ineffective use of the insulin produced by the body. High sugar concentration in the body causes the red blood cells (RBCs) to become sticky, leading to atherosclerosis, which narrows the blood vessels, causing high blood pressure and damaging effects to the walls of the blood vessels (Arnold et al., 2020; Brownlee and Cerami, 1981). Hypertension is a condition that occurs when the pressure in the blood vessels is too high (140/90 mmHg or higher). The cardiovascular system also known as the blood vascular or the circulatory system provides blood supply throughout the body. It consists of the heart, which is a muscular pumping device and a closed system of vessels called arteries, veins and capillaries (Deedwania et a., 2022; Lindholm et al., 2002).

Hypertension and diabetes are common comorbidities, they are closely interlinked (Petrie et al., 2018). Moreover, patients with hypertension often exhibit insulin resistance and are at a greater risk of developing Diabetes than the normotensive individuals (Tackling and Borhade, 2019). Their frequent coexistence in the same individual is not a coincidence, because aspects of the pathophysiology are shared by both conditions, particularly those related to obesity and insulin resistance (Tarray et al., 2014).

The major cause of morbidity and mortality in diabetes is cardiovascular disease, which is exacerbated (triggered) by hypertension. There is also substantial overlap in the cardiovascular complications of diabetes and hypertension related primarily to micro-vascular and macro-vascular disease. In fact, a person with diabetes and high blood pressure is four times more likely to develop heart disease than someone who does not have either of the conditions (Colberg, et al., 2010; Dunlay et al., 2019; Fowler, 2008; Heid, 2022).

Accordingly, hypertension has similar risk factors as Diabetes, such as endothelial dysfunction, vascular inflammation, arterial remodeling, atherosclerosis, dyslipidemia, and obesity (Jia and Sowers, 2021). Even mildly raised blood sugar levels can over time, put an individual more at risk (Zavaroni et al., 1992; WHO,. 2015, 2023). This creates a need for studying the fate of the individuals with both controlled and uncontrolled diabetes, towards developing hypertension and cardiovascular diseases.

MATERIALS AND METHOD

A total number of 50 patients were studied. Several tests were conducted for the effective data collection and analysis.

HbA1c test
HbA1c test was conducted to measure the average blood sugar level of patients over the past 3 months. Where an A1C value below 5.7% indicated the individual is normal, between 5.7 and 6.4% indicated pre-diabetes and 6.5% or higher indicated diabetes.

Random Blood Sugar Test
This test was used to measure the present level of blood sugar in patients. A blood sugar level of 200 mg/dl or higher indicated diabetes.

Lipid profile test
This test was used for measuring the level of lipoproteins for effective diagnosis of hypertension and heart diseases. Patients with high levels of LDL, VLDL, triglycerides, cholesterol and low levels of HDL showed risk of Hypertension and MI.

Blood pressure measurement
Using a sphygmomanometer, this test was used to measure the systolic pressure diastolic pressure, for studying the blood pressure variations.

Cardiac biomarkers test
This test was used for screening the Cardiac troponin I and troponin T, Creatine kinase (CK), CK-MB (myocardial band), Myoglobin, released into the bloodstream when the heart muscle is damaged or stressed.

RESULTS

Number of diabetic patients studied was 30 males and 20 females, making a total of 50 patients. In which hypertensive patients were 39, and patients with CVDs were 11.

From the total subjects, (12) 24% of the patients had controlled diabetes with HbA1c value below 7 whereas (38) 76% of the patients had uncontrolled diabetes with HbA1c value above 7.

Among the patients with controlled diabetes 75% had hypertension and 50% had CVDs. And among patients with uncontrolled diabetes 58% had hypertension and 7% had CVDs.

According to body weight, about 78% (39) of the total subjects 100% (50) had a body weight ranging from (61-90) kgs, and a significant number of diabetic patients was observed in the same range. Out of which only 32 patients had hypertension and only 9 patients were observed to have CVDs.

Each range of body weight had diabetic patients with the complications of high blood pressure and only two groups of body weight range (51-60 and 91-100) kgs had no CVDs.

According to age factor about 52% of total subjects belonged to the age group of (50-70) years and showed a high frequency of diabetic patients compared to other age groups. A high number of patients with hypertension and CVD(s) were also observed in the same age group.

Only 16% of the total subjects belonged to the age group of 71-90 years, and all of them were hypertensive while only 1 patient showed CVD(s) complication.

However, Diabetic patients belonging to the age group of 31-40 years showed neither hypertension nor CVD(s) complications.

DISCUSSION

In absence of medical intervention and care, the duration (time) of the diabetic condition in an individual and age factor play a role in the development of hypertension and CVDs complications in most of the diabetic patients. The findings were supported by Ritchie. and Abel (2020) and Mattila and de-Boer (2010).

The existence of more cases of hypertension and CVD(s) among the individuals of 50-70 years, suggests that with time, lifestyle choices influences the progression of these complications in both pre diabetic and diabetic patients (Wahidin et al., 2023).

About 78% of the studied diabetic patients had complaints of high blood pressure, and if not well taken care of, this makes them at risk for development of several CVDs such as coronary artery disease, congestive heart failure, atrial fibrillation, cerebrovascular disease, peripheral arterial disease and aortic aneurysm (Zivanovic et al., 2010).

The prevalence of more cases of hypertension and cardiovascular complications in patients with controlled diabetes compared to patients with uncontrolled diabetes, also suggests that, though diabetes has a potential to trigger and influence the development of hypertension and CVDs complications, other factors such as age, lifestyle, occupation, activity (exercise), diet and genetics, can be the cause behind the existence of these conditions in diabetic patients.

The fact that no cases of hypertension and CVD(s) were traced in the youngest age group also suggests that physical activities, body exercises and observing a healthy lifestyle do help greatly in minimizing the risk of getting the complications associated with diabetes.

CONCLUSION

The development of hypertension and CVD(s) in diabetic patients had significant correlation with the age and duration of the disease in an individual. Moreover unhealthy lifestyle, lack of physical activity (exercises) and failure to follow the medical prescription given have been the cause of the manifestation of these

complications overtime, even when they were absent at the first place.

Thus, along with medications, patients should be advised to decrease body weight, quit smoking, do regular exercises and control blood pressure. A proper control of these risk factors may help to decrease the severity of diabetes and the associated complications in general.

DECLARATION BY AUTHORS

The authors hereby declared that it was their original piece of research and had not been sent to any other journal for publication.

ETHICAL APPROVAL

Approved.

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